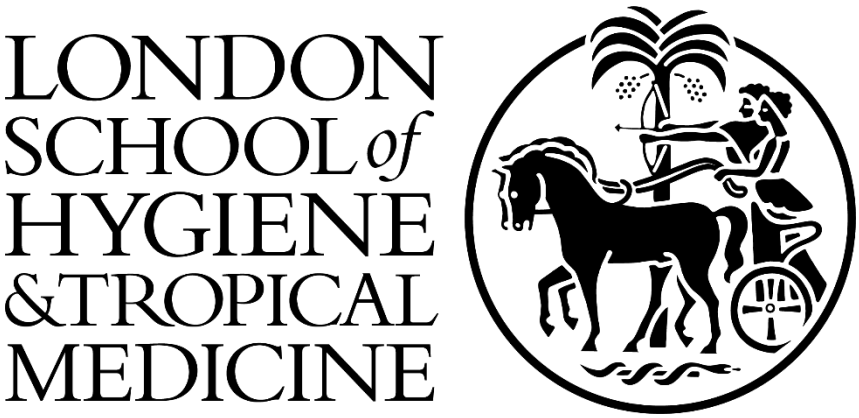

Children's work and parental investment in education in north-western Tanzania

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ABSTRACT

Changes associated with modernisation, including livelihood change, urbanisation, and the introduction of formal education, reduce children's ability to contribute to their households, and produce a trade-off between work and learning. Increasingly high levels of investment in education are thought to raise the costs of children, resulting in a 'quantity-quality trade-off' which incentivises reduced fertility. Relatively few studies have examined children's time allocation in contemporary transitioning populations, where education is available and valued, but where subsistence livelihoods still create demand for children's work. This study collected time allocation data from 1,278 children living in two communities in a rapidly modernising setting in Mwanza region, Tanzania. Focus group discussions were also conducted to investigate the perceived costs and benefits of education for parents and adolescents.

The findings from this research highlight the importance of considering children's work in providing a more nuanced understanding of variation in education. Lower-than-anticipated trade-offs between work and school suggest the opportunity costs of school in this context may be relatively low, potentially contributing to the stalled fertility decline. Households may balance work and schooling demands through substitution between co-resident children, and through fostering networks, with implications for classic models of fertility decline which focus mainly on parental investment. Girls' household work involves a sacrifice of leisure time and does not appear to diminish significantly with modernisation, suggesting the need to challenge gender stereotypes, and reduce the domestic work burden in transitioning contexts. Finally, education is highly valued, but the barriers to academic achievement mean that few experience the desired benefits, pointing to the importance of improving employment prospects together with providing good-quality, locally relevant schooling.

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TABLE OF CONTENTS

TABLE OF TABLES

SUPPLEMENTARY TABLES

TABLE OF FIGURES

SUPPLEMENTARY FIGURES

1. INTRODUCTION

> "In short, some assume that children work only if they must, others that they work whenever they can."
>
> *(Hawkes, O'Connell, & Blurton Jones, 1995)*

Children can be framed as 'useless', in their dependence on others for investment and relative lack of skill and knowledge, or as 'useful', in their ability and willingness to contribute to their households. For much of human history, it is likely that they were both, and that learning and working were complementary features of childhood (Kramer, 2005). The increasing expansion of formal education has created a trade-off between learning and working, tipping the balance in favour of children being economically 'useless' and yet emotionally 'priceless' (Zelizer, 1985). Trade-offs between work activities and school attendance, and changing patterns of parental investment, are central to classic models of the demographic transition. These models frame reduced fertility as a response to the increasing costs of raising a child in contexts where high levels of investment are required, and where children's economic worth is reduced (Becker, 1960; Kaplan, 1996; Kaplan & Lancaster, 2000). This thesis, situated at the intersection between demography, anthropology, and evolutionary ecology, investigates parental investment in education and children's time allocation to work, school, and leisure in a community experiencing fertility decline, modernisation, and livelihood change.

1.1. Thesis overview

While the determinants of fertility and education in transitioning contexts have received considerable attention, relatively less research has examined changing patterns of children's work. Time is a limited resource, meaning decisions about education necessarily involve decisions about children's work. Moreover, in many transitioning

contexts, children's work contributions remain important for their households, and may be an important way to gain skills, while low-quality schooling and few formal employment opportunities render the payoffs to investment in education far from certain.

Additionally, much demographic research on education in transitioning contexts comes from large-scale, highly aggregated datasets, such as Demographic and Health Surveys. Such surveys are valuable in identifying broad trends, but inadequate for exploring patterns within communities, which may be masked by aggregated analysis (Lawson & Uggla, 2014). Demographic researchers have therefore increasingly turned to more traditionally anthropological methods, emphasising the importance of understanding the social and cultural context in which demographic behaviour occurs, and the need for more micro-level studies of the processes underlying demographic transition (Bernardi, 2007; Dribe, Oris, & Pozzi, 2014). The integration of theory from evolutionary biology with demographic research has also provided useful insights, particularly in the study of mortality, but also in reconciling economic and social models of fertility, and generating testable hypotheses regarding the impact of socioecological context on reproductive behaviour, parental investment, and children's time allocation (Bock, 1999, 2002a; Kaplan, 1994; Sear, 2015b).

This thesis therefore takes an interdisciplinary approach. Given the relative lack of data on children's time allocation in transitioning contexts, this project set out to collect this data in a setting in north-western Tanzania (Kisesa ward, Mwanza region) chosen to be representative of a rural but rapidly changing context (Kishamawe et al., 2015). Primary data collection was carried out in order to allow for a deeper understanding of the research context, as well as to trial a novel form of time allocation data collection with children, to give more detailed information than is generally available in larger surveys.

Quantitative data collection was complemented by qualitative interviews and focus group discussions with teachers, parents, and adolescents from the local area.

Human behavioural ecologists (see section 1.3) have called for research in this field to more directly address applied themes that engage with wider debates surrounding contemporary world issues (Gibson & Lawson, 2015; Tucker & Rende Taylor, 2007). This thesis speaks to these calls, and also engages with some of the wider debates surrounding education and international child labour policy, particularly some of the critical perspectives within anthropology and sociology regarding the issues arising from the hegemony of Western views on ideal childhoods (Abebe & Ofosu-Kusi, 2016; Bourdillon, Levison, & Myers, 2010; Hart, 2006; Nieuwenhuys, 1996).

1.1.1. Thesis objectives and aims

The overarching aims of this thesis are:

1. To describe the forms and levels of children's work and school attendance in two villages in Kisesa ward, Tanzania, contrasting a more urban town with a more rural village
2. To quantitatively investigate some of the household structure and child-level determinants of time allocation to school, work, and leisure activities
3. To investigate the perceived costs and benefits of school and work from the perspective of both adolescents and parents

The objectives of this project are to collect quantitative data on children's time allocation and education in order to investigate the trade-off between work and school, and to describe differences in time allocation between the town and village, addressing aim 1. Addressing aim 2, the objectives are to use quantitative data to test predictions regarding the association between gender, birth order, residence in town, and relationship to the household head, and educational outcomes and time allocation.

Finally, to address aim 3, the objectives are to include quantitative attitude questions in the household survey, and to conduct focus group discussions with parents and adolescents. These aims and objectives inform specific research questions which are addressed in each substantive chapter. The following sections outline the theoretical background to this study, briefly describing demographic transition theories before outlining the main theoretical framework for this study, human behavioural ecology, and relevant theoretical and empirical work regarding children's work and parental investment in education. I then explore some of the broader social science perspectives on children's work and education. Finally, I outline the thesis structure, including a description of the three research papers which form the main body of this thesis.

1.2. The demographic transition

The demographic transition describes the pattern of demographic change, seen around the world over the past two centuries, in which mortality and fertility rates decline, with an interim period of rapid population growth (Kirk, 1996; Notestein, 1945). Numerous scholars since the 19th century have theorised about the causal mechanism underlying this pattern, attracting research from demography, economics, history, sociology, and evolutionary anthropology (Becker, 1960; Borgerhoff Mulder, 1998b; Caldwell, 1976; Cleland & Wilson, 1987; Coale & Watkins, 1986; Easterlin & Crimmins, 1985; Knodel & van de Walle, 1979; Lesthaeghe, 1977). A point of broad consensus is that fertility decline is linked to 'modernisation', whether causally or by association (Kirk, 1996). There are no countries that have experienced modernisation without experiencing fertility decline, though there is evidence for a 'J-shaped' relationship such that as modernisation continues, fertility begins to increase again (Myrskylä, Kohler, & Billari, 2009). While not always explicitly defined, 'modernisation' is generally understood to incorporate changes associated with increasing integration into the global economy. These include economic changes such as urbanisation, improved healthcare, and

increased access to labour markets; social changes such as access to mass media, exposure to Western values, and family planning programmes; and political changes including increasing government intervention in daily life, and legislation including compulsory education, and restrictions on age at marriage and entry into the labour force (Kirk, 1996; Mattison & Sear, 2016).

Theoretical models of the demographic transition emphasise different aspects of modernisation, falling broadly into three categories (Shenk, Towner, Kress, & Alam, 2013). Firstly, fertility decline has been linked to the decline in mortality. When mortality declines, parents can be more certain that children will survive to adulthood, and so no longer require high fertility in order to ensure surviving offspring (Coale & Treadway, 1986). Additionally, greater life expectancy increases the payoffs to investment, and may reduce the perception of extrinsic risk, motivating greater control of fertility and more investment in offspring (Chisholm, 1993; Quinlan, 2007). Secondly, modernisation has been linked to the rising cost of children, leading parents to reduce the number of children in order to invest more in each child, also known as a 'quantity-quality trade-off' (Becker, 1960; Kaplan, 1996). Finally, a number of theories have focused on cultural diffusion, both of the idea of fertility limitation, and of the means of doing so, for example family planning technology (Bongaarts & Watkins, 2014; Cleland & Wilson, 1987). All these theories have received a range of support from empirical studies, and it is likely that all of these factors – mortality decline, socioeconomic change, new forms of contraception, and the social diffusion of ideas – have played some role, and that different transitions have been influenced by them to different extents (Mason, 1997). Our ability to infer causal processes is hampered by a lack of reliable data, particularly micro-data on individuals within transitioning societies, and a dearth of studies which examine multiple theories. Two recent studies of fertility decline in Bangladesh and Bolivia emphasise the interaction between economic and social influences in changing

fertility behaviour; both found support for multi-causal pathways of fertility decline, with education being a strong predictor in both studies (Shenk et al., 2013; Snopkowski & Kaplan, 2014).

A limitation of many classic models of the demographic transition is their reliance on historical European patterns of socioeconomic and demographic change, rather than on contemporary transitions occurring in low-income countries. Such accounts are vulnerable to the fallacy of the 'developmental paradigm'; Thornton (2001)'s term for the assumption that societal change is linear and universal, with societies differing only in their position along the same developmental trajectory. Thornton describes how this model has conflated cause and effect, and led to the widely accepted view that changes from 'traditional' family structures to 'modern' ones drive socioeconomic development (Thornton, 2001). Thus, low fertility, gender equality and youth autonomy are framed as prerequisites for economic development, while 'traditional' family structures are viewed as impediments to 'progress'. Development programmes therefore promote family planning, female education, and reduced work during childhood, as the key to both individual and societal wealth and well-being. Yet contemporary economic and demographic transitions differ in several important respects, not least the role of external agencies in changing both the real and perceived costs and benefits of education and high fertility. Studying contemporary transitions is thus vital for understanding the ways in which parental investment and children's time allocation respond to socioeconomic modernisation, and for assessing the relevance of classic models of demographic transition beyond the historical European fertility decline.

1.3. Human behavioural ecology

The theoretical framework for this thesis is that of human behavioural ecology (HBE), which can be defined as the analysis of human behavioural variation within the

framework of evolutionary theory (Nettle, Gibson, Lawson, & Sear, 2013; Winterhalder & Smith, 2000). HBE assumes that mechanisms influencing human behaviour, such as psychological preferences, cultural transmission biases, and decision-making processes, have been shaped by natural selection such that individuals respond to their environments in a way that maximises their fitness, i.e. their total number of genetic descendants (Borgerhoff Mulder & Schacht, 2012). This does not necessarily mean that individuals consciously act to improve their fitness; rather, that evolved psychological mechanisms influence individuals to behave in a way that is likely to improve their fitness in that particular environment, often through behaviours that are proxies of fitness, for example attracting a mate and having children, altruism towards family members, or seeking to improve their wealth, status, or longevity. As fitness is difficult to measure, particularly in cross-sectional studies, studies more often measure indicators such as number of children, physical health, social status, or income as proxies of 'success' in adapting to a particular environment (Nettle et al., 2013; Sear, 2015a). HBE focuses on the context-dependency of behaviour, recognising that people have been selected to have extensive phenotypic and behavioural plasticity, allowing them to respond flexibly to different environmental conditions (Borgerhoff Mulder & Schacht, 2012; Nettle et al., 2013). Viewing behaviour as being shaped by natural selection therefore does not imply genetic determinism. Rather, it recognises that considerable variation in behavioural strategies both within and between populations can arise from traits facilitating adaptation to different environmental pressures, such as developmental plasticity, social learning, and cultural transmission (Sear, 2015a; Wells & Stock, 2007).

1.3.1. Life history theory and embodied capital theory

Central to HBE is life history theory and the trade-offs it proposes. All organisms must fulfil goals of survival, growth, and reproduction, but face trade-offs between these

goals due to having limited resources of time and energy (Stearns, 1992). Embodied capital theory extends life history theory by integrating economic behaviour, social behaviour, and demographic traits. Embodied capital is a similar concept to that of human capital in economics, being the physical growth, strength, health, social relationships, skills and experience that increase an individual's fitness (Bock & Sellen, 2002; Kaplan, 1996; Kaplan, Bock, & Hooper, 2015). Thus embodied capital theory states that individuals experience trade-offs between investing in their own embodied capital, or in producing offspring, and then once reproduction has begun, between investing in the embodied capital of existing offspring, or in producing another offspring. Individuals resolve these trade-offs in terms of which option is perceived (consciously or unconsciously) to have the greater fitness returns. Returns are shaped both by the environment, and by individual traits, which will determine the relative costs and value of different forms of embodied capital (Kaplan et al., 2015).

Human life history is unusual relative to other great apes, in having an extended post-weaning period, in which juveniles remain nutritionally dependent and thus costly, yet also having lower mortality rates and higher fertility rates. An extended period of juvenile dependence has been understood as part of a suite of adaptations, including extensive intergenerational support of reproduction, and large brains, that facilitates phenotypic plasticity, and the acquisition of complex foraging skills and context-specific knowledge during development (Kaplan & Bock, 2001). Together, these traits allow humans to exploit high-quality resources through extractive foraging (and agriculture), and to adapt to rapidly changing or new environments, while maintaining relatively high fertility rates (Kaplan, Hill, Lancaster, & Hurtado, 2000; Wells & Stock, 2007).

Under this model, the juvenile period allows time for growing and learning, during which juveniles are subsidised by their parents and other kin until they reach adult

competency. Embodied capital accumulated during childhood is predicted to relate to adult competence, with the costs of delaying reproduction being recouped through higher adult social and reproductive success, and ultimately greater long-term fitness (Kaplan & Bock, 2001). Consistent with this functional perspective on childhood, a number of studies in pre-transition societies have demonstrated that productivity in most tasks increases with age, that important skills are developed during childhood, and that physical growth and strength are important for skill proficiency (Bird & Bliege Bird, 2002, 2005; Bliege Bird & Bird, 2002; Crittenden, Conklin-Brittain, Zes, Schoeninger, & Marlowe, 2013; Gurven, Kaplan, & Gutierrez, 2006).

1.3.2. Embodied capital models of the demographic transition

The demographic transition presents a serious challenge to evolutionary models of fertility behaviour. That individuals consciously limit their fertility in the face of increasing resources, and that wealthier individuals reduce their fertility earlier and to a greater extent than others, seemingly contradicts models which assume that individuals seek to maximise their reproductive success (Borgerhoff Mulder, 1998b). Embodied capital theory (ECT), in a similar way to Becker's economic models (Becker, 1960), proposes that increasing integration into competitive wage labour markets motivates individuals to invest more in formal education for themselves and their children, delaying the start of childbearing, and increasing the cost of raising children. Additionally, shifts away from subsistence livelihoods reduce children's ability to contribute to household production, and disincentivise skill acquisition through learning-by-doing. This is proposed to lead to a quantity-quality trade-off, whereby parents better maximise their fitness in the long-term by having fewer children, but investing more per child to ensure each child receives sufficient investment to be socially, economically, and reproductively successful as an adult (Kaplan, 1996; Kaplan & Bock, 2001).

In pre-transition societies there is limited evidence that quantity-quality trade-offs favour fertility reduction. While short inter-birth intervals do appear to reduce child survival, there is little evidence for an 'optimum' family size above which fitness is compromised (Lawson & Borgerhoff Mulder, 2016). In these settings, the benefits of large families appear to outweigh the costs of sibling competition. This could be because child care from extended kin networks and children's own production reduces the cost of childbearing for parents, having more siblings with whom to cooperate in adulthood is beneficial, or because there is limited scope for accumulating material wealth (Draper & Hames, 2000; Hill et al., 2011; Kramer, 2005). However, modernisation does appear to introduce circumstances which foster quantity-quality trade-offs, with the increasing dispersal of kin groups, greater accumulation of material wealth, and the aforementioned increasing cost of raising children (Lawson & Borgerhoff Mulder, 2016). In post-transition societies, there is much more evidence for sibling competition and for a negative association between family size and educational investment (Lawson & Mace, 2009; Lawson, Makoli, & Goodman, 2013). Studies in contemporary African societies have also supported this pattern, with larger family size often being associated with better educational outcomes prior to significant fertility decline; however, it appears that this pattern reverses as the demographic transition proceeds (Eloundou-Enyegue & Williams, 2006). In transitioning societies, where elements of modernisation such as formal education and market integration are combined with a reliance on kin networks for social support, and on children's contributions to household livelihoods, quantity-quality trade-offs and subsequent fertility decisions are likely to be complicated.

It remains debatable whether the extent to which fertility is limited in post-transition societies can be considered adaptive. Mathematical modelling suggests that in contexts with 'snowballing' resources, such as extensive heritable wealth, intensive investment and reduced fertility can ensure higher fitness (Hill & Reeve, 2005). However, empirical

studies have shown that while decreased fertility may increase the social and economic status of descendants, it is not associated with greater overall fitness (Goodman, Koupil, & Lawson, 2012; Kaplan, Lancaster, Johnson, & Bock, 1995). Non-diminishing returns to education even at high levels of investment, rapidly changing environments, and conflict between fertility goals and other indicators of success such as education, high-status work, and wealth, may have led to 'runaway' parental investment, i.e. investment beyond what is necessary to produce successful offspring (Kaplan, 1996; Mace, 1998, 2007; Sear, 2015b). Although individuals may no longer be maximising their fitness, this does not preclude the use of an embodied capital framework to understand fertility behaviour, as individuals still use evolved mechanisms to respond to environmental cues (Sear, 2015a).

1.3.3. Parental investment in education

An extended period of juvenile dependence requires high levels of parental investment in offspring embodied capital (Kaplan & Bock, 2001). Parental investment is any investment in offspring by the parent that increases the offspring's reproductive success, at the expense of the parent's ability to invest in other offspring (Trivers, 1972). Parents may make direct investments in offspring embodied capital, for example provisioning children with food, clothing, medicine, and shelter, or paying bridewealth or dowry payments to secure them a spouse, or they make indirect investments that facilitate children's own acquisition of embodied capital, for example by paying school fees, or by allocating them to do productive tasks to help them practice and learn skills.

Parents aiming (unconsciously) to maximise their fitness may best achieve this by biasing investment towards the offspring with the greatest perceived returns in terms of reproductive success (Trivers, 1972). This leads to the prediction that parents should not necessarily invest equally across all children. A particularly straightforward prediction is that step-parents will invest less in their step (non-biological) children, and several

studies have demonstrated reduced educational and time investment in stepchildren and children in whom men have low paternity confidence (Anderson, Kaplan, Lam, & Lancaster, 1999; Anderson, Kaplan, & Lancaster, 2007, 1999; Hofferth & Anderson, 2001; Marlowe, 1999). Outcomes for fostered and non-fostered children are compared in Chapter 6.

Gender is also an important dimension by which investment may be biased, as the returns to investment in boys' versus girls' education may differ due to gender differences in work and marriage patterns. Globally, the focus has been on educational investment biased towards boys as this is most common (United Nations, 2013). The returns to investment in sons' education may be higher: when men command higher wages than women; when there is strongly gendered division of adult labour with men specialising in wage work; when wage work is incompatible with childbearing; in patrilocal settings where girls marry and move away; or if boys are perceived to perform better in school (Borgerhoff Mulder, 1998a; Gibson & Sear, 2010; Grogan, 2007). However, in certain contexts preferential investment in daughters may occur, for example in matrilineal contexts where wealth is inherited through the female line, in contexts where boys' work is valuable and incompatible with attending school, or where girls have greater potential for marrying someone of higher wealth or status than their brothers (Cronk, 1989; Gibson & Sear, 2010; Hedges, Borgerhoff Mulder, James, & Lawson, 2016; Mburu, 2016). In recent years, a female advantage in tertiary education has emerged across many post-transition societies. This has been attributed to gender differences in non-cognitive abilities, in that boys are more likely to experience learning disabilities, dyslexia, and behavioural disorders, while girls tend to have greater attentiveness and self-discipline (Becker, Hubbard, & Murphy, 2010; Pekkarinen, 2012). Gender biases in parental investment in education will be explored further in chapters 4 and 5.

Birth order is another dimension of parental investment bias that has received attention. At a given point in time, earlier-born children are predicted to be of greater reproductive value to their parents, because they have survived more of the higher mortality infant and juvenile phase, and because they are closer to beginning reproduction and thus have a shorter generation time (Clutton-Brock, 1991; Jeon, 2008; Jones & Bliege Bird, 2014). Earlier-born children's work may also be more valuable, as they are likely to be more skilled and efficient than later-born children (Bock, 2002a; Gurven & Kaplan, 2006). With regards to educational investment, there may therefore be a conflict, with the payoffs to investment in earlier-born children being higher, but the opportunity costs of their time also being greater. This may account for the mixed empirical results with regards to birth order biases in education (see Chapter 5 for a review of this literature).

Finally, modernisation and parental wealth are anticipated to alter parental investment biases. In contexts with higher extrinsic mortality, few labour market opportunities, and where education is a novel investment, parents may be uncertain of the payoffs to educational investment, and therefore may benefit most from pursuing a 'bet-hedging' strategy, investing at a low but relatively equal amount in their children (Liddell, Barrett, & Henzi, 2003). Modernisation is anticipated to increase the certainty of payoffs to investment, and hence to increase parental investment biases, while wealthier parents are expected to be better able to access returns on educational investment. In a series of studies in Ethiopia, Malawi, and Tanzania, parental investment biases by gender and birth order were found to be exacerbated in the wealthiest households, and in the more 'modern' setting in Ethiopia (Gibson & Lawson, 2011; Gibson & Sear, 2010; Hedges et al., 2016). Predictions about the association between modernisation and educational investment will be addressed in chapter 4.

1.3.4. Children's work and embodied capital

Across most pre-transition societies, children are expected, and generally willing, to do work for their family (Lancy, 2012). Anthropological studies of children's work have demonstrated two interrelated benefits of this work. For the vast majority of human evolution, and in contemporary subsistence populations, the productive tasks children undertake are similar to those they will perform as adults. Participating in productive activities can therefore be viewed as a way to gain embodied capital, providing the opportunity to develop important skills and experience (Bock, 2002b). Formal education is a relatively new phenomenon, and direct teaching was uncommon in most societies prior to the introduction of schools. Instead, children predominantly learnt through observation and imitation of adults, and through 'learning-by-doing' (Lancy, 2010, 2012). Play is also an important part of skill acquisition, and playing at productive tasks may help children to practice skills before progressing to doing them (Bock, 2002b). In pre-transition societies, unlike industrial ones, work, play, and learning may be indistinguishable. Children may play games on their way to run errands or fetch water, or develop numeracy skills through counting games, or learn how to process grain by helping their mother; education is embedded in work and play, rather than being a separate activity (Lancy, 2012).

Children's work is also beneficial in and of itself. A number of demographic studies have shown that children in agricultural societies make significant contributions to their household economy (Cain, 1977; Caldwell, 1976; Kramer, 2002; Lee & Kramer, 2002; Nag, White, & Peet, 1978; Vlassoff, 1979). Although children are costly, they can help to offset both their own, and their siblings' costs, leading some researchers to describe juveniles as 'helpers-at-the-nest' (Bereczkei & Dunbar, 2002; Kramer, 2002, 2011; Lee & Kramer, 2002; Turke, 1988) (but cf. Hames & Draper, 2004, who do not find evidence that earlier-born daughters improve their mother's fitness through 'helping at the

nest')). Particularly in agricultural societies, children's contributions may be crucial in underwriting the costs of their parents' reproduction, facilitating high fertility rates (Kramer & Boone, 2002).

Despite being an important component of the changing costs of children, relatively few studies have examined children's work in contemporary transitioning societies using an evolutionary framework. Rende Taylor (2005) used a behavioural ecological framework to investigate girls' involvement in the sex trade in Thailand, finding that lastborn girls both receive the most educational investment, and are most at risk for prostitution. It is suggested that the importance of earlier-born girls as helpers to their parents leads to them receiving less education, but also protects them from being entered into the sex trade, whereas parents want to ensure high returns on their investments in younger daughters' embodied capital (Rende Taylor, 2005). In Fiji, Mattison & Neill (2013) examined the effect of urbanisation on children's work patterns, finding that children in more urban households work less, potentially because the higher returns to education in urban environments incentivise parents to forego the short-term benefits of children's work and prioritise time spent in education instead. Finally, Bock (2002b, 2002a; Bock & Johnson, 2004)'s research in Botswana has provided detailed ethnographic descriptions of children's work, and has examined trade-offs between work and school, demonstrating intra-household work substitution and related effects on educational investment. In this thesis, I aim to build on this previous work by collecting detailed data on the everyday work done by children in an area of north-western Tanzania where education is the norm, but not guaranteed for all children, and where children still make significant work contributions to their households.

1.4. Childhood in global perspective

Perceptions of childhood and children in industrialised countries have changed drastically since the 19th century, from being economic 'assets' for their families, to being economically 'worthless' but emotionally 'priceless' (Lancy, 2015; Zelizer, 1985). There has been increasing concern for the protection of children, and the promotion of childhood as a period of innocence, freedom from responsibility, and learning. International conventions, such as the United Nations Convention on the Rights of the Child (UNCRC) and the International Labour Organization (ILO)'s Minimum Age Convention (see Box 1; ILO, 2017, 2018), and global development goals for universal education, seek to apply global standards to children living in very different contexts, and assume that the model of childhood they promote is universally desirable. Critiques of rights-based approaches to children's lives have highlighted their ethnocentrism in assuming that the best interests of children are the same throughout the world, and their failure to recognise children's agency and motivations (Archambault, 2011; Hampshire, Panter-Brick, Kilpatrick, & Casiday, 2009). The emotional hyperbole of many media and policy accounts of child labourers, child brides, child soldiers, and street children, portrays them as the innocent victims of exploitative parents or states, eliciting moral indignation which is harnessed to secure donations or action (Hart, 2006). While there are undoubtedly vulnerable children who benefit from outside intervention, these accounts can obscure the specific contexts which lead to children experiencing these outcomes, instead implying that they are the victims of the moral failings of their parents or societies (Archambault, 2011; Hart, 2006; Pupavac, 2001). This risks stigmatising families who are constrained by economic or social situations and must make difficult choices; most parents act in what they consider to be their children's best interests, but these may not align with the priorities of international agencies (Cassidy, 1987; Hampshire et al., 2009).

The assumptions and ethnocentrism of global perspectives on childhood have had important consequences for the study of children's work. The first, and perhaps most important consequence, is that it has influenced how work is conceptualised. Work has little role in a model of childhood in which the education and protection of children are the main concerns. In this model, only work that can be framed as educational, in providing experience or training, is permissible. Children's work in transitioning contexts is therefore most often conceptualised as problematic, either in being exploitative or risky, or as a barrier to 'better' uses of children's time such as education. The focus of empirical work and policy has thus been on harmful forms of children's work, or the effect of working on school attendance, and data collection has focused on measuring 'child labour' (see Box 1 for definitions of child labour and children's work) (Bourdillon et al., 2010). Many studies focus on 'market work' – work for wages, or producing goods or services for sale – which is seen as exploitative and harmful. However, very few working children are actually involved in market work. Across 36 developing countries, Edmonds & Pavcnik (2005) found that while 68.4% of children aged 5 to 14 were 'economically active', only 2.4% were involved in paid work outside the family. There is therefore a significant lack of data on the work done by the majority of children worldwide, underestimating the time children, particularly girls, spend working. This approach also implies that household work is benign. However, household chores and caring duties can also be time-consuming, physically demanding and disruptive of schooling, and very little is known about the relationship between household work and schooling (Ilahi, 2000; UNICEF, 2016).

The second consequence for the study of children's work is that the benefits of children's work are frequently overlooked. As outlined above, work can be an important way for a child to acquire embodied capital and contribute to their family. In societies with high youth unemployment in which the majority of adult occupations are

subsistence-level, spending time in productive work may actually be more beneficial than attending school, where the skills acquired may be of limited direct relevance. Studies done with working children have shown the pride, self-esteem, and value they derive from their work (Bourdillon, Levison, White, & Myers, 2015). The framing of child labourers as passive victims of exploitation ignores the agency children exert in their own lives, and overlooks the constraints they live within. As work is seen as a less desirable use of children's time, studies frequently look for trade-offs between work and school, and policies recommend compulsory schooling as the 'antidote' to harmful child labour (Brown, 2012). However, contemporary studies find little evidence that increasing time spent in school reduces child work, or vice versa. Edmonds & Pavcnik (2005) found out-of-school children work on average only one hour more per week than in-school children. 42% of out-of-school children were 'idle', i.e. neither working nor in school, and children who did not work were actually less likely to attend school. Work is

often combined with school, and may provide children with the means to pay school costs (Dessy & Pallage, 2003; Edmonds & Pavcnik, 2005; Nieuwenhuys, 1993).

Box 1. Defining, measuring, and limiting children's work

The ILO definition of child labour is "work that: is mentally, physically, socially, or morally dangerous and harmful to children; [that] interferes with their schooling by: depriving them of the opportunity to attend school; obliging them to leave school prematurely; or requiring them to attempt to combine school attendance with excessively long and heavy work" (ILO, 2018).

The ILO Minimum Age Convention, 1973 (no. 138), raised the minimum age of employment to 15 years, or the age at which compulsory education ended if that was younger.

The ILO Worst Forms of Child Labour Convention, 1999 (no. 182), prioritises the elimination of the activities deemed the most harmful, including the employment of children in prostitution, pornography, and armed conflict.

The UNCRC and the African Charter on the Rights and Welfare of the Child require states to protect children "from all forms of economic exploitation and from performing any work that is likely to be hazardous or to interfere with the child's physical, mental, spiritual, moral, or social development".

The ILO defines 'work' as the production of goods or services for sale, or goods for household consumption; unpaid household services (e.g. chores) are only included if done in hazardous conditions or for long hours. Statistics distinguish between 'children in employment' and 'child labourers'. 'Child labourers' are:

- 5 to 11-year-olds performing any kind of work whether hazardous or not
- 12 to 14-year-olds performing hazardous work, or non-hazardous work for more than 14 hours per week
- 15 to 17-year-olds performing hazardous work, or non-hazardous work for more than 43 hours per week

'Children in employment' are:

- 15 to 17-year-olds working less than 43 hours per week in non-hazardous work
- 12 to 14-year-olds working less than 14 hours per week (ILO, 2017)

A 10-year-old helping in their family's shop is thus defined as a child labourer in the same way as a 10-year-old working each day breaking rocks in a quarry, while a 10-year-old spending five hours a day cooking and cleaning is not counted.

While some of the children in this thesis would be defined as being 'child labourers' according to the definitions above, I use the term 'children's work' rather than 'child labour', to avoid the emotive connotations of the latter phrase, and in line with other social science research in this area (e.g. Nieuwenhuys, 1996; Bourdillon et al., 2010).

Finally, the converse problem applies to education; while the benefits of education are extolled around the world, there is relatively less recognition of the costs of school beyond economic and practical barriers such as school fees. Yet for many children in rural, developing settings, school can be a far from positive place. They may have to travel long distances, face harsh punishments, be in crowded classrooms, and use an unfamiliar language, while children from poor or minority backgrounds may face discrimination. The culture of competition, and a school system designed to educate a small class of 'elites', may also erode children's confidence and self-esteem (Nieuwenhuys, 1996; Varkevisser, 1973). Additionally, in contexts with few formal employment opportunities and high youth unemployment, schooling may not be as beneficial as it is often portrayed (Bourdillon et al., 2010).

Taken altogether, these assumptions mean that 'normal' children's work has been overlooked and undervalued, both in theory, and in terms of data collection. Yet it is likely to be a key component of fertility and schooling decisions in transitioning contexts. This project set out to address this gap and speak both to theory within evolutionary anthropology and demography, and to the broader picture surrounding children's work, including critiques which have called for more nuanced studies and more detailed data collection on children's time allocation (Bourdillon et al., 2010).

1.5. Thesis structure

As a research paper-style thesis, Chapters 4, 5, and 6 are written to comply with the themes and formats of various peer-reviewed journals. Chapter 4 represents work accepted for publication, while chapters 5 and 6 are manuscripts under review at two different journals. In line with the interdisciplinary nature of this thesis, each paper is written for different disciplinary audiences. All three chapters use the data collected during fieldwork undertaken during the second year of this PhD project. Chapters 4 and

6 were formatted for submission to American journals, but spelling has been altered to British English throughout. References are all in APA style, and are included in one bibliography at the end of the thesis for ease of reference.

Chapter 2: Data collection and fieldwork

This chapter outlines the data collection and fieldwork phase of this project, including a description of the study site, a consideration of different methods of collecting time use data, and an overview of the data collection instruments used in this study.

Chapter 3: Perceived costs and benefits of education

In this chapter, I describe the main themes emerging from the teacher interviews and focus group discussions, together with the quantitative results from a set of attitude questions asked during the household survey, in order to provide contextual information about the perceived costs and benefits of education in the local area.

Chapter 4: Trade-offs in children's time allocation: Mixed support for embodied capital models of the demographic transition in Tanzania

In this paper, published in *Current Anthropology* (Hedges, Sear, Todd, Urassa & Lawson, in press), I tested predictions regarding how parental investment in education, and trade-offs between work and school attendance, vary by gender and degree of modernisation, using a comparison between a rural village and a more market-integrated town as a proxy for modernisation. I find that in the town, children work less and are more likely to attend school. In the village, girls are more likely to attend school than boys, which I attribute to the herding work done by younger boys, which is less compatible with school attendance than household chores. Education does trade-off with work, but to a lesser extent than the trade-off between education and leisure time. This implies that the opportunity costs of school attendance may be lower than assumed

in demographic transition models, and may account for the high enrolment rates in conjunction with relatively high fertility across much of sub-Saharan Africa. The trade-offs vary by gender, with girls spending more time working than boys, but sacrificing leisure time rather than education time. This 'double shift' is similar in town and village, suggesting that girls' work burden is currently not significantly ameliorated by modernisation.

Chapter 5: Sharing the load: the influence of co-resident children on the intra-household allocation of work and schooling in north-western Tanzania

This paper is under review at *Demography.* Mixed results regarding the effects of birth order on educational investment have often been explained by the labour substitution of earlier-born (relatively older) children for later-born children. However, relatively few studies have investigated how children resident within the same household influence the allocation of work as well as schooling. With regards to age order, I find opposite effects for boys and girls. Girls who are relatively older within the household work more, have less leisure time, and are less likely to be in school. Relatively older boys on the other hand are more likely to be in school, and work less in cattle-herding households. There is less evidence that out-of-school children substitute for schoolchildren, though out-of-school girls do appear to substitute for schoolgirls' chores. Girls substitute for boys' chores, but boys do not appear to substitute for girls' farm work. This study highlights the complexities of decision-making regarding children's time allocation in transitioning contexts, and demonstrates the importance of girls' work contributions to the household economy as a whole.

Chapter 6: Earning their keep? Fostering, children's education and work in north-western Tanzania

This paper is under review at *Demographic Research.* The puzzle of fostering is that it is theoretically predicted to result in worse child outcomes, but empirically is a widespread practice that often does not negatively impact children. I suggest that the benefits accruing to foster households through inclusive fitness gains, and children's work contributions, mean foster children are able to offset some of their costs and hence still receive educational investment. I find that foster children are only disadvantaged when fostered by distant kin. All foster children contribute more farm work to their households; however, on weekdays foster children do not appear to work more than other children. Orphaned children are not specifically disadvantaged, though maternal orphans appear to work slightly more on weekdays. This study suggests that foster children's work does help to explain why fostering may be a beneficial arrangement, and demonstrates the remarkable buffering effect and substantial investments in children made by wider kin networks in this setting.

Chapter 7: Discussion

Finally, in this chapter I will present a summary of the results from the three papers, followed by a broader discussion of the implications of these findings for theory and policy surrounding children's work. Implications include: the importance of considering children's work and play in research on childhood; the need for economic and evolutionary models to consider both gender variation and the role of extended kin networks in influencing educational investment and children's time allocation; and the potential that the high value of education worldwide does not necessarily reflect the true economic payoffs to educational investment. I then reflect on the limitations of this project, and outline some of the potential areas for future research, before ending with some concluding thoughts.

2. DATA COLLECTION AND FIELDWORK

2.1. Study site

2.1.1. Kisesa Health and Demographic Surveillance Site

Data collection for this thesis was carried out within Kisesa, a rural ward in the Magu district of Mwanza Region, in north-western Tanzania. The ward is covered by the Kisesa Health and Demographic Surveillance Site (HDSS), which started in 1994 and collects data on various demographic and socioeconomic factors from households in seven villages. There is a significant gradient in the percentage of the population classified as rural, from 0-20% in the largest village, to 81-100% in villages further from Mwanza city (Figure 2.1; Popinchalk, 2013). There are eleven government primary schools in the ward, and two government secondary schools. All villages have a sero-survey clinic, and there is a health centre in Kisesa, and three dispensaries in the more rural villages. The study site covers an area of approximately 150km^2, collecting data on over 35,000 people (Kishamawe et al., 2015).

2.1.2. The Sukuma

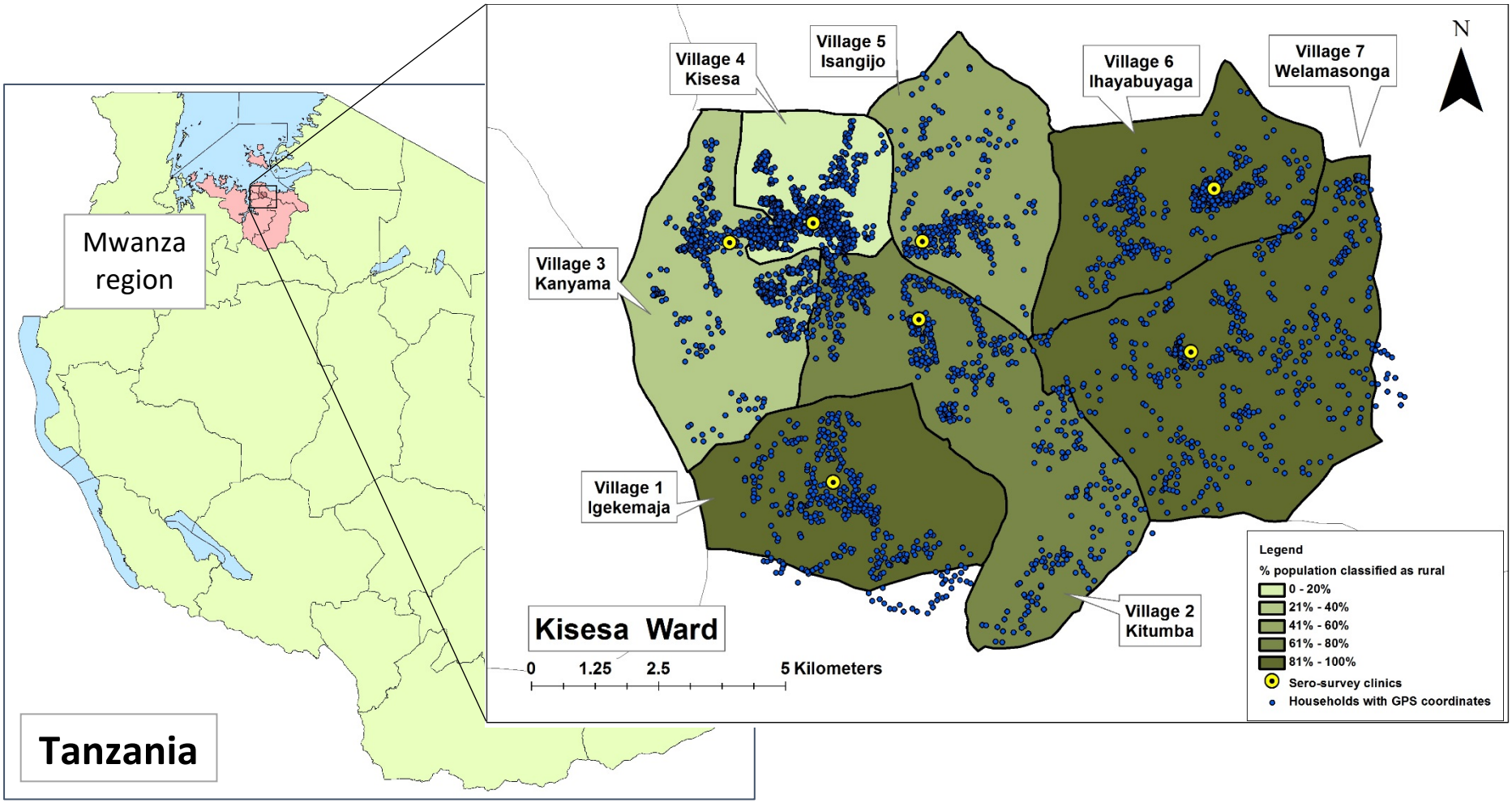
The main ethnic group in this area is the Sukuma, who are also the largest ethnic group in Tanzania, representing about 17% of the national population (Malipula, 2015). There is very little information on Sukuma life prior to the 1950's, with what information there is limited to colonial and missionary records. More work has been done in the latter half of the 20th century, though still relatively little in comparison to the number of Sukuma people (Wijsen & Tanner, 2002: 37). Below I describe relevant ethnographic work on the Sukuma, while acknowledging that cultural norms and livelihood traditions are not fixed, and without carrying out my own detailed ethnographic enquiry, this work should be considered to provide only broad generalisations. This is particularly the case given the large geographic range of the Sukuma, meaning there may be considerable local variation in cultural norms and practices (Hadley, 2005). The main works referenced are

"I am just a Sukuma": Globalization and identity construction in Northwest Tanzania" (Wijsen & Tanner, 2002), written by two Christian missionaries working in Tanzania in the latter half of the twentieth century; "*Socialization in a changing society: Sukuma childhood in urban and rural Mwanza, Tanzania"* (Varkevisser, 1973), written by a sociologist working in the area around Mwanza city; and research papers related to work carried out at the Kisesa Health and Demographic Surveillance Site, which while not ethnographic in methodology, does provide relevant local context.

Sukuma households are relatively large compared to neighbouring ethnic groups, with households often containing affinal kin and fostered children, leading to considerable variation in household structure and the relatedness of resident children to household heads (Lawson et al., 2015; Urassa et al., 1997). The Sukuma are traditionally patrilocal, and polygynous marriage is permitted (Hadley, 2005). Among the household heads interviewed for this study who were married (72.6%), 21.1% were in a polygynous marriage in the village, and 10.6% were in a polygynous marriage in the town. Marriage is nearly universal, and both divorce and remarriage are common (Boerma et al., 2002). Marriages can be either informal, involving cohabitation without a ceremony, or formal, involving a religious, legal, or traditional ceremony. The majority of formal marriages include bridewealth transfers from the husband to the woman's family, negotiated prior to the marriage and paid in money, livestock, or other currencies. In the case of informal marriages, a woman's parents may request "compensation" in place of bridewealth from their daughter's husband at a later point in time (Wijsen & Tanner, 2002: 53). While there are some inheritance rights recognised by customary law, in practice inheritance is determined by the circumstances surrounding a particular person's death. Traditionally the oldest son inherited land, but now fathers may divide their fields among their sons due to the scarcity of land (Wijsen & Tanner, 2002: 49-54; Varkevisser, 1973: 35).

Traditionally, the Sukuma were subsistence agropastoralists, with cattle keeping an important part of Sukuma identity (Wijsen & Tanner, 2002: 40-42). Since independence, there have been several social and economic changes to Sukuma life. The socialist policy of villagization (*ujamaa*; redistributing land and resettling households to live in more centralised villages) went against the Sukuma's preference for independence and 'living apart together' in dispersed homesteads. During this process, women lost a lot of land as it was assumed by central authorities that men owned all the land, and women suffered a concomitant reduction in status and marital stability. In general, increasing population density has reduced land availability, and together with the growing importance of material wealth, has diminished the reliance on cattle keeping (Wijsen & Tanner, 2002: 129-130; Varkevisser, 1973: 35-37). There has been an increasing move into the cash economy, with many families selling surplus crops or engaging in petty trading (Wijsen & Tanner, 2002: 170). Further information on household livelihoods can be found in chapter 4.

Figure 2.1 Map of Tanzania with detail showing households and villages covered by the Kisesa HDSS
HDSS map courtesy of Jocelyn Popinchalk, (Popinchalk, 2013)



2.1.3. Children's work and education in Tanzania

The United States Department of Labor (USDoL) estimates that 25% of Tanzanian children aged 5 to 14 are working, with 81% of these children working in agriculture. Tanzania has ratified the ILO conventions on child labour, and additionally passed the Child Act in 2009, which prohibits the employment of children in exploitative labour, defined as work which deprives a child of his or her health or development, exceeds 6 hours a day, and/or is inappropriate to his or her age. The Child Act also prohibits forced child labour, hazardous work, and the sexual exploitation of children (USDoL, 2013).

Education is compulsory between ages 7 and 14. The Tanzanian education system includes seven years of primary education (Standard 1 to Standard 7), four years of ordinary level secondary education (Form 1 to Form 4), and two years of advanced level secondary education (Forms 5 and 6). Students sit national exams in Standard 4 and Standard 7, the latter determining acceptance into a government secondary school, and then in Forms 2, 4, and 6. Primary school education is free, while at the time of this study (2016 academic year), fees had to be paid for secondary school, though these were abolished for the school year beginning in 2017. Even without school fees, families still pay costs such as uniform, stationery, and exam entry fees. At primary level, the language of instruction is Swahili, while at secondary level it is English (UNESCO, 2011).

Net primary school enrolment (the ratio of school-age children who are in school to the total school-age population) has increased dramatically, from 49% in 1999 to 83% in 2013, though there has been a decline from 97% in 2008 (World Bank, 2015). Gender equality in access to education has improved at primary level, and girls are now enrolled at similar rates to boys (United Nations, 2014). However, girls are underrepresented at secondary and higher level (UNESCO, 2011). Less than 60% of boys and girls progress to secondary school, and there are concerns over the low quality of schooling available,

and the failure to attract well-qualified teachers (United Nations, 2015b; World Bank, 2015).

2.2. Measuring children's work

Time use surveys are increasingly used in developing country contexts to investigate work. In subsistence contexts where households are largely self-sufficient, many work activities are not 'market exchanges' and so cannot be measured in terms of income. Time, however, is an important resource that provides a common metric across different contexts, and so can be a useful measure of work and other activities (Ilahi, 2000). Particularly in recent years, feminist scholars have emphasised time use surveys as a way to recognise the importance of women's unpaid work such as childcare, which is often overlooked in standard economic surveys (Esquivel, Budlender, Folbre, & Hirway, 2008). The same consideration applies to children's work, the majority of which is unpaid household or agricultural work, and which may often not be defined as 'work'. This leads to the underestimation of children's, particularly girls', work (UNICEF, 2016).

There are several challenges in collecting time allocation data (United Nations, 2005). Firstly, defining and measuring different activities can be difficult, for example many people might not define childcare as 'work', or may underreport activities that only take short amounts of time. Additionally, studies must decide how to deal with simultaneous activities, for example whether to 'double-count' time so that both activities are recorded, or whether to focus only on 'primary' activities. Time use surveys generally ask participants to recount their activities either over a 24-hour period, or over a typical day or week, and so are subject to recall bias, which may particularly underrepresent habitual activities. Social desirability bias may also be a problem if participants underreport certain activities; with regards to children's work, participants may underreport work activities, or overreport time spent in other activities such as school

or study. In many developing country settings there are additional challenges, such as high rates of illiteracy, and different concepts of time, for example a reliance on daylight rather than clock time (United Nations, 2005). Finally, time allocation data can be collected in different ways, for example asking participants to self-complete a 24-hour diary, using face-to-face interviews, using a proxy respondent, or using behavioural observations. The next sections discuss the choice of respondent, and observation versus self-report, with specific reference to children's time allocation.

2.2.1. Choice of respondent

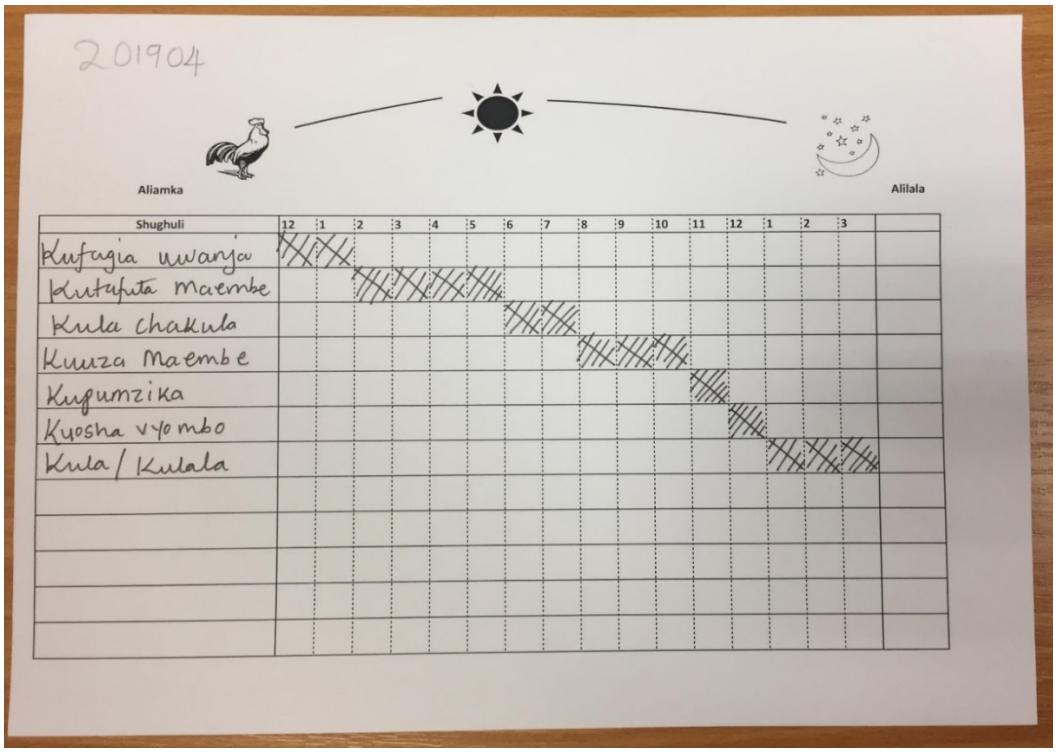
The ILO recommends that time use questions be answered by the child without proxy, with assistance for younger children (less than 9 years old) from a parent or sibling if they have difficulty comprehending or responding to questions (ILO, 2004). However, in practice many household surveys rely on proxy respondents, generally the mother. The effect of the choice of respondent on work measures has been investigated by a few studies in recent years. In Peru, where attitudes towards children's work are generally negative, proxy respondents systematically underreported children's work participation relative to child respondents, with agricultural activities done by younger children being the most prone to underreporting (Dammert & Galdo, 2013). In Tanzania, social desirability bias may be lower due to more positive perceptions of children's work, and one study did find that proxy reports did not differ significantly from children's self-report (Dillon, Bardasi, Beegle, & Serneels, 2010). However, this study did not collect proxy and self-report data for the same child, hampering their ability to compare directly. Another study in Tanzania which did have data for the same child from both their own and a proxy report found a significant proxy effect, with proxies greatly underreporting children's work time (Janzen, 2015).

During the pilot study for this project, we started by asking a parent or guardian to report on the focal child's time spent in specific activities, for example fetching water,

doing farm work, or doing household chores. However, this approach was time-consuming and had a high cognitive burden for participants, who firstly had to ascertain whether the child had done the activity, then at what time and for how long. Asking directly how much time had been spent in different activities appeared to be difficult for respondents to calculate, and we saw a number of disagreements between children and adults over how long certain tasks took to complete. Therefore, we trialled using a diagram instead, with columns corresponding to the different hours of the day, and rows where different activities could be written, and tested this with child respondents (Figure 2.2). Children tended to mention more activities, and gave more detail than parents. The process of answering these questions appeared easier, as the timing of activities could be related to specific events, such as waking up, or eating a meal, and having a narrative flow appeared to make recall easier. It also meant we did not have to define activities as 'work' or 'play', but could instead use the children's own descriptions.

In the pilot, we began by asking about children aged 5 to 17. However, respondents said children under the age of 7 mainly spend their time playing, and are not expected to do chores. At this age they have not yet started attending school, and were very shy around strangers, and not really able to answer questions. We therefore decided to change the age range of eligible children to between 7 and 19, which corresponds with the ages of formal education in Tanzania.

Figure 2.2 Time diagram used in pilot study. Cross-hatching indicates at what time different activities were done, e.g. the first row shows that the child swept the yard for two hours from 6am to 8am. (12 o'clock in the morning in Swahili time is 6am)



2.2.2. Observation versus self-report

Many anthropological studies have used behavioural observation, or scan sampling, to investigate time allocation in pre-transition societies (e.g. Bird & Bliege Bird, 2002; Bock, 2002a; Flinn, 1988; Turke, 1988). In scan sampling, the researcher observes an individual and records their current activity at pre-selected moments in time, giving a sample of 'states' which can be converted into the proportion of time spent in that particular activity (Altmann, 1974). The advantages of this approach versus asking participants to self-report their time allocation is that it avoids recall error and social desirability bias, and, assuming scan times are randomised, provides a representative and unbiased description of all activities (Baksh, 1989; Borgerhoff Mulder & Caro, 1985; Gross, 1984). I originally planned to carry out scan samples of a small sub-sample of children, in order to provide a validity check to the self-report data, and information around the timing

and social context of activities. However, a number of problems with this approach were raised during pilot work, including large distances between households, intrusion into households' privacy, and the large proportion of children attending school, for whom proxy reporting would be necessary, negating the benefits of behavioural observation. Time allocation interviews with children themselves were therefore chosen as the most appropriate way of measuring children's work in this setting.

2.3. Data collection

2.3.1. Household surveys

In order to provide a comparison in terms of degree of modernisation, surveys were carried out in the least rural (Kisesa) and the most rural village (Welamasonga) in the HDSS. The HDSS provided a sampling frame of households in these villages with eligible children, from which households were randomly selected using a random number generator. Households are defined by the HDSS as 'a group of people who eat together from the same pot' (Kishamawe et al., 2015). The aim was to interview 200 households from each village. Initially, 200 households were sampled from Kisesa and household surveys were conducted between February and the beginning of April. Thirty-eight households could not be interviewed because they had moved, no longer had eligible children resident, or refused to take part. In Welamasonga, we therefore over-sampled 250 households. Household surveys took place in Welamasonga from April until mid-June, with 198 households interviewed. Following the school holidays in June and July, we returned to Kisesa and sampled a further 100 households, of which we interviewed 96 in July and August. Table 2.1 shows the final sample together with reasons for non-interview.

Table 2.1 Sample description and reasons for non-interview

	Kisesa	Welamasonga	Total
Households sampled	300	250	550
Households interviewed	258	198	456
Not interviewed			
Moved or not known	28	36	64
Ineligible	9	14	23
Refused	5	2	7
Eligible children	619	768	1,387
Children interviewed	538	740	1,278
Not interviewed			
Boarding school	44	8	52
Working	5	1	6
Travelling	29	13	42
Ill or disabled	1	1	2
Refused	2	5	7

Surveys were administered using ODK Collect software on Google Nexus tablets. Computer-assisted data collection is increasingly favoured for household surveys because it: reduces the time required to enter, process, and clean data; minimises errors and missing data; and permits more complicated instrument designs by facilitating complex skip patterns (Gravlee, Zenk, Woods, Rowe, & Schulz, 2006; Ice, 2004). ODK Collect is open-source and has become popular for use in administering surveys in developing country contexts, with features including GPS location, photos, and signatures (Brunette et al., 2013). Surveys were encrypted and uploaded to a password-protected database at the end of each day.

Household surveys included three elements; the household questionnaire, answered by the household head or other adults; the family questionnaire, completed for each eligible child and answered by their parent or guardian; and the time allocation interview, answered by all eligible children who could be followed up. Paper versions of

the surveys were made in case of technological problems, and these are included in Appendix 9.1.

The household questionnaire began with a household roster, recording everyone resident in the house, their age, gender and relationship to the household head, as well as education and occupation for household members aged 20 and over, and the household head's marital status, religion, and ethnicity. A set of socioeconomic questions then collected information on the household's livelihood, including land and livestock ownership, types of crops grown, and whether the household had a shop or business. An asset index based on those used in the Tanzania Demographic and Health Survey (DHS, 2010) and previously in the HDSS was used to assess household wealth. Since the 1990s, demographic surveys have used ownership of consumer durables to construct a proxy index of wealth, rather than indicators such as income or expenditure. In rural communities where households are primarily engaged in subsistence livelihoods, these indicators can be unreliable with considerable variation over time, and so may not accurately reflect household wealth. While there are also issues with asset indices, a number of studies have found them to perform better in analyses, and to have smaller measurement errors, than income or expenditure variables (Bollen, Glanville, & Stecklov, 2002; Filmer & Pritchett, 2001; Houweling, Kunst, & Mackenbach, 2003). Asset questions were followed by a set of nine questions pertaining to food security, based on the Food and Agricultural Organization (FAO)'s Household Food Insecurity and Access Scale (Coates, Swindale, & Bilinsky, 2007). This index asks questions about a household's food security during the past month, including experiencing anxiety about food supply, limiting food quality and reducing food quantity, and the frequency with which these were experienced. Finally, respondents were asked whether they agreed or disagreed with a series of statements regarding education and children's work.

Figure 2.3 A girl being interviewed by her family's rice field on a Saturday morning

The family questionnaire collected information on the focal child's parents, including their marital status, residence, education, and occupation, and their siblings and half-siblings. There were also questions about their education, including their current enrolment status, highest grade level, and whether they had repeated any school years, and if they were no longer enrolled, the reason for dropping out. At the end of the family questionnaire, the parent or guardian was asked for their consent to interview the child in question, and a convenient time and location were arranged if the child was not present already. After the first week of fieldwork, we started to return on Saturday mornings to interview many of the children who had been in school during the week (Figure 2.3), and also arranged with some of the local headteachers to interview children while they were at school (Figure 2.4). Children who were not attending school could often be found in the town or village centre, or at relatives' houses.

Figure 2.4 Interviews at a local primary school

For the time allocation interview, the child was first told briefly about the project, and told that we wanted to find out about their work, and activities like school or playing (see full consent statement in Appendix 9.1.3.1). They were first asked some questions about whether they had previously done work such as farming, herding, working in a shop or business, doing petty trading, and working as a houseboy or housegirl (domestic worker), and if so, at what age they had started this work, and whether they had spent time doing it during the past week. They were then shown the time allocation diagram, and asked whether they could remember the activities they had done on the previous weekday (so children who were interviewed on a Monday were asked about the previous Friday). After saying at what time they had woken up, they continued to list the activities they had done and at what time, or how long they took, up until the time they went to bed. The smallest time unit collected was half-an-hour, which may underestimate the occurrence of activities taking only a short amount of time. However,

it was felt that asking in more detail would place too much cognitive burden on respondents, particularly younger children, and might lead to inaccuracies. Additionally, we did not ask for simultaneous activities due to difficulties in recording and analysing this data; again, this may lead to underestimates of activities frequently done in conjunction with others, for example childcare. After the diagram was completed, the fieldworker took a picture using the tablet; the data were later entered into an Excel template from the photograph.

Interviews done on a Monday had a longer recall period than interviews done on other days, introducing the possibility that these interviews were subject to greater recall bias. Table 2.2 shows the difference between reported school attendance and time allocation between children interviewed on a Monday and those interviewed on another day. There does not appear to be a difference in attendance or reported work, but there is a suggestion that those with a longer recall period may have slightly over-estimated time spent in education, and under-estimated leisure time compared to those interviewed about the previous day, though this is not statistically significant. A control for Monday interview is therefore included in time allocation analyses in Chapters 5 and 6; for Chapter 4, analyses including a Monday control variable are presented in the Supplementary Material.

Table 2.2 Difference in reported school attendance and time allocation between children interviewed on a Monday and those interviewed on another day

	Monday	Other day	*p* value
N	224	885	
% reporting they attended school yesterday (among those enrolled; N=886)	78.5	80.6	0.630[a]
Mean hours spent in			
Chores	2.25	2.27	0.900[b]
Farm work	1.29	1.24	0.790[b]
Leisure	7.42	7.82	0.116[b]
Productive work	3.61	3.71	0.684[b]
Education	5.96	5.46	0.110[b]

[a] *p* value from chi-squared test
[b] *p* value from t-test

2.3.2. Qualitative data collection

Focus group discussions with a sub-sample of participants were planned in order to address the third aim of this study, investigating the perceived costs and benefits of education for adolescents and parents. Teacher interviews were also conducted in order to provide more information about local schools, and the challenges faced in the pursuit of education. Teacher interviews were done in May 2016. We initially planned to interview teachers at the local government primary and secondary schools attended by the majority of children in our sample. However, we were not granted permission to go into secondary schools, and so only conducted interviews in the five government primary schools in the area, three in the town and two in the village. We arranged interview times with the headteachers at each school. At each school we set up a table and chairs outside, at a short distance from the school buildings. We asked to interview, where possible, one teacher from each grade level, as well as the headteacher, though this was not possible at all schools. Teachers were briefed on the aims of the research and given the opportunity to ask questions, and were asked for their consent, both to be interviewed and to be recorded. Teachers were given the option of being interviewed in

either English or Swahili, and all chose to speak in Swahili, so all interviews were carried out by field assistant Holo Dick, and subsequently transcribed and translated into English. The interviews asked about the teacher's professional background, the subjects they teach, what challenges they face as a teacher, what challenges children and their parents face in accessing education, what knowledge and skills students learn at school, and what the expectations are for them after leaving school (full question guide in Appendix 9.2.1).

Figure 2.5 Participants in mothers' focus group

Focus groups were done during the school holidays in June 2016, when we were not doing household surveys. Focus group participants were recruited from households which had been interviewed during the quantitative surveys. Thirteen focus groups were done in total; four with parents, two in the town and two in the village, and separately for mothers and fathers in each location (Figure 2.5), and nine with young people aged 15 to 19. Originally eight focus groups were planned with adolescents, one with

schoolboys, one with schoolgirls, one with out-of-school boys, and one with out-of-school girls, in both the town and the village. However, an additional focus group with out-of-school girls was done in the town due to a mix up with recruitment, meaning nine discussions with adolescents were held altogether. Focus group participants were invited to come either to the Tazama project office in the town, or to the primary school in the village. They were reimbursed for their attendance, and also given a soda during the course of the discussion. Interviews were conducted by trained facilitators with previous experience of running focus group discussions; two male facilitators for the male focus groups, and two female for the female groups, one of whom led the discussion and one who took notes.

Figure 2.6 Focus group facilitator makes notes next to the timeline used to guide discussion

At the start of the discussion, the participants were introduced and told about the aims of the research, and asked for their consent to the interviews being recorded.

Discussions were carried out primarily in Swahili, though some participants also contributed in Sukuma. The recordings were later transcribed and translated into English. Participants were first shown a timeline with pictures of children from birth up until adulthood, with some children continuing through primary school and secondary school and completing Form 4, other children dropping out of secondary school, and others leaving school after completing primary education (Figure 2.6). Participants were asked about the reasons why children might follow these different paths, and the things that contribute to children dropping out of school or continuing. They were then asked about the benefits and challenges faced by people who followed the different paths (interview guide and timeline pictures in Appendix 9.2.2). The findings from the qualitative component of this project are discussed in the next chapter.

3. PERCEIVED COSTS AND BENEFITS OF EDUCATION

Data from the focus group discussions, the teacher interviews, and the attitude questions from the household survey were used to investigate the perceived costs and benefits of education in this area. Following the completion of fieldwork, I read through the interview transcripts, referring back to the Swahili versions if necessary to check the translations. With the teacher interviews, I followed the interview guide and aimed to draw out broad answers in terms of the barriers to schooling, including challenges faced by teachers and schools, and challenges faced by families and children, as well as teachers' thoughts on the quality of education and their expectations for their students. For the focus group discussions, I read through each discussion and identified the key themes emerging with regards to the main factors influencing children's pathways through school, predominantly the factors that may cause them to drop out, then the overall benefits and costs associated with education. The key findings from the teacher interviews and focus groups, and a summary of responses to the attitude questions, are outlined below in order to provide context for the quantitative analyses in the following chapters.

3.1. Main findings from teacher interviews

3.1.1. Barriers to schooling: school environment

Every teacher commented on the pressing need for better school infrastructure and equipment. Overcrowding was mentioned by every teacher as a major impediment to learning, with teachers highlighting the difficulty of giving children individual attention in classes of 150 – 200. Overcrowding leads to poor classroom discipline; several teachers commented that they cannot move round the classroom freely to check on and engage all students. One teacher spoke of how the motivated, well-behaved students sit at the front and pay attention, but that others sit at the back and talk and misbehave, meaning

they do not learn. With so many students per class, teachers cannot set many assignments as they cannot keep up with marking. Schools in the town operate a shift system for some classes, where some children come in the morning and others in the afternoon; while this eases crowding in the classrooms, it also reduces the amount of time for learning. Many teachers spoke of the problems of students not having access to text books or equipment, having to sit on a dusty floor and have their exercise books on their knees, making it difficult to teach good handwriting skills. One Swahili teacher told us how she has only 5 text books for a class of 216 children. Another teacher spoke of the difficulties of having out of date or mismatched text books, making it difficult to teach the correct curriculum. Several teachers spoke of how the lack of proper desks discourages students and may knock their confidence, whereas when students can have proper books and sit comfortably, they feel good about learning. When asked what changes they would like to see, almost every teacher said they wanted the government to build more classrooms, provide enough desks and books, and improve school infrastructure such as repairing access roads, building proper pit latrines and providing a proper drinking water source.

A few teachers mentioned that teachers could sometimes be harsh and that some children were scared of the punishments they might receive. One teacher said that sometimes if children were going to be late, they would rather miss school altogether than risk getting beaten when they arrived. However, other teachers highlighted the necessity of using beatings to maintain order, and one teacher said that a child who was motivated to do well would accept that they deserved a punishment.

Teachers of younger grades mentioned the difficulty of transitioning between home and school, and adjusting to the school environment, particularly using Swahili instead of Sukuma in the village. The transition between learning three subjects in Standard 2 and

10 subjects in Standard 3 was also mentioned as a challenge for children. Teachers of older grades spoke of children reaching puberty, and the challenge of them entering into relationships. This was seen to be a particular problem for girls, who might get pregnant and drop out. One teacher said they thought better education should be provided about relationships and the risks, and that girls should be supported to know how to deal with being approached by men.

3.1.2. Barriers to schooling: home environment

Poverty at home was emphasised as a challenge by several teachers. All teachers also mentioned the problem of hunger for poorer children. They spoke of how many children come to school without having even drunk tea in the morning, leading to problems concentrating in class. Children are supposed to return home for their midday meal, but many stay at school because they know there will not be food at home. Teachers recommended that schools should provide food for students and teachers at lunchtime, or failing that, at least provide porridge or tea. One teacher mentioned a lack of kerosene lamps at home as another barrier for poor children, meaning they could not study at home. Many teachers highlighted how poorer parents struggled to find the cash to buy uniforms, shoes, pens and exercise books for their children, particularly in large families where they might have several children to provide for at once. Headteachers said there is not much support for parents if they cannot find the money; many teachers spoke of buying books and pens for children with their own money, and one teacher spoke of a local organisation providing grants for the poorest families. A couple of teachers spoke of how children might compare themselves with others and feel embarrassed, for example by having torn clothes or lacking books, which led to a lack of confidence, and a lack of motivation to attend school.

The loss of children's help at home was also highlighted by several teachers. Particularly for mothers with young children, the loss of childcare could make things challenging at home. Many teachers spoke of work as a reason for absenteeism, noting that market day was a particular challenge as parents wanted to go to market and needed their older children at home to look after young siblings. Additionally, teachers spoke of parents needing their children to help with business, with some families being reliant on their children's income. Teachers at the village school mentioned cattle herding as a reason for many boys to miss school. The harvest season was mentioned as a particularly challenging time, with families needing their children's labour or childcare. Work done at home was mentioned as an impediment to learning, particularly for girls. Having to do domestic chores left children tired, and with little time for reading or studying at home.

Other challenges at home included a lack of cooperation from parents, which made it difficult for teachers to resolve behavioural issues such as truancy. Cooperation between home and school was mentioned by several teachers as an important element in children's progression through school. Teachers recommended that parents should take an interest in their children's learning, providing them with time at home to read by themselves, and asking to see their exercise books to check that they were attending school, and to provide their children with motivation and encouragement. However, a few teachers spoke of antagonism between teachers and parents, with one teacher saying parents did not like teachers, and blamed teachers for any problems with their children. A couple of teachers mentioned that some children living with their grandmothers, or with a stepmother, faced extra challenges because they were required to do more work, while other teachers said orphans, or children living with HIV/AIDS, faced particular challenges.

3.1.3. Barriers to schooling: challenges faced by teachers

Teachers also spoke of personal challenges, with difficult teaching conditions leading to a lack of motivation. Teachers are expected to keep up with curriculum changes without receiving additional training; as one teacher put it, how can you teach computing if you do not know how to use a computer yourself? Another spoke of how some of the students know more about computers than the teachers, which is bad for discipline. Many teachers also commented on the long distances they had to travel to get to work, meaning they had to leave early in the morning, and sometimes had to leave school early in order to get home. They recommended that the government build houses for teachers near to schools. A couple of teachers pointed out that this would enable teachers to provide extra remedial classes in the evening for students who were struggling. Several teachers also complained that their salaries are not enough to cover their expenses, particularly as often they must provide their own supplies, such as chalk, and sometimes need to buy exercise books for children whose parents cannot afford them. One teacher spoke of how this led to teachers pursuing other ways of making money such as small businesses, which distracted them from teaching and led to teacher absenteeism.

3.1.4. Quality of education and doing well at school

Despite the aforementioned issues, the majority of teachers said they felt their school provided a good quality education. Only one teacher said he did not think the education provided was good. However, there was an air of resignation for many teachers in answering this question, giving an impression that they were doing the best they could under very difficult conditions. When asked to compare government schools with private schools, many maintained that there was no difference in teaching quality, and in fact several pointed out that government teachers must undergo training, whereas private teachers do not. However, most teachers acknowledged that the smaller class

sizes in private schools meant that teachers could give children more individual attention, and help those who were struggling. Others said that the emphasis on using English in private schools did help children later at secondary school. However, in general, teachers seemed proud of their schools. One teacher told us how the student with the highest Standard 7 (end of primary school) mark came from their primary school last year. Another told us that the school was consistently among the best in the district, coming 17th out of 110 schools the previous year. However, several teachers did mention poor learning outcomes as a challenge, saying that many children cannot read or write even by Standard 5 (fifth year of primary school; age 12). Many said that it was difficult for children to catch up once they fell behind, because teachers could not spend time with them to help them.

When asked what expectations teachers had for their students, most seemed a little confused by the question, saying that it depended on the individual child. Most did expect that children would pass and progress to secondary school, though this was seen to be somewhat outside of anyone's control. Most teachers said children would go on to be self-employed and go into small-scale business, including entrepreneurship or farming, or do technical work like weaving or carpentry. School was seen to be important for these jobs, with the subject of work skills (taught in primary school) providing children with useful skills. One teacher said that if children were good at English, they could get jobs as secretaries. A few mentioned becoming doctors, government ministers, or nurses, but on the whole these were not seen as likely career options for the majority of children.

When asked what helps children do well, other than having the correct supplies and support from parents and teachers, most teachers emphasised that it is an individual trait. "The issue of not understanding, we put it as an issue of creation… maybe God has

created him like that." Others mentioned children being sick or having psychological problems as a reason for not doing well. Only a couple of teachers explicitly said that children of wealthier parents do better, though there was a general implication that poorer children faced more challenges, and the home environment was given as a reason for children struggling. Many teachers emphasised the importance of learning independence and self-reliance, and that children must be self-motivated in order to succeed.

3.2. Main findings from focus group discussions

3.2.1. Home influences on pathways through school

Several influences on children's journeys through school were mentioned during focus group discussions with parents and adolescents. The home environment and parents' attitudes were frequently said to be very important, though participants differed in how much blame should be placed on parents themselves for children dropping out of school. In several groups, participants brought up issues such as parents wanting children to stay at home to do chores or farm work, parents not recognising the value of education and so being unwilling to pay the costs, or wanting to marry their daughters off in order to get bridewealth payments. Other participants also brought up the issue of parents' lack of engagement with their children's education, saying that some parents don't show an interest in their children's learning or give them advice about schoolwork, and that they don't actively follow up on their children if they are playing truant. While participants did agree that there were such parents, it was also acknowledged that parents sometimes had to make difficult choices. Most groups recognised the issue of poverty for families struggling to make ends meet, with secondary school fees being a particular barrier, as well as the more indirect problem of children wanting to work and

earn money in order to help their families, or being needed at home to work or care for younger siblings.

"Wazazi wanaona watoto walale njaa huyu naye inakosemakana hela ya kwenda shule, kwa hiyo wanaona tu bora wawahudumie watoto wale"

"Parents see their children go to sleep hungry while they give money to one to go to school, so they think it is better to provide food for the children to eat"

Out-of-school boy, village

"Ilikuwa imefikia elimu ikawa ya watu wenye hela tu"

"It has come to the point where education is just for the rich people"

Father, town

"Labda unakuta nyumbani kwao ni maisha magumu… Sasa yaani ni anaamua sasa niwasaidie wazazi wangu, bora tu niende nikatafute… kazi"

"Maybe you find at their home life is very difficult… then she decides now let me help my parents, it is better that I go and find work"

Out-of-school girl, town

"Sasa labda unajua utachelewa kuamka, kidogo inabidi ufagie uwanja, ufate maji halafu ukimaliza ndiyo uende shule… Unaamka saa kumi kama unaenda shule."

"So maybe, you know, you will be late to wake up, you have to sweep the compound, you have to fetch water then if you finish you can go to school… You wake up at 4:00 am if you go to school."

Schoolboy, town

3.2.2. School influences on pathways through school

The school environment was also frequently mentioned as an important influence on children. During the discussions with teenagers, they described harsh and humiliating

punishments as a challenge associated with school; being beaten for being late or not knowing the answer, as well as having to do chores such as fetching water or firewood, uprooting tree stumps, digging holes, and cleaning the toilets. These punishments were said to be an important reason why children drop out of school, or do not want to continue to secondary school; not just because of the physical discomfort, but because doing them took so much time out of the school day that it made attending school pointless. The language barrier was an additional challenge; having to speak in English made studying at secondary school very difficult and contributed to children feeling like there was no point in attending, particularly as failure to answer in English frequently resulted in punishment. The long journeys to school were also problematic, making the school day very long and tiring, and presenting opportunities for children to be tempted away by friends, or motivating girls to have relationships with men who would give them money for a *piki piki* (motorbike taxi) or bus fare. A few participants also criticised the education system more broadly; one teenage boy said the government should be blamed for not providing enough schools to serve the local area. One father said he thought teachers were corrupt; some favoured their own children, while others were so worried about losing their jobs that they would help the students to cheat during exams to ensure the pass rate was high enough, meaning that often even though children appeared to be doing well, they actually didn't know very much. Other fathers agreed that the quality of teaching at local schools was 'careless'. During the discussion with out-of-school girls in the town, one girl said that it is relatively common for teachers to try to have relationships with female students, resulting in a catch-22 situation whereby if the girl refuses, the teacher might punish her or try to have her expelled, but if she agrees, she runs the risk of getting pregnant, which would also result in her being expelled.

"Anapigwa, anapewa na adhabu anaona kupigwa kote huku na adhabu halafu na wenzangu nawaona kule barabarani wanafanya kazi, boranliende, anaacha kabisa shule"

"She gets beaten, she is given punishment, then she thinks, why all these beatings and punishments? I see all my colleagues on the road, they are working, it is better for me to stop going to school completely."

Out-of-school girl, town

"Masomo yanamshida… Kama anafundishwa haelewi anaona tu aache"

"Learning becomes difficult… When she is taught she doesn't understand, she thinks she will just drop out"

Out-of-school girl, town

3.2.3. Peer influences on pathways through school

Peer pressure was also cited by all groups as an important influence on children's education. Friends were said to encourage children to skip school in order to go and earn money, or to drop out altogether. In most discussions, 'bad groups' were said to tempt children into smoking weed, drinking alcohol, and having casual relationships. Additionally, older students were said to discourage children from progressing to secondary school, as they would tell them how difficult the subjects are, or emphasise the negative aspects of school such as being punished. One schoolgirl said that family members are sometimes jealous of others doing well at school, and so try to discourage students from going to school.

3.2.4. Individual influences on pathways through school

While the role of parents, teachers and friends was discussed, it was also acknowledged that the decision to stop attending school is often made by the student themselves. This decision was framed as the choice between attending school, with its associated difficulties, or being able to earn money and have more freedom and independence

from their parents. Several participants said that students often see little point in secondary school, particularly if they struggle to learn English or have little hope of passing their final certificate; many children feel that it is better to stop going to school, and to earn money instead. Other teenagers said that while parents may not prevent children attending school, the need for chores to be done might lead to students being late, or missing afternoon school, and that this also made them feel like there was little point in continuing in school.

"Shule hainisaidii chochote, bora tu niache"

"School isn't helping me at all, it's better that I just stop"

Out-of-school girl, town

Some participants were critical of children wanting to drop out of school, referring to this mentality as 'taking the shortcut' and pointing out the negative behaviours that some adolescents engage in when not attending school, such as smoking weed, drinking alcohol, and pursuing casual relationships. It was also cited as a source of considerable conflict between parents and children. During the parents' discussions, several mothers and fathers spoke of difficulties in getting their own children, or other relatives, to attend school, speaking of how their children might get up in the morning and put on their uniform as if heading off to school, but secretly take other clothes to change into and play truant instead. A few teenage participants spoke of people they knew, generally boys, who had fought badly with their parents and run away from home. In the village, out-of-school boys spoke of having felt 'forced' to attend school by their parents, despite not wanting to go. Particularly as children grow older and become teenagers, it was acknowledged that they often want more independence and are less willing to listen to their parents. After reaching puberty, sexual relationships might be an issue, and most groups mentioned teenage pregnancy as a reason why girls drop out of school. One mother spoke about teenage boys wanting to earn money so that they

could rent their own room in town, in order to have casual relationships or to drink alcohol with their friends. A few girls said that upon reaching adolescence, many girls in the village wanted to get married, in order to have their own home and their own children.

"Niliamua kuolewa na mimi nikazae, nikazae watoto nitengeneze mji wangu"

"I decided to get married and have children, to make my own home"

Out-of-school girl, village

"Akienda kufanya kazi… atapata hela kutumia, tofauti na kwenda shule anaona apite shortcut"

"If she goes to work she will get money to spend, rather than going to school she thinks she will take a shortcut"

Schoolgirl, town

In several groups, participants emphasised children's own ability and motivation. Several participants pointed out that children are born with different abilities, some do well at school but others have different talents. These children do not have the ability or motivation to succeed at school; they want to pursue their other talents, or they feel that school is a waste of time because they know they will not pass. This seemed to be accepted by most participants, with one participant citing it as a form of self-awareness. It was acknowledged in a few groups that some children drop out of school but are still very motivated to work hard, and that they may well do better than those who stay in school in the long run. Entrepreneurship, getting additional vocational training, and working hard at what you choose to do were all said to be alternative ways that someone might do well even without education. One father said this was actually an important role for a parent, recognising what his child's abilities are and helping them to succeed.

"Kuna mtu yaani unakuta anasoma kabisa anaamka na saa nane anasoma, lakini kwenye mtihani ukienda wa mwisho ni yeye, mwingine unasoma kidogo, unafaulu… na kuna wengine hawasomi lakini likija swali kwenye mtihani anafaulu wanaitwa genius hao!"

"Some people, you find them studying, they wake up at 2.00 am and study, but when it comes to the exams they come last, while another person only studies a little and passes… and there are other people that don't study but when a question comes up in the exam they know the answer, they are called geniuses!"

Schoolboy, town

"Na mtu ukifeli darasa la saba siyo hivi umefeli maisha"

"If somebody fails Standard 7, it doesn't mean that she has failed in life"

Out-of-school girl, town

"Basi yule mzazi wake kwanza atakuwa anaelewa kwamba mtoto wangu kalama yake ni ipi katika maisha yake"

"The parent will know which pen is right for his [child's] life"

Father, village

3.2.5. Benefits of education

When asked which path is best for children to take, all participants said that staying in school and passing Form 4 is the best path, and that getting a good education will help someone to find a good job and have a good life. Participants also agreed that those with education gain respect and trust in the local community, because they are self-reliant. Despite there being little difference in the types of work done by the different children discussed (i.e. those who completed primary, those who drop out of secondary school, and those who complete Form 4), participants still emphasised the importance of completing secondary school. Several participants said local companies will only employ those who have their Form 4 certificate, while one participant said that

increasingly even jobs such as being a domestic worker require you to speak English, meaning you need secondary school education. One father said that even if a child just wants to farm or rear cattle, it is still beneficial to go to school because they will be more aware of modern farming techniques, such as what vaccinations livestock need. Completing Form 4 was seen as providing better opportunities; someone who had dropped out of secondary school would just have to take whatever job they could, whereas if you passed your final exams, you would be able to choose a good job. Many participants contrasted the "*maisha mazuri*" (good life) that could be gained through education with the "*maisha magumu*" (difficult life) that they felt characterised life for most people locally, struggling to make ends meet. The challenges of getting married and having children as a teenager were also highlighted by many groups, saying that girls may have health problems if they give birth too young, and that they may not be able to provide for their children. Additionally, a few mothers and girls said that those who get married early risk being oppressed by their husband and not being happy in their marriage.

"Unakuwa unaheshimika wanakuwa wanasema ee lashika ilisomi"

"You are respected, they say, this one is learned"

Out-of-school girl, town

"Mtu asiyekuwa na elimu inaonekana kama kitu ambacho kimo gizani"

"Somebody that doesn't have education, it is like he is in darkness"

Father, town

"Ana kazi yake kabisa hata anakaa ofisini… siyo kama vile mimi nije kuhangaika kulima ndiyo nipate niivishe nifanye nini niuze nipate hela, lakini yeye hela zake anazipata tu kiulaini"

"[Someone who finishes Form 4] has her job, she even sits in an office… she isn't like me, struggling to farm, I have to harvest, then sell, I have lots to do to get money, but she gets her money more easily"

Out-of-school girl, town

Among the parents, the benefits of having educated children were made clear. They wanted their children to avoid having to struggle in life. If your child can get a good job they will be able to help their family, maybe by setting up a business or improving their house, and they will be able to support their parents in old age. Additionally, they will be a role model for their younger siblings, and will be able to help them and provide advice about their own education. One father described the benefits of having an educated person in the family – they can help to read letters or medication packaging, and can assist their parents with business in the town. In the past, he said, people from the village worried about going into town because they did not know where the toilets were, but if you can read you are able to follow the signs.

"Hakuna mzazi anayefurahia kwamba mwanae aache shule kwa kukosa matunda ya baadae."

"There is no parent who is happy when her child stops going to school because they won't be able to reap the fruits in future."

Mother, town

"Sidhani kama yupo mzazi anayesema mtoto wangu asisome"

"I don't think there is a parent that says my child shouldn't go to school"

Father, town

"Atanilisha kama nilivyomlisha yeye"

"She will feed me just as I fed her"

Mother, town

"Mtoto wako, kama wewe hujui kusoma mzazi, imekupita shule, atakuongoza mahala pazuri sana kwamba, 'hapa, baba'"

"Your child, if you don't know how to read, he has gone to school, he will guide you to a better place by saying, 'here, father'"

Father, village

3.2.6. Costs of education

However, several challenges associated with education were also noted. Many groups pointed out the lack of jobs locally as a problem, saying that many children finish school and then just end up sitting at home. A few participants spoke of needing financial and social capital in order to get a job; you need a relative with good connections who can help you get a job, you might have to pay bribes, and if you want to set up a business you need some start-up capital. Several also pointed out that if children want to continue their education, for example by getting a diploma or degree, it is very expensive and their families may not have the money (higher education is not subsidised by the government). Parents also spoke of children forgetting their families and not using their education to support their parents, or of children who have been educated no longer wanting to help with farming or household chores. One father said that it can be difficult to see the benefits of education, because there are very few educated people locally; people can see the benefits of farming for themselves because they get food, or can sell cattle and buy a bicycle, whereas the benefits of education are less clear. Another father said that sometimes people have unrealistic expectations about education; they think that if their child completes Form 4, they can be a doctor, then when their neighbour's child finishes Form 4 and is still at home, they think education is not worthwhile.

"Akafanya familia yake huko, akajenga huko halafu tena, wengine naona wengine wanajenga labda kwa wake zao kule alikooa, kwenu anapasahau"

"He abandons his family, and he builds there, there are some people that build houses where their wife comes from, he forgets about his home"

Father, village

"[Interviewer]: Wanaomaliza form 4 huwa mnawaona wanafanya nini?

[Respondent]: Wanakaa tu nyumbani, wanaanza kulima"

"[Interviewer]: The people that completed form four, what do you see them doing?

[Respondent]: They just sit at home, they start to farm"

Out-of-school girl, village

"Sisi zamani ule mwamko wa elimu… umeanza tu siku za karibuni… sasa [mtoto] haoni hakuna mtu aliyesoma [na] akaendelea ambaye anafaidika na elimu… na sasa hatajua kwamba kumbe ukisoma, unapata kazi nzuri, unanunua na pikipiki, unaendesha na gari"

"A long time ago there was no interest in education… it just started recently… now [the child] doesn't see anyone that has gone to school and continued, no one who has benefited from education… and so he won't know that if you go to school you get a better job, you buy a motorcycle, you drive a car"

Father, town

Several teenage participants said that the lack of certainty over the benefits of education led students to drop out of school. They spoke of being mocked by friends for going to school and wasting their parents' money, when they could be earning money instead, and of questioning themselves whether there was any point to continuing in school without being sure of passing Form 4. Parents spoke of the humiliation they faced after investing in their children's education just to find that they dropped out, or failed their final exams. Several participants expressed the opinion that it might actually

be worse for a student to continue in secondary school and fail, than to drop out earlier. Therefore, while the ideal was for a child to finish secondary school, parents did appear to be quite pragmatic, recognising that the likelihood of a child succeeding is relatively low. In general, both parents and children seemed to be quite resigned to the difficulties of attending school, and that for many children, the temptations of an easier life would win out. All participants agreed that the single most important factor was a child's motivation; if a child was motivated and worked hard, they could succeed.

"Hivi wewe unasoma kuwa nani, maana rais wa nchi yupo…, walimu yaani kweli na wewe ukija kuwaza kweli mimi nikisoma nitakuja niwe nani"

"[people say to you] so what are you studying to be, there's already a president… and when you think about it, actually if I keep going to school what will I be?"

Schoolgirl, town

"Anashawishiwa na makundi; 'acha, wewe acha shule, shule itakusaidia nini? Wangapi wamemaliza form four lakini tunawaona mitaani?'"

"She is enticed by the groups; 'stop, stop going to school, how will school help you? How many people have finished form four but still we see them in the streets?'"

Out-of-school girl, town

"Kwa sababu jitihada zako zimefanya nini, zimekwama na kila mzazi hilo huwa analifanya, ukimwambia kwamba shule kwa sasa nimeshashindwa lakini tayari ameshagharamia mambo mengine mengine… Anajua kwamba hii inakuwa ni dharau kwa nani, kwa mzazi"

"Because all your efforts have failed, and every parent feels this, when you tell the parent, 'now I have failed at school', and yet he has already paid the expenses for many, many things… You know that it becomes humiliating to the parent"

Father, village

3.3. Reflections on perceived costs and benefits of education

Education appears to be very highly valued, and is perceived to be very beneficial, with the potential to provide a good, stable job, and better prospects for a child and their family. In terms of primary education, my impression is that it now has such a central role in social life that the costs of not having at least some schooling are very high. Not being able to speak good Swahili would be a big barrier to any kind of interaction outside of very rural areas, and even a small amount of literacy and numeracy is now necessary for daily life. Therefore it seems that only for very poor families, or families heavily reliant on their children's work, do the costs of primary school outweigh the benefits. However, opinions expressed about the benefits of continuing in education were perhaps more ambivalent. While passing Form 4 it is stated as the ideal, there appeared to be more variation in whether adolescents and their families consider it a worthwhile gamble. For families, the risk of investing in education only for a child to drop out or fail to get a job may outweigh the potential benefit. For adolescents, the benefit of a better job in the distant future may be overridden by the benefit of earning money now, particularly given the practical difficulties of long journeys and financial costs, and the need for high self-motivation among students.

3.4. Attitude questions

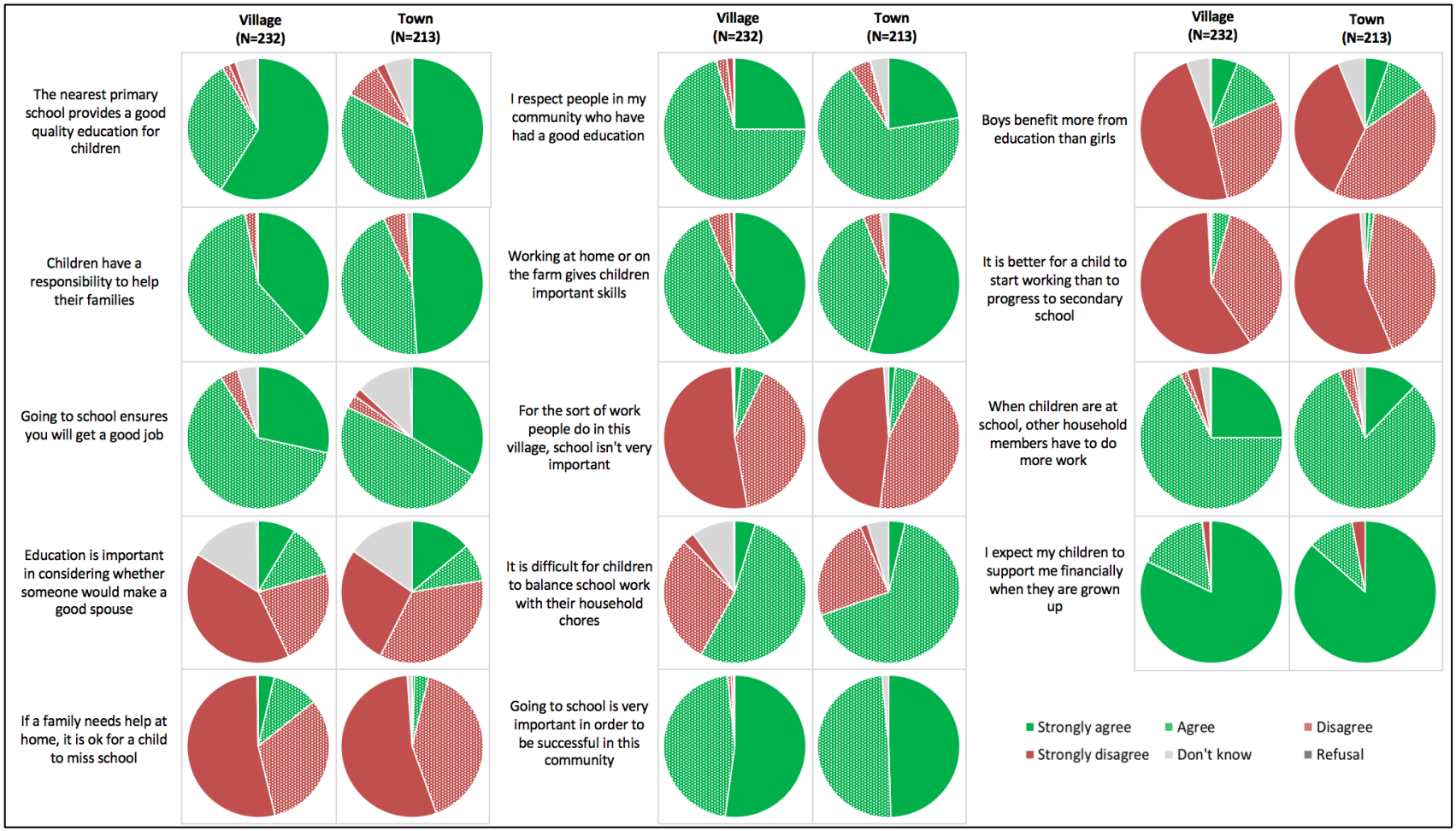
At the end of the household survey, a set of attitude questions was included to quantitatively investigate parents' or guardians' views on children's work and education. Responses revealed little variation in attitudes reported by parents or guardians towards education and children's work, suggesting strong social norms (Figure 3.1). Reported attitudes towards education were very positive; the vast majority of people agreed that going to school is important in getting work as an adult (92.1%), and earns you respect

(93.8%) and success (92.1%). There was less consensus between village and town on the quality of primary education offered locally, with 10.5% of respondents in the town feeling that the education on offer was of poor quality compared to 3.1% of those in the village. Education was a priority for the majority of respondents, with 89.6% saying that education should be prioritised over work on a day-to-day basis, and in the longer term, 95.7% saying that children should progress to secondary school rather than start working. The value of children's work in imparting skills, and as a part of the household economy, was recognised by most participants (94%). There was less consensus between village and town over whether children's work interferes with their schooling; in the town, 69.7% of respondents agreed that it is difficult for children to balance work and school, compared to 57.9% in the village. During interviews, respondents who disagreed with this question often commented that most children could do the work expected of them before or after school hours. There was the most consensus regarding children's responsibilities to their families, with 97.5% of participants agreeing that they expect their children to support them when they grow up, and 95.5% agreeing that children should help at home. The majority of respondents said the benefits of education were the same for boys and girls, though 17% believed that boys benefit more from education than girls. The question of whether education is important for whether someone is a good husband or wife elicited amusement and confusion in equal measure; the large amount of 'don't know' responses (15.6%) suggests the wording of this statement was not clear to many participants. Some participants laughed and said education was not important; others, when prompted to consider with regards to choosing a partner for their own son or daughter, did agree that they would want someone with a good education (20.7% in the village, 22.4% in the town).

While self-reported attitudes asked in this way are likely to reflect social norms and to be heavily influenced by social desirability bias, education does appear to be highly

valued in this area. During the course of my fieldwork, I was surprised at how positive people's attitudes about education were, given the poor quality of the education on offer, the challenges children and their families experience in accessing school, and the relative lack of opportunities for educated young people locally. It is possible that these attitudes reflect socially expressed ideals, and that parents are more pragmatic when it comes to their own children's education.

Figure 3.1 Summary of responses to statements about education and children's work, from household surveys



4. TRADE-OFFS IN CHILDREN'S TIME ALLOCATION: MIXED SUPPORT FOR EMBODIED CAPITAL MODELS OF THE DEMOGRAPHIC TRANSITION IN TANZANIA

RESEARCH PAPER COVER SHEET

PLEASE NOTE THAT A COVER SHEET MUST BE COMPLETED FOR EACH RESEARCH PAPER INCLUDED IN A THESIS.

SECTION A – Student Details

Student	Sophie Hedges
Principal Supervisor	Rebecca Sear
Thesis Title	Children's work and parental investment in education in north-western Tanzania

If the Research Paper has previously been published please complete Section B, if not please move to Section C

SECTION B – Paper already published

Where was the work published?	**Current Anthropology**		
When was the work published?	**October 2018**		
If the work was published prior to registration for your research degree, give a brief rationale for its inclusion			
Have you retained the copyright for the work?*	**Yes**	Was the work subject to academic peer review?	**Yes**

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Stage of publication	Choose an item.

SECTION D – Multi-authored work

For multi-authored work, give full details of your role in the research included in the paper and in the preparation of the paper. (Attach a further sheet if necessary)	I was responsible for the research design, and conducted the statistical analysis. I was also primarily responsible for writing this work and responded to reviewer comments. My co-authors supported this work in an advisory capacity and helped to edit the writing.

Student Signature: [redacted] **Date:** 29/06/2018

Supervisor Signature: [redacted] **Date:** 29/06/2018

4.1. Abstract

Embodied capital theory (ECT) argues that socioeconomic 'modernisation' leads to high-cost, high-return parental investments in education, in turn incentivising demographic transitions to low fertility. However, few studies have directly investigated the proposed opportunity costs of schooling in contemporary developing populations undergoing socioeconomic change. We present a study of children's time use in two communities in Mwanza, Tanzania, representing either end of a local rural-urban gradient. Consistent with ECT, town compared to village residence was associated with increased schooling at the expense of time allocation to children's work. However, these patterns apply primarily to boys, for whom herding work is relatively incompatible with schooling. Girls more readily combine domestic chores with school attendance, a pattern which may account for unexpectedly high female school enrolment in this population. Furthermore, the strongest time allocation trade-offs were not between school and work, but between school and leisure time, suggesting overall low opportunity costs to education. Mixed support for ECT may partially explain why fertility decline has stalled in many low-income countries, despite education uptake. Finally, we advocate that international development programs consider the well-being implications of reduced leisure time accompanying education uptake, particularly for girls maintaining a 'double-shift' of school and domestic work.

4.2. Introduction

Embodied capital is defined as the skills, knowledge, experience, physical growth and strength acquired during childhood and adolescence, which increase adult social and reproductive success. Embodied capital theory (ECT), developed by evolutionary anthropologists, predicts that children's time allocation favours activities that improve long-term social and reproductive success, but that there may be trade-offs between

activities with long-term returns which are not immediately productive, and activities with short-term returns (Gurven & Kaplan, 2006). Processes involved in economic 'modernisation', including urbanisation, declining mortality and market integration, lead to greater payoffs to investment in embodied capital gained through formal education (Mattison & Sear, 2016). Schooling enables children to gain practical and social skills that will be beneficial in the long-term. But attending school is costly, both directly, and through opportunity costs arising from time allocation away from productive activities. Children therefore become more costly, leading parents to invest more in fewer children. These 'quantity-quality trade-offs' are hypothesised to have driven the global decline in fertility over the past two centuries (Kaplan, 1996; Kaplan et al., 2015).

Support for the importance of quantity-quality trade-offs in causing fertility decline primarily focuses on data from historical European demographic trends and variation in fertility within modern affluent populations (Lee, 2003). However, the primacy of Europe in influencing demographic transition theories is problematic because the process of modernisation in contemporary developing populations may be distinct (Thornton, 2001). Embodied capital models of the demographic transition posit that parents incur costs, but that these are offset by increased payoffs for their children in adult life. Thus, education is presented as beneficial, but this may not always be the case in contemporary rural low-income settings. Poor education quality, a lack of employment prospects, and reliance on subsistence livelihoods, make the payoffs to education uncertain (Nieuwenhuys, 1993). There are also concerns that the widely-assumed trade-off between children's work and school attendance (i.e. the opportunity costs of educating children) is exaggerated in both current theory and policy discourse, with few studies demonstrating a direct trade-off between time spent in work versus education (Beegle, Dehejia, Gatti, & Krutikova, 2008; Pörtner, 2016). Indeed, work and school may

often be complementary; for example, children may earn money for school expenses through part-time work (Nieuwenhuys, 1993).

ECT also anticipates that parents will invest according to the specific returns expected for different children, based on socioecological context, household factors, and individual-level factors such as child gender (Bock, 2002a; Gurven & Kaplan, 2006). In a patrilocal, patrilineal context, such as we study here, sons remain nearby as adults, meaning parents may anticipate greater returns to educating boys. Furthermore, when men earn higher wages than women and are more likely to have a job requiring formal education, parents are anticipated to favour educating sons. However, non-economic outcomes, including maternal and child health, social status, and marriage opportunities, are also improved by education and may lead to greater payoffs to girls' education in some contexts (Bedasso, 2008).

With long-term benefits to education uncertain, and potentially limited or absent altogether, differential opportunity costs of schooling may be pivotal for parental investment decisions in many rural low-income populations. Typically, girls do more domestic chores and childcare, while boys are more involved in work outside the household (Murdock & Provost, 1973). Anthropologists have highlighted the importance of girls' childcare in underwriting the costs of high fertility in pre-transition societies (Kramer, 2002). Other studies emphasise the importance of boys' labour in contributing to household subsistence (Cain, 1977). However, existing data on children's work and time allocation in contemporary low-income settings likely underestimates the amount of work done by children, particularly girls, due to the focus on market-based work done for cash income (Assaad, Levison, & Zibani, 2010; Esquivel et al., 2008). Household work is often overlooked, yet these duties may be time- and energy-consuming, essential to household functioning, and disruptive of schooling (Ilahi, 2000). Additionally, few studies

have considered the impacts of schooling and work on children's leisure time (Bacolod & Ranjan, 2008).

We present a novel study of children's time allocation in two communities in north-western Tanzania, representing either end of a local rural-urban gradient. Departing from much of the prior literature, we take a holistic perspective on children's time allocation throughout a complete day, including contributions to domestic and farm work, and leisure time. Defining work more broadly and collecting data on leisure activities, rather than focusing solely on school or market work, allows a more nuanced investigation of predictions derived from ECT. We outline five hypotheses regarding the impacts of modernisation and gender on (i) school enrolment, (ii) patterns of children's work, and (iii) the trade-offs between these activities.

4.2.1. Social context and hypotheses

Fieldwork was conducted in the Mwanza region of north-western Tanzania, a context in which social, economic, and demographic transitions are occurring. Primary school enrolment in Tanzania increased dramatically following the universal education movement in the 1970s, but declined in the 1980s (Beegle et al., 2008). Less than 60% of children progress to secondary school, and there are concerns over the low quality of schooling available (Hivos/Twaweza, 2014). Many households are still involved in subsistence agropastoralism, with children also working on household farms (ILO, 2013; USDoL, 2013). In the Mwanza region, under-5 mortality has declined substantially over the past decade, but fertility remains high at 6.4 children per woman on average (DHS, 2010; Kishamawe et al., 2015). Within this context, we use residence in a neighbouring village and town as a proxy for degree of modernisation, in order to test hypotheses derived from ECT. While we acknowledge that modernisation is a multi-faceted process which cannot be fully captured by a two-way comparison (Kirk, 1996), there are clear

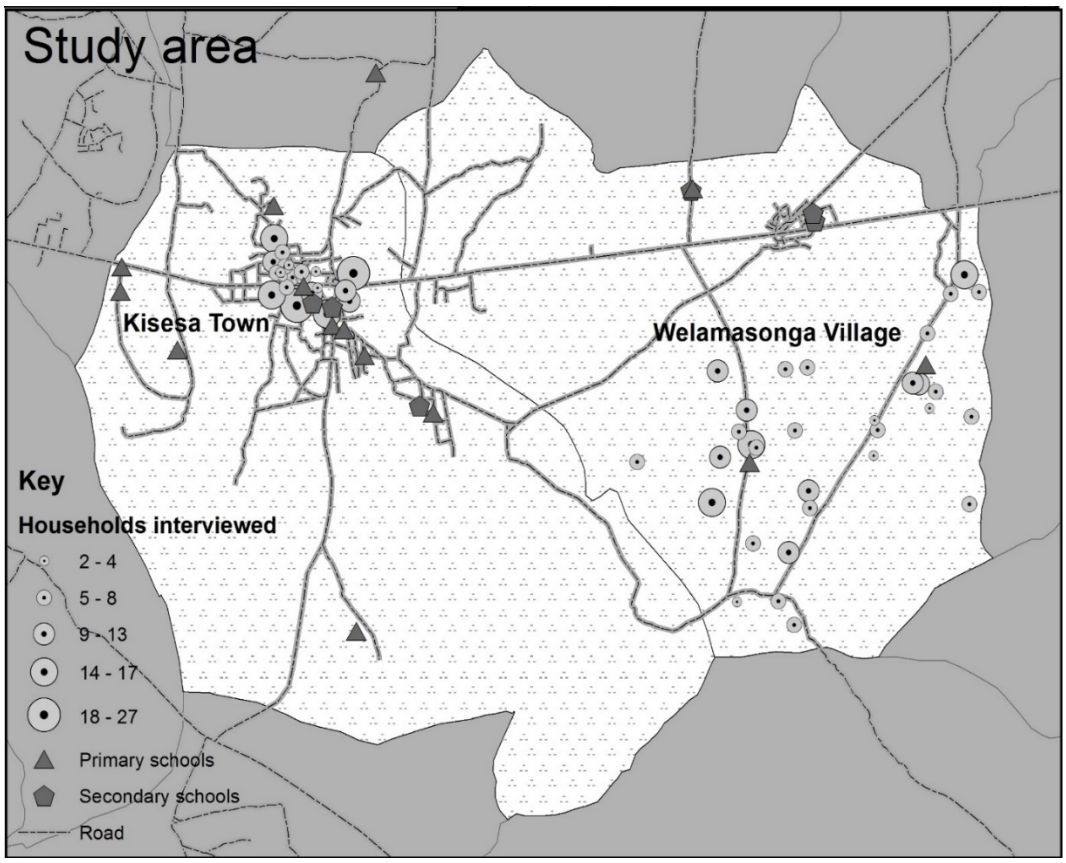
differences between the village and town in the anticipated payoffs to children's work and education.

The village and town are both within the Magu Health and Demographic Surveillance Site (HDSS), approximately 20km east of Mwanza city (Figure 4.1). Most residents are part of the Sukuma ethnic group, the largest in Tanzania, representing about 17% of the nation (Malipula, 2015). Traditionally, the Sukuma lived in large, dispersed homesteads and maintained large herds. Now cattle keeping is declining, as land holdings decrease in size and consumer goods become a more important indicator of wealth (Wijsen & Tanner, 2002). In the village, 83% of households are reliant on agropastoralism, with 45% of households selling surplus crops or animal products, and 38% being subsistence farmers. In the town, more households rely on petty trading or labouring (20%), or small businesses and skilled work as, for example, mechanics or tailors (53%). The opportunities for paid employment and entrepreneurship are much greater in the town, which has a central market, and is linked by public transport to large markets in Mwanza city and its surrounding suburbs. Near the town are large businesses including a textile factory and a Coca-Cola depot, which require a secondary school certificate for employment. By contrast, in the village knowledge and skills associated with traditional livelihoods, particularly cattle herding, remain important, and are best acquired through practical experience. The village generally retains a stronger Sukuma identity, with many families continuing to speak Sukuma, and 42% practicing traditional religious beliefs. In the town, most speak Swahili, the national language in which primary school is taught, and the majority of households identify either as Christian (92%) or Muslim (5%).

While predictions are drawn from ECT, our analyses are somewhat exploratory, given the unpredictability of returns to investment in a transitioning context. Our first two hypotheses concern parental decisions to enrol children in school. In the town, we

anticipate higher returns to investment in skills acquired through school, due to the greater potential for formal employment (Kaplan, 1996; Mattison & Neill, 2013). Our first hypothesis therefore is that (1) modernisation (proxied here by town residence) will be associated with greater school enrolment. Given the patrilocal, patrilineal context, and the typically higher earnings of men (FAO, 2014), we expect boys to receive more education. Thus, we anticipate that (2) girls will be less likely to be enrolled in school than boys. We also take the opportunity to consider potential interactions between gender and village/town residence in predicting education outcomes.

Figure 4.1 Map of the study area showing distribution of households interviewed, as well as the main roads and schools attended by children



Our third and fourth hypotheses concern children's work. Agricultural and particularly pastoralist livelihoods are associated with high labour demands, traditionally met partly through children's labour (Kramer, 2002; Sellen, 2003). Modernisation is associated with lowered reliance on agriculture and reduced livestock ownership, and so is expected to

be associated with lower returns to children's agricultural work. Additionally, better access to water and smaller household size (i.e. fewer household members) in the town is expected to reduce the returns to children's household chores. This leads to our third hypothesis, that (3) modernisation will be associated with less work overall for children, particularly farm work. Gendered division of labour is observed across societies, and children are socialised to fulfil these gendered roles as adults. Among the Sukuma, farm work and cattle herding are boys' tasks, while household chores are girls' tasks (Varkevisser, 1973). Our fourth hypothesis is therefore that (4) boys will do more farm work and girls will do more household chores.

Finally, we examine the trade-off between work and education suggested by ECT. As time is a limited resource, school attendance is expected to reduce time spent in other activities. Furthermore, as the returns to children's work are expected to be lower, and the returns to school attendance higher in the town, the opportunity costs of school are expected to be lower. Thus, we hypothesise that (5) there will be a trade-off between work and education, but that modernisation will reduce the magnitude of this trade-off.

4.3. Methods

We conducted a study of children and young adults aged 7-19. The HDSS provided a sampling frame of all households with members aged 7-19, from which we randomly sampled 550 households. Surveys collected information about household membership, education and occupation, and household assets, land and livestock ownership, business involvement, and food security, based on the Household Food Insecurity and Access Scale (Coates et al., 2007). Food security is used as a proxy for household wealth in our analyses. We believe this is an effective measure of household wealth in the context of a food insecure population and avoids comparability issues in alternative wealth measures

(e.g. comparing land or cattle ownership) in the face of marked livelihood variation between town and village.

Children's time allocation on the previous school-day was recorded through a time allocation interview (Figure 4.2). 1,278 children were followed-up out of a total of 1,387 eligible children (92.1%). Children were shown a diagram representing the day, and were asked to remember everything they did on the previous weekday, from when they woke up until they went to sleep. A diagram was shaded to indicate the time and duration of the activities (time diagram example shown in Supplementary Material; SM Figure 1). The advantage of these data is that they provide a 'child's eye' view of children's contributions to their households. There are some limitations, however, including possible biases in self-report, for example previous studies have suggested children may overestimate their work hours (Janzen, 2015); as a snapshot of a single day, these data cannot account for seasonal variation, nor all potential strategies families may employ to ameliorate the trade-off between work and school, such as working on weekends or during school holidays; we also collected data only on the primary activity and did not ask about concurrent activities, which we acknowledge may underestimate time in activities potentially combined with others, e.g. childcare.

It should be noted that the analysis presented here is part of a larger body of work conducted using the same dataset, and hence that additional hypotheses were tested in addition to those presented here. A limitation of this analysis is therefore that the rate of Type I errors may have been inflated above the assumed level of $\alpha = 0.05$. This should be considered when reading the results.

Figure 4.2 Time allocation interview being conducted with a girl outside her home in the town

We used logistic regression models to test hypotheses 1 and 2, regarding the effect of town residence (our proxy for modernisation) and gender on schooling. We constructed three binary outcome variables relating to schooling: schooled, where 1 indicates the child has ever been enrolled in school; enrolled, where 1 indicates the child is currently enrolled in school; and progressed, for those aged 14-19 only, where 1 indicates the child has attended secondary school. The clustering of children (Level 1, n=1,367) within households (Level 2, n= 456) was accounted for using mixed effect models, including a random effect for household in schooled and enrolled models. Progressed models did not include a random effect because the clusters are more sparsely populated, which may overestimate fixed and random effects (Clarke, 2008). All models adjust for child age and food security as a proxy for household wealth. An interaction between gender and residence was included to investigate whether gender differences were reduced in the town.

Hypotheses 3 and 4, regarding children's time spent in work, were tested using linear regression models. Activities from the time allocation interview were coded into one of five categories; leisure / personal (hereafter referred to as 'leisure'), education, household chores, farm work or herding (hereafter referred to as 'farm work'), and market work (full details given in SM; SM Table 4.1). Total time spent in each activity category was calculated and divided by the number of hours covered by the interview (5am-10pm; 17 hours) to give the proportion of time spent in each activity category. Separate regression models were run for each activity, as well as a new activity variable, productive work, which was calculated as the total number of hours spent in chores, farm, and market work. The outcome variable for each regression model was hours spent in that activity, with gender and place of residence being the key predictor variables. An interaction between residence and gender was included to investigate whether gender differences exist between the town and village. Analyses were stratified by school attendance (attended on the previous school day or not) and age group (7-13 and 14-19), as work patterns change with age, and differ between those who attended and did not attend school. Models were adjusted for age and household food security, and school enrolment for those who did not attend school.

Fractional multinomial logistic regression (Buis, 2017) was used to investigate hypothesis 5, the trade-off between education and other activities. This method accounts for autocorrelation between time uses, as time spent in one activity automatically reduces the time available for other activities. The outcome variables are the proportions of time spent in education, leisure activities, household chores, farm work, and market work, adding up to 1 for each child. The key predictor variables were gender, residence, and school attendance. These models were stratified by age group, and adjusted for age, household food security and school enrolment. Models give predicted proportions of

time in the five categories, subsequently converted back into hours. All analyses were carried out in Stata version 14.

Table 4.1 Sample size and description of child education outcomes and household characteristics

	Village	Town	Total
Sample:			
Number of households	234	222	456
Number of children aged 7–19	768	619	1,387
Number of children interviewed	740	538	1,278
Mean household size (SD)	8.0 (2.9)	7.1 (3.2)	7.6 (3.1)
Mean number of children aged 7–19 per household (SD)	3.3 (1.7)	2.7 (1.8)	3.0 (1.7)
Education outcomes:			
Ever enrolled (%)	702 (91.4)	608 (98.2)	1,310 (94.5)
Currently enrolled (%)	574 (74.7)	528 (85.3)	1,102 (79.5)
Progressed (%; 14–19-year-olds)	80 (30.9)	196 (72.3)	276 (52.1)
Attended on previous day (%; currently enrolled and followed up only)	490 (87.2)	417 (88.7)	907 (87.9)
Mean years of education (SD; previously enrolled)	5.9 (2.5)	8.1 (2.8)	6.6 (2.8)
% households:			
With salaried member	1.7	12.6	7.0
With skilled member	3.0	20.3	11.4
With business or shop	10.3	32.9	21.3
Farming and selling agricultural produce	45.3	4.1	25.2
Subsistence farming	38.0	9.9	24.3
Owning land	95.3	72.5	84.2
Growing crops	96.2	47.3	72.4
Owning cattle	43.6	7.2	25.9
With electricity	2.1	50.5	25.7
With water source on own land	3.4	36.0	19.3
Classed as ‘severely food insecure’	50.4	48.4	49.5

4.4. Results

4.4.1. Descriptive statistics

Town households are smaller; more likely to have an educated household head; less likely to own land, grow crops, or own cattle; more likely to have a formal business or salaried member; and have greater access to public services such as electricity and water (Table 4.1). These data support our assumption that town residence is a proxy for modernisation. Food insecurity is high and similar across the village and town, suggesting that, despite livelihood variation, both locations face similar socioeconomic challenges in provisioning their families.

Only 5% of children had never attended school, primarily because they were still considered too young. In the village, 79% of girls and 71% of boys were currently enrolled, while in the town, 84% of girls and 87% of boys were enrolled. Of the 1,278 children interviewed, 80% were enrolled and 70% had attended school. There was no significant difference in missing school between the village and town.

Figure 4.3 shows children's time allocation by age, stratified by gender and location. Children spend about half their time in personal or leisure activities. Leisure time decreases with age, while time spent in education and work increases with age; except among the oldest children who spend little time in education and more in either work (village) or leisure (town). Farm work is predominantly done by village boys and older village girls. Girls do more household chores than boys in both town and village.

Table 4.2 Results from logistic regression models of educational outcomes; ever enrolled in school, currently enrolled in school (whole sample), and progressed to secondary school (for 14–19 year olds only)

	Ever enrolled	**Currently enrolled**	**Progressed (14–19-year-olds)**
Town (reference = village)	12.22**	7.00**	5.86**
	[3.67,40.72]	[3.83,12.82]	[3.40,10.10]
Female (reference = male)	1.98*	1.82*	1.27
	[1.06,3.72]	[1.14,2.88]	[.74,2.18]
Residence#gender interaction	.27+	.41*	1.22
	[.06,1.20]	[.20,.87]	[.56,2.64]
Household food security score	1.05+	1.04*	1.06**
	[.99,1.10]	[1.01,1.08]	[1.02,1.09]
Age (years)	1.74**	.58**	1.25**
	[1.50,2.02]	[.54,.63]	[1.12,1.41]
Constant	.01**	2099.90**	.00**
	[.00,.07]	[578.02,7628.80]	[.00,.03]
Random intercept for household	.96	.83	
	[.48,1.90]	[.52,1.34]	
N	1,367	1,367	523

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

Exponentiated coefficients presented; 95% confidence intervals in brackets

4.4.2. Education

Table 4.2 shows results from our logistic regression of the three education outcomes. These results support hypothesis (1): town residence is associated with higher odds of enrolment and progression to secondary school. Contrary to hypothesis (2), girls have higher odds of enrolment than boys, though there is no gender difference in progression to secondary school. There are interactions between residence and gender, with gender differences being reduced in the town (though this is only marginally significant for ever-enrolled). In the village therefore, boys are less likely to be in school than girls; in the town, the overall level of educational investment increases, and the gap between boys and girls is reduced. The educational 'disadvantage' to village boys is surprising given historical trends in this area indicating higher male enrolment rates (SM Figure 4.2).

4.4.3. Work

Figure 4.4 and Figure 4.5 present results from the linear regression models, predicting hours spent in chores, farm work, leisure, and overall productive work (chores + farm work + market work) (full regression results are shown in SM; SM Table 4.2 and SM Table 4.3). Results for market work are not presented given the negligible amount of time spent in this activity. We first discuss work patterns for children who did not attend school, before considering children who did attend school.

Among children who did not attend school, Figure 4.4 shows that village/town differences are clear and in line with hypothesis (3), that modernisation would be associated with less productive work. Hypothesis (4) stated that boys would do more farm work and girls more household chores. Our results show that gender differences in the type of work done are substantial, and in the expected direction. Differences in the amount of work done are more complicated. Among 7–13-year-olds, there are no significant gender differences in work and leisure in the town, but village boys do marginally more work and have marginally less leisure time than village girls. Among 14–19-year-olds however, gender differences are exacerbated with modernisation. Girls do approximately four hours more chores than boys in both locations. In the town, boys therefore do much less productive work than girls, and have more leisure time, while in the village there is no significant gender difference in amount of work among 14–19-year-olds.

Among children who attended school, gender and village/town differences are much smaller (Figure 4.5). Consistent with hypothesis (3), those in the town do slightly less productive work; a difference which is significant among 14–19-year-olds. Those in the town also have significantly less leisure time than those in the village, because they spend more time in education. In line with hypothesis (4), some gender differences are

statistically significant, in that girls do more household chores than boys, and this difference is reduced in the town. In the village, boys do more farm work than girls, while neither boys nor girls do much farm work in the town. This leads to town girls doing more productive work and having less leisure time overall, particularly among 14–19-year-olds.

These results suggest that the lower enrolment rates seen for boys in the village may be due to their time spent farming. They also suggest that there may not be a straightforward trade-off between work and school, because girls do similar amounts of, if not more, productive work than boys, and yet are not less likely to be enrolled. In the next section, we estimate the trade-offs in time allocation between work, leisure, and school.

4.4.4. Trade-offs between work and school

Figure 4.6 presents results from the fractional multinomial logistic regression model, showing the predicted difference in time allocation, in hours, between school attenders and non-attenders (full model output in SM Table 4.6). This gives us an indication of the opportunity costs of schooling, as it shows which activities are reduced to allocate time to education. In Figure 4.6, activities for which we cannot be statistically confident of a difference between school attenders and non-attenders have confidence intervals that cross 0. For example, school attendance has negligible impacts on market work for both genders. As expected, school attendance substantially increases time in education, particularly among older children, who allocate 9-11 hours a day to education. Which activities are reduced to make space for schooling depends on gender and location.

Among 7–13-year-olds, school attendance primarily reduces leisure time, by up to seven hours a day. Village boys are the exceptions here; school leads to a relatively small reduction in leisure time, but a larger reduction in farm work of around four hours a day.

Village girls also have a small reduction in both chores and farm work with school attendance, while for both girls and boys in the town, only chores are reduced. These results imply that the opportunity costs of schooling are highest for village boys, while there are relatively small trade-offs between work and education for girls or town boys.

Among 14–19-year-olds, the effect of school attendance on reducing work is greater for girls. School attendance reduces time spent in household chores by approximately five hours for girls in the town. For village girls, school attendance reduces household chore time by around three hours, and farm work by around two hours. As in the younger group, village boys trade-off education and farm work, with school attendance decreasing farm work by around five hours. Town boys, in this case, are the exception, as they only show small trade-offs between work and education, with school attendance instead reducing leisure time by nearly eight hours. Thus, the opportunity costs of school attendance are elevated at older ages for both town and village girls, to a level similar to village boys, but are negligible for boys living in town.

Figure 4.3 Mean percentage of time spent in education, market work, farm work, household chores, and leisure between 5am and 10pm on the previous school day, by age. Data are displayed by gender and urban/rural residence. Time spent in leisure decreases with age, while time spent in education and work increases with age. Farm work is predominantly done by village boys and older village girls. Girls do more household chores than boys in both town and village. Only a small amount of time is spent doing market work by any children.

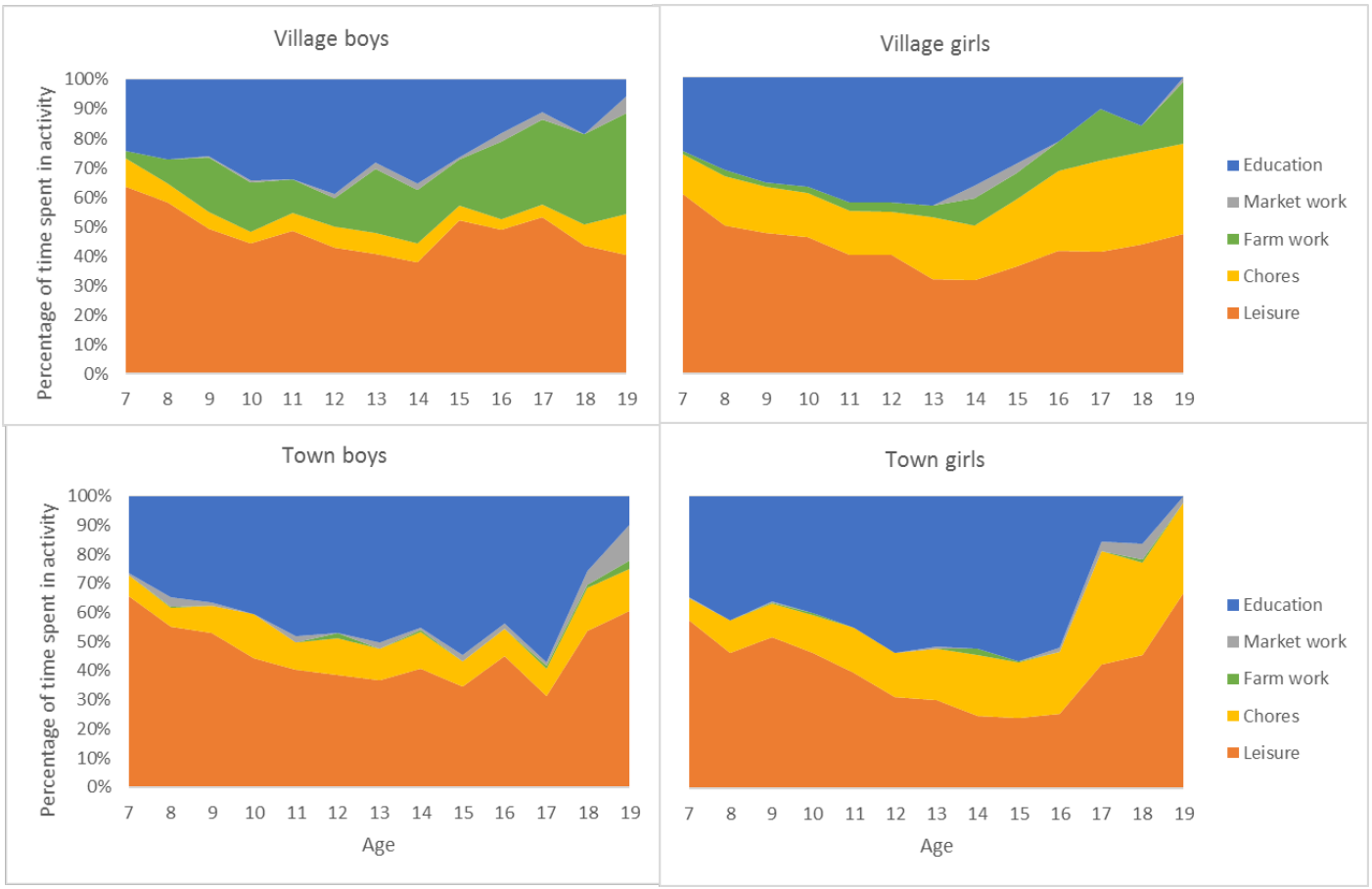


Figure 4.4 Predicted hours spent in household chores, farm work, leisure, and productive work from linear regression models, for those who did not attend school on the previous day; the left hand graph is for younger children aged 7 to 13, and the right hand graph is for older children aged 14 to 19. Results are shown by village and town, and for boys (hollow blue triangles) and girls (solid red diamonds). Error bars represent 95% confidence intervals.

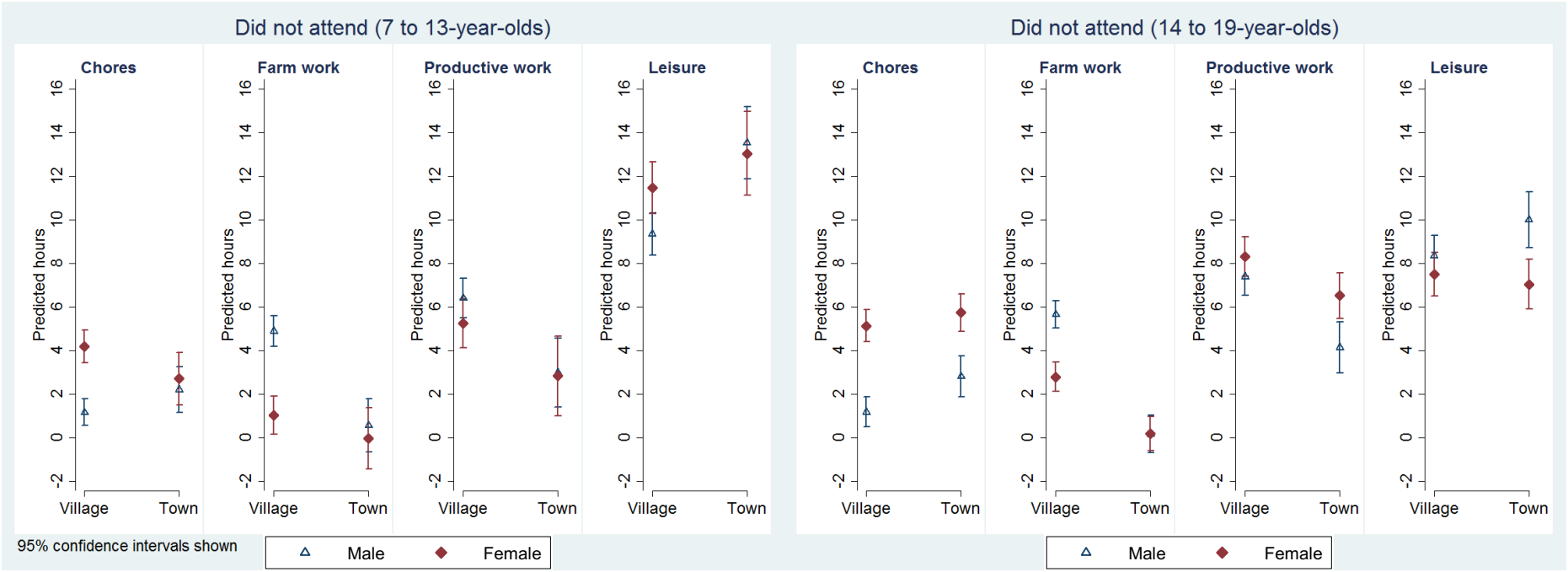


Figure 4.5 Predicted hours spent in household chores, farm work, leisure, and productive work from linear regression models, for those who did attend school on the previous day; the left hand graph is for younger children aged 7 to 13, and the right hand graph is for older children aged 14 to 19. Results are shown by village and town, and for boys (hollow blue triangles) and girls (solid red diamonds). Error bars represent 95% confidence intervals.

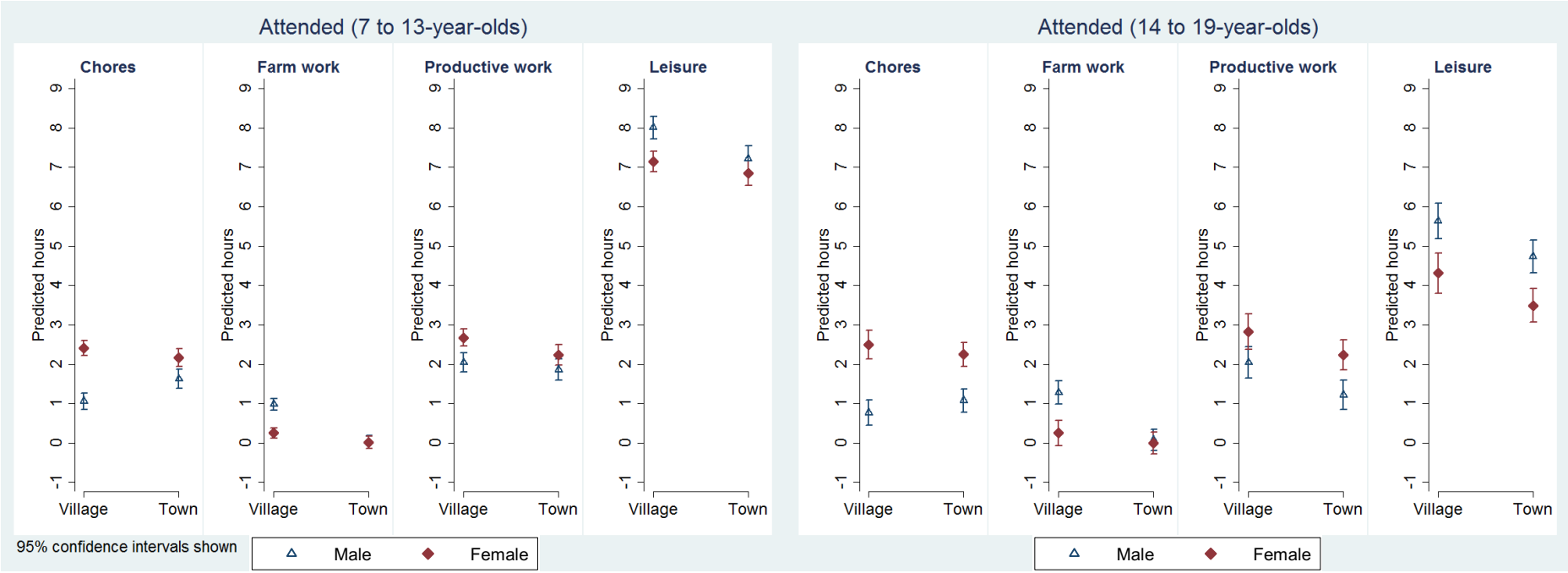
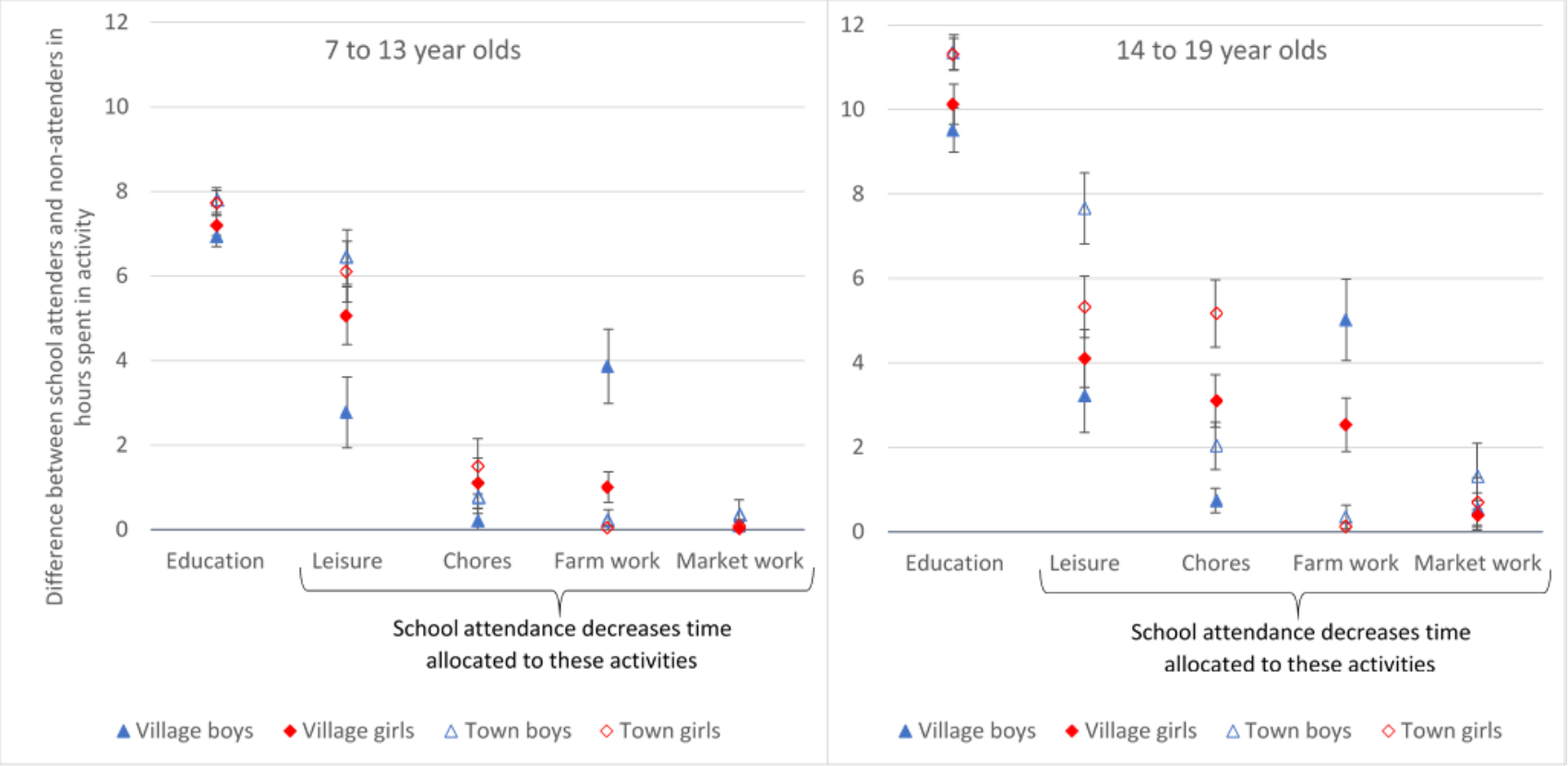


Figure 4.6 Predicted hours from fractional multinomial logistic regression models showing the absolute difference between school attenders and non-attenders in time spent in education, leisure, household chores, farm work, and market work, by gender and residence. Models were run separately according to age group and are adjusted for gender, age, household food security, and enrolment status. The baseline, 0, represents time allocation for non-attenders. School attendance increases time spent in education, and decreases time spent in other activities. 95% confidence intervals that cross the baseline indicate a non-significant difference between attenders and non-attenders. Village markers are solid. Town markers are hollow; boys' markers are blue triangles and girls' are red diamonds.



In summary, hypothesis (5), that work would trade-off against education but that this trade-off would decrease with modernisation, is partially supported. We do find trade-offs between work and education, particularly for older children, but a substantial amount of the time that children spend in education is traded-off with leisure time, rather than work. Further, there are gender differences in this trade-off. Modernisation impacts boys' time allocation to a greater degree than girls'. In the village, boys' work is valuable, and this appears to impact their enrolment. In the town, boys do much less work, lowering the opportunity costs of schooling. Girls' work patterns on the other hand show much smaller differences with modernisation, with the opportunity costs of older girls' time being quite high in both the town and village.

4.5. Discussion

Consistent with ECT, we report evidence that modernisation increases investment in education, reduces farm work, and is associated with lower opportunity costs to schooling. However, contrary to our expectations, the strongest trade-offs in time allocation are not between school and work, but between school and leisure time. Furthermore, we find that the classic narrative of ECT applies primarily to boys; male-dominated farm work is relatively incompatible with schooling, while female-dominated household chores are more readily combined with school. These findings have important theoretical and applied implications for our understanding of socioeconomic 'modernisation' and its impacts on childhood experience.

In this context, the opportunity costs of educating children appear modest. This in turn implies that the returns to education need not be particularly high to justify parental investment in child schooling. Education uptake may therefore be driven, not just by increasing economic benefits, but by decreasing opportunity and direct costs. Throughout Tanzania, household labour requirements have shrunk in recent years

following villagisation policies (*ujamaa*), and shifts towards less labour-intensive crops (Varkevisser, 1973; Wijsen & Tanner, 2002). Direct costs have also declined with the abolition of primary school fees, though families do bear the costs of school supplies, for example uniform and stationery.

Low opportunity costs to schooling in this setting, and perhaps more broadly across low-income, high-fertility African populations, may not be characteristic of past European transitions. However, historical analyses of education uptake in Industrial England similarly contradict the view that schooling uptake was driven primarily by anticipated economic returns. It has been argued that the promotion of compulsory education was a way of controlling young people's time, rather than because school would be useful to children (Cunningham, 1990; Horrell & Humphries, 1995). Thus, schooling may be better considered as a form of cooperative child care, which frees parental time for other productive activities by reducing the burden of child supervision and direct care. A fruitful area for future study would be to consider the impact of schooling on parental productivity.

If education is not very costly, as in this context where both opportunity costs and direct costs of schooling (at least at the primary level) appear modest, school enrolment can be high even in the absence of high returns. This has consequences for fertility decline, implying that schooling does not necessitate, or even necessarily incentivise, a switch to a 'quality over quantity' focused parental investment strategy. Indeed, despite near universal primary school enrolment and growing secondary school attendance in this population, fertility rates remain high, suggesting many families perceive education and high fertility as compatible strategies. In rural South Africa, high investment in education was also observed despite limited payoffs; with parents argued to invest in

education in the hope that at least one child may benefit, but continuing to have many children to provide old-age security and household labour (Liddell et al., 2003).

The opportunity costs of boys' work appear much higher than those for girls, particularly at younger ages, and this is reflected in boys' lower school enrolment rates in the village. Lower enrolment of boys is an unexpected pattern, given the typically assumed greater economic pay-offs to male wage-labour and the international focus on out-of-school girls (United Nations, 2015b). Yet, other studies have also recently documented a 'male disadvantage' in education in pastoralist settings in both Kenya and north-eastern Tanzania (Hedges et al., 2016; Mburu, 2016). We suggest this trend is driven by the relative compatibility of girl's household chores with school attendance. Sending boys to school and foregoing their work may be a more significant decision, involving the expense of employing someone else to herd the cattle, losing opportunities for passing on knowledge and skills to the next generation and potentially foregoing income from cattle keeping altogether (Siele, Swift, & Kratli, 2013).

While often overlooked by both theoretical and policy-grounded research on childhood, leisure and social time is an important component of childhood experience, and may have important implications for child health, wellbeing, and achievement (Bock & Johnson, 2004). Our results indicate that schoolgirls sacrifice leisure time, and combine education with household work. This situation, where gender equality in the public sphere (school) has been achieved, at least superficially, but gender differences remain in the private sphere (household), echoes the 'double shift' seen in many 'modern' economies, in which women combine full-time work with responsibility for unpaid household work and childcare (Hochschild & Machung, 1989; McDaniel, 2012).

4.5.1. Conclusions

ECT dominates contemporary research into the impact of modernisation on parental investment and reproductive strategies, particularly in evolutionary anthropology and demography (Lawson & Borgerhoff Mulder, 2016). Yet, available data on patterns of educational investment and children's work, presented here and elsewhere, provide mixed support for assumptions about the costs and benefits of education, and the consequent motivations for limiting fertility. Indeed, many contemporary low-income populations have both high school enrolment and high fertility, supporting the view that low opportunity costs of schooling are an important explanatory factor behind stalled fertility declines. This conclusion echoes wider concerns that historical processes need not necessarily be reflected in current and future patterns of change (Thornton, 2001).

Our analyses also make clear that the impact of modernisation on childhood cannot be understood without considering gender. Parents in this population, and elsewhere, are increasingly educating daughters, often more than their sons, a pattern which may be driven by relatively low opportunity costs and emerging employment opportunities for young women. We caution that for girls, school attendance involves sacrificing leisure time to combine school with household chores, with unknown consequences for their well-being. More holistic studies of the costs and benefits of children's time allocation, that fully explore children's time beyond the most obviously 'functional' behaviours of work and schooling, will provide better understanding of how best to promote positive outcomes across all dimensions of children's lives.

4.6. Acknowledgements

We thank the National Institute of Medical Research, Mwanza; our fieldwork team, especially Holo Dick, Pascazia Simon, and Vicky Sawalla; all our participants; and the headteachers who allowed us to conduct interviews in their schools. This study was

funded by the UK Economic and Social Research Council, the Wenner-Gren Anthropological Foundation, the International Society for Human Ethology, the Parkes Foundation, and the European Human Behaviour and Evolution Association. We would like to thank the editor and two anonymous reviewers for their constructive comments.

4.7. Supplementary Material

4.7.1. 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 labour, including a minimum age of 14 for paid employment, and programs to reduce the most harmful forms of labour, 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.

4.7.2. 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.

4.7.3. 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).

SM Table 4.1 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 *uji* (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/*uji*/ 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)

SM Table 4.2 Results from original 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**	0.79	-4.65**	-3.91**	2.59**	1.98**	-5.62**	-2.73**
	[1.88,5.67]	[-0.54,2.12]	[-6.11,-3.20]	[-5.78,-2.04]	[1.28,3.91]	[0.81,3.15]	[-6.77,-4.47]	[-4.04,-1.42]
Female	1.63*	2.83**	-4.24**	-1.71*	-0.78	4.28**	-3.19**	0.85
	[0.17,3.10]	[1.80,3.86]	[-5.37,-3.12]	[-3.15,-0.26]	[-1.87,0.31]	[3.32,5.25]	[-4.14,-2.23]	[-0.24,1.93]
Town # Female	-1.42	-2.10*	3.60**	1.75	-2.13*	-0.4	3.05**	2.17*
	[-4.22,1.37]	[-4.06,-0.13]	[1.45,5.75]	[-1.01,4.51]	[-3.94,-0.32]	[-2.01,1.21]	[1.46,4.63]	[0.37,3.98]
Enrolled	-0.23	0.33	-0.08	0	1.60*	0.49	-1.42*	-1.68*
	[-1.68,1.21]	[-0.69,1.35]	[-1.19,1.03]	[-1.43,1.43]	[0.29,2.90]	[-0.67,1.64]	[-2.56,-0.28]	[-2.98,-0.39]
Age	-0.58**	0.18	0.32*	0.52**	0.12	-0.03	-0.08	-0.14
	[-0.90,-0.26]	[-0.05,0.40]	[0.07,0.56]	[0.21,0.84]	[-0.17,0.40]	[-0.28,0.22]	[-0.33,0.17]	[-0.43,0.14]
Household food security	-0.02	-0.03	0.07+	0.02	0.02	-0.03	0.03	-0.01
	[-0.12,0.08]	[-0.10,0.04]	[-0.01,0.15]	[-0.08,0.12]	[-0.06,0.09]	[-0.10,0.03]	[-0.04,0.09]	[-0.08,0.06]
Constant	16.70**	-0.27	0.7	1.01	6.48*	2.25	7.23**	10.86**
	[12.43,20.97]	[-3.27,2.73]	[-2.59,3.99]	[-3.22,5.23]	[1.40,11.57]	[-2.27,6.76]	[2.78,11.68]	[5.79,15.93]
N	138				231			

β coefficients presented; 95% confidence intervals in brackets

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

SM Table 4.3 Results from original 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**	0.56**	-0.95**	-0.19	-0.90**	0.31	-1.21**	-0.83**
	[-1.23,-0.35]	[0.24,0.88]	[-1.17,-0.73]	[-0.55,0.17]	[-1.52,-0.28]	[-0.13,0.75]	[-1.60,-0.81]	[-1.37,-0.28]
Female	-0.87**	1.35**	-0.73**	0.63**	-1.32**	1.73**	-1.03**	0.78*
	[-1.26,-0.48]	[1.07,1.64]	[-0.92,-0.53]	[0.31,0.95]	[-2.00,-0.65]	[1.24,2.21]	[-1.46,-0.60]	[0.18,1.37]
Town # Female	0.50+	-0.80**	0.72**	-0.25	0.08	-0.56+	0.95**	0.24
	[-0.10,1.10]	[-1.24,-0.37]	[0.42,1.02]	[-0.74,0.25]	[-0.83,0.99]	[-1.21,0.09]	[0.37,1.53]	[-0.55,1.04]
Age	-0.78**	0.09**	0.03	0.12**	-0.16+	-0.10+	-0.07	-0.17*
	[-0.85,-0.71]	[0.03,0.14]	[-0.01,0.06]	[0.06,0.18]	[-0.32,0.00]	[-0.21,0.02]	[-0.17,0.03]	[-0.31,-0.03]
Household food security	-0.02	-0.01	0	-0.01	0.02	-0.02	0	-0.02
	[-0.04,0.01]	[-0.03,0.01]	[-0.01,0.02]	[-0.03,0.01]	[-0.02,0.06]	[-0.04,0.01]	[-0.03,0.02]	[-0.05,0.02]
Constant	16.43**	0.34	0.65**	1.04**	7.90**	2.60**	2.47**	5.01**
	[15.51,17.34]	[-0.33,1.01]	[0.19,1.11]	[0.28,1.79]	[5.18,10.63]	[0.66,4.54]	[0.73,4.21]	[2.61,7.40]
N	685				207			

SM Table 4.4 Results from re-run 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, household food security, and Monday interview.

	7 to 13 year olds				14 to 19 year olds			
	Leisure	**Chores**	**Farm work**	**Productive work**	**Leisure**	**Chores**	**Farm work**	**Productive work**
Town	4.15**	1.00	-5.24**	-4.31**	2.83**	2.23**	-5.82**	-2.94**
	[1.79,6.50]	[-0.65,2.64]	[-7.08,-3.40]	[-6.63,-1.99]	[1.33,4.33]	[0.90,3.55]	[-7.18,-4.47]	[-4.45,-1.44]
Female	1.78*	2.73**	-4.31**	-1.85*	-0.75	4.32**	-3.25**	0.84
	[0.26,3.30]	[1.67,3.79]	[-5.49,-3.12]	[-3.35,-0.36]	[-1.87,0.36]	[3.34,5.30]	[-4.25,-2.25]	[-0.27,1.95]
Town # Female	-1.61	-2.21+	3.95**	1.94	-2.08*	-0.99	3.10**	2.17*
	[-5.15,1.93]	[-4.68,0.26]	[1.19,6.72]	[-1.55,5.42]	[-4.14,-0.03]	[-2.81,0.82]	[1.25,4.95]	[0.11,4.23]
Enrolled	-0.68	0.59	0.17	0.5	2.01**	0.27	-1.53*	-2.00**
	[-2.27,0.92]	[-0.53,1.70]	[-1.08,1.42]	[-1.07,2.07]	[0.61,3.40]	[-0.96,1.50]	[-2.78,-0.27]	[-3.40,-0.61]
Age	-0.55**	0.12	0.35*	0.51**	0.07	0.02	-0.08	-0.1
	[-0.90,-0.20]	[-0.13,0.37]	[0.07,0.62]	[0.16,0.86]	[-0.23,0.38]	[-0.24,0.29]	[-0.35,0.19]	[-0.40,0.20]
Household food security	-0.01	-0.04	0.07	0.00	-0.01	-0.03	0.03	0.00
	[-0.12,0.11]	[-0.12,0.04]	[-0.03,0.16]	[-0.11,0.12]	[-0.09,0.08]	[-0.11,0.04]	[-0.04,0.11]	[-0.08,0.09]
Monday interview	0.37	-0.23	-0.16	-0.59	-0.08	-0.27	0.38	-0.04
	[-1.39,2.12]	[-1.46,0.99]	[-1.54,1.21]	[-2.32,1.13]	[-1.32,1.16]	[-1.37,0.82]	[-0.74,1.50]	[-1.28,1.19]
Constant	16.25**	0.45	0.39	1.34	7.55**	1.46	7.13**	9.88**
	[11.54,20.95]	[-2.83,3.74]	[-3.29,4.07]	[-3.30,5.97]	[2.15,12.96]	[-3.31,6.23]	[2.27,12.00]	[4.48,15.29]
N	123				207			

β coefficients presented; 95% confidence intervals in brackets; + p<0.10, * p<0.05, ** p<0.01

SM Table 4.5 Results from re-run 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, household food security, and Monday interview.

	7 to 13 year olds				14 to 19 year olds			
	Leisure	**Chores**	**Farm work**	**Productive work**	**Leisure**	**Chores**	**Farm work**	**Productive work**
Town	-0.70**	0.72**	-0.93**	-0.05	-0.82*	0.28	-1.17**	-0.80*
	[-1.19,-0.21]	[0.37,1.08]	[-1.19,-0.67]	[-0.45,0.35]	[-1.51,-0.12]	[-0.22,0.77]	[-1.65,-0.69]	[-1.43,-0.18]
Female	-0.87**	1.35**	-0.73**	0.63**	-1.35**	1.73**	-1.05**	0.76*
	[-1.26,-0.47]	[1.07,1.63]	[-0.94,-0.52]	[0.31,0.95]	[-2.04,-0.66]	[1.23,2.22]	[-1.53,-0.57]	[0.14,1.39]
Town # Female	0.53	-0.77**	0.68**	-0.19	0.23	-0.5	0.97**	0.29
	[-0.15,1.21]	[-1.25,-0.28]	[0.32,1.04]	[-0.74,0.36]	[-0.78,1.24]	[-1.23,0.22]	[0.27,1.67]	[-0.63,1.21]
Age	-0.75**	0.09**	0.03	0.11**	-0.14	-0.09	-0.07	-0.16*
	[-0.83,-0.67]	[0.03,0.14]	[-0.01,0.07]	[0.05,0.18]	[-0.32,0.03]	[-0.21,0.04]	[-0.20,0.05]	[-0.32,-0.01]
Household food security	-0.03+	-0.02	0	-0.01	-0.02	-0.01	-0.01	-0.01
	[-0.05,0.00]	[-0.04,0.00]	[-0.01,0.02]	[-0.04,0.01]	[-0.06,0.03]	[-0.04,0.03]	[-0.04,0.02]	[-0.05,0.04]
Monday interview	-0.24	-0.06	0.03	-0.05	0.06	0.13	0.25	0.32
	[-0.63,0.16]	[-0.34,0.23]	[-0.18,0.24]	[-0.37,0.27]	[-0.57,0.69]	[-0.32,0.59]	[-0.19,0.68]	[-0.25,0.89]
Constant	16.38**	0.46	0.57*	1.16**	8.25**	2.21*	2.58*	4.71**
	[15.39,17.37]	[-0.25,1.17]	[0.04,1.09]	[0.36,1.96]	[5.26,11.24]	[0.07,4.35]	[0.51,4.65]	[2.01,7.42]
N	598				171			

β coefficients presented; 95% confidence intervals in brackets; + p<0.10, * p<0.05, ** p<0.01

SM Table 4.6 Results from original 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**	0.16	-1.24**	-0.69	5.65**	-0.20+	-1.26**	-2.45**
	[3.90,5.59]	[-0.06,0.38]	[-1.57,-0.91]	[-1.66,0.29]	[4.75,6.55]	[-0.40,0.01]	[-1.72,-0.80]	[-3.93,-0.97]
Female	0.11**	0.71**	-1.56**	-1.39*	0.34**	1.29**	-0.67**	-0.27
	[0.04,0.19]	[0.56,0.86]	[-1.93,-1.18]	[-2.45,-0.32]	[0.21,0.48]	[1.06,1.53]	[-1.00,-0.35]	[-1.18,0.63]
Town residence	0.13**	0.05	-3.22**	0.96+	0.37**	0.31**	-3.10**	0.53
	[0.05,0.20]	[-0.09,0.20]	[-4.32,-2.11]	[-0.17,2.10]	[0.24,0.50]	[0.11,0.52]	[-3.93,-2.26]	[-0.31,1.38]
Age	0.20**	0.15**	0.19**	0.24	0.09**	-0.01	0	0
	[0.18,0.22]	[0.11,0.19]	[0.11,0.28]	[-0.08,0.56]	[0.04,0.14]	[-0.08,0.05]	[-0.10,0.11]	[-0.29,0.28]
Household food security	0.01+	-0.01	0.03+	-0.08*	0	-0.01	0	-0.01
	[-0.00,0.01]	[-0.02,0.01]	[-0.00,0.06]	[-0.15,-0.01]	[-0.02,0.01]	[-0.03,0.00]	[-0.02,0.03]	[-0.10,0.07]
Constant	-6.90**	-3.33**	-3.11**	-5.27**	-6.48**	-1.29*	-0.49	-2.47
	[-7.77,-6.02]	[-3.85,-2.81]	[-4.23,-2.00]	[-8.31,-2.23]	[-7.66,-5.29]	[-2.38,-0.19]	[-2.23,1.25]	[-7.74,2.80]
N	823				438			

β coefficients presented; 95% confidence intervals in brackets

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

SM Table 4.7 Results from re-run 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. Models control for child age, household food security, and Monday interview.

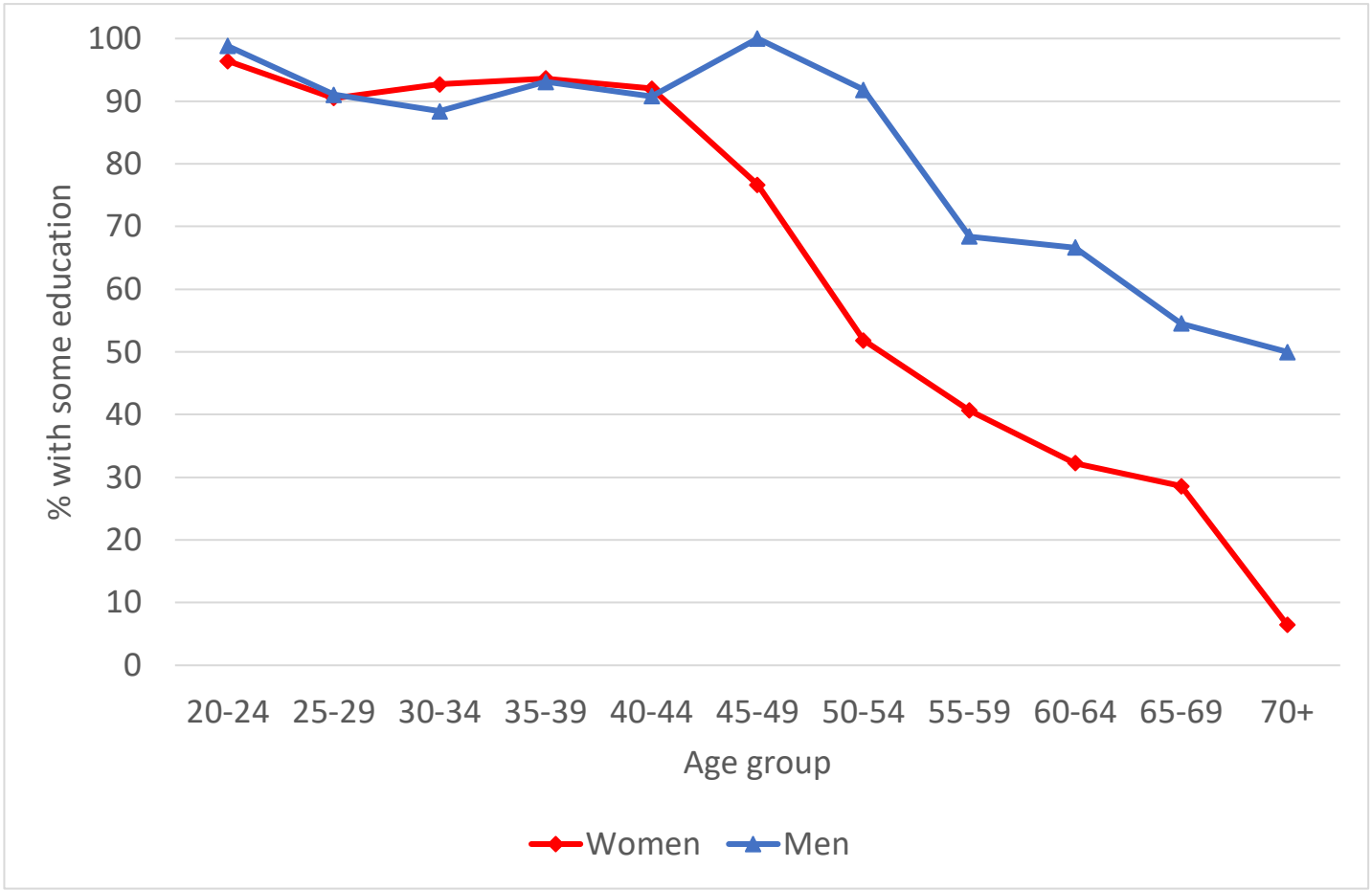
	7 to 13 year olds				14 to 19 year olds			
	Education	**Chores**	**Farm work**	**Market work**	**Education**	**Chores**	**Farm work**	**Market work**
School attendance	4.71**	0.11	-1.24**	-1.01*	5.97**	-0.18	-1.22**	-2.26**
	[3.78,5.65]	[-0.13,0.34]	[-1.57,-0.91]	[-1.94,-0.09]	[4.80,7.14]	[-0.40,0.05]	[-1.69,-0.75]	[-3.77,-0.75]
Female	0.11**	0.75**	-1.57**	-1.21+	0.31**	1.31**	-0.73**	0.01
	[0.04,0.19]	[0.59,0.91]	[-1.96,-1.18]	[-2.47,0.04]	[0.16,0.46]	[1.05,1.56]	[-1.06,-0.39]	[-0.98,1.00]
Town residence	0.07+	0.15+	-4.20**	0.89	0.29**	0.26*	-4.26**	0.52
	[-0.01,0.16]	[-0.01,0.31]	[-5.68,-2.71]	[-0.20,1.98]	[0.15,0.44]	[0.03,0.49]	[-5.56,-2.97]	[-0.43,1.48]
Age	0.19**	0.13**	0.18**	0.18	0.09**	0.01	0.01	-0.02
	[0.17,0.21]	[0.09,0.17]	[0.10,0.27]	[-0.18,0.54]	[0.04,0.15]	[-0.07,0.08]	[-0.09,0.11]	[-0.33,0.29]
Household food security	0.01*	-0.01	0.02	-0.11*	0.01	-0.01	0	0.01
	[0.00,0.02]	[-0.02,0.00]	[-0.00,0.05]	[-0.22,-0.01]	[-0.01,0.02]	[-0.03,0.01]	[-0.02,0.03]	[-0.09,0.10]
Monday interview	0.08+	0.01	0.01	-11.68**	-0.05	-0.01	0.18	-0.41
	[-0.01,0.17]	[-0.17,0.18]	[-0.39,0.40]	[-12.65,-10.72]	[-0.24,0.14]	[-0.26,0.25]	[-0.23,0.59]	[-1.58,0.77]
Constant	-6.87**	-3.11**	-2.98**	-3.79**	-7.03**	-1.74**	-0.62	-2.57
	[-7.83,-5.91]	[-3.67,-2.55]	[-4.10,-1.87]	[-6.52,-1.06]	[-8.37,-5.68]	[-2.92,-0.55]	[-2.41,1.17]	[-8.35,3.22]
N	721				378			

β coefficients presented; 95% confidence intervals in brackets

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

SM Figure 1 Example of a completed time allocation diagram. Rows are different activities and columns indicate the time of day, from 12 o'clock in the morning Swahili time (6am) to 4 o'clock at night (10pm). Row 2 (Kufata maji) shows this child went to fetch water at 6:30am and 6:00pm. If children had done activities outside of these hours, for example had woken at 5am, additional boxes were added by the field assistants.

SM Figure 2 Percentage of individuals with some education for adults aged 20 or over, grouped by age, from education levels given for each household member in household survey. 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.



5. SHARING THE LOAD: THE INFLUENCE OF CO-RESIDENT CHILDREN ON THE INTRA-HOUSEHOLD ALLOCATION OF WORK AND SCHOOLING IN NORTH-WESTERN TANZANIA

RESEARCH PAPER COVER SHEET

PLEASE NOTE THAT A COVER SHEET MUST BE COMPLETED <u>FOR EACH</u> RESEARCH PAPER INCLUDED IN A THESIS.

<u>SECTION A – Student Details</u>

Student	Sophie Hedges
Principal Supervisor	Rebecca Sear
Thesis Title	Children's work and parental investment in education in north-western Tanzania

<u>If the Research Paper has previously been published please complete Section B, if not please move to Section C</u>

<u>SECTION B – Paper already published</u>

Where was the work published?			
When was the work published?			
If the work was published prior to registration for your research degree, give a brief rationale for its inclusion			
Have you retained the copyright for the work?*		Was the work subject to academic peer review?	

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SECTION C – Prepared for publication, but not yet published

Where is the work intended to be published?	Demography
Please list the paper's authors in the intended authorship order:	Hedges, Lawson, Todd, Urassa, & Sear
Stage of publication	**Undergoing revision**

SECTION D – Multi-authored work

For multi-authored work, give full details of your role in the research included in the paper and in the preparation of the paper. (Attach a further sheet if necessary)	I was responsible for the research design, and conducted the statistical analysis. I was also primarily responsible for writing this work. My co-authors supported this work in an advisory capacity and helped to edit the writing.

Student Signature: [redacted] **Date:** 29/06/2018

Supervisor Signature: [redacted] **Date:** 29/06/2018

5.1. Abstract

Economic and evolutionary models of parental investment often predict education biases towards earlier-born children, resulting from either household resource dilution or parental preference. Previous research, however, reports mixed findings on the impact of children's birth order and age order (relative age, compared to co-resident children) on education. This may be because, in societies where children work, older children are more efficient at household tasks and may substitute for younger children, whose time can then be allocated to school. The role of this kind of labour substitution in determining children's schooling remains uncertain because few studies have simultaneously considered intrahousehold variation in children's education and work. Here, we investigate the influence of co-resident children on education, work and leisure in north-western Tanzania, using detailed time use data collected from multiple children per household (n=1,273). We find opposing effects of age order within the household by gender. Relatively young girls do less work, have more leisure time, and have greater odds of school enrolment than older girls. We suggest this results from labour substitution: older girls are more efficient workers, freeing younger girls' time for education and leisure. Conversely, relatively older boys have the highest odds of school enrolment among co-resident boys, possibly reflecting traditional norms regarding household work allocation and age hierarchies. Gender is also important in household work allocation: boys who co-reside with more girls do fewer household chores. We conclude that considering children as both producers and consumers is critical to understanding intra-household variation in children's schooling and work.

5.2. Introduction

Time allocation may differ substantially between children living within the same household, especially in modernising populations where children are now expected to

attend school alongside making valuable productive contributions to the household economy. This variation may have important implications for their well-being and long-term economic and reproductive success (Bock, 2002a). Demographers, economists and anthropologists have long been interested in the reasons underlying intra-household differences, focusing particularly on variation by gender and birth order. Previous research has found mixed results about the influence of co-resident children on children's time spent in school and work (reviewed below), perhaps because the majority of studies tend to focus on either education or work, rather than considering the two simultaneously. Treating education and work separately leads to contradictory predictions about the allocation of education and work between children within households. Education is most frequently framed as a measure of parental investment, as it is costly both directly, and through the opportunity costs of children's lost work contributions. Both economic and evolutionary models of parental investment often predict that earlier-born children will be favoured, either as an inadvertent consequence of household resource dilution (unlike early-born children, later-born children always have to share household resources with siblings), or parental preference (Edmonds, 2006; Hertwig, Davis, & Sulloway, 2002; Jeon, 2008). However, opposing predictions arise from models of children's work, where parents are anticipated to optimise household production. For example, in economic models of 'child labour' (i.e. work for income), older children within the family command higher wages, and are predicted to be preferentially allocated work, and hence less likely to receive education (Basu & Van, 1998; Edmonds, 2006). Similarly, in studies focusing more on children's contributions to household work, earlier-born children are more productive and so, in common with economic models, have been predicted to work more, and be less likely to attend school (Lee & Kramer, 2002).

Here, influenced by embodied capital theory (Kaplan et al., 2015), we take a holistic approach to children's time allocation and simultaneously investigate how gender and the presence of co-resident children influence children's time spent in education, work and leisure in north-western Tanzania. Embodied capital theory, which combines elements of evolutionary and economic theory, predicts that parents will strategically allocate time and resources in order to balance both short-term needs and long-term investment. While embodied capital models are based on the assumption that individuals are maximising fitness, in practice other outcomes, such as education or income, are typically used as proxies of fitness, aligning these models with many economic models (Kaplan et al., 2015). Investment may be biased towards those who will produce the greatest returns in the long-term, while those who are currently most productive, or for whom other uses of time are least valuable, are expected to be preferentially allocated work over other co-resident individuals (Gurven & Kaplan, 2006).

We first outline the theoretical basis for birth order differences in both economic and evolutionary anthropological studies of the family, and review the evidence from empirical studies. We then outline predictions regarding educational investment and children's work, which we test using detailed time use data collected in north-western Tanzania. We particularly focus on testing for labour substitution effects in children's time allocation, given the important contributions children make to the household economy in this setting. We further extend work in this area by investigating the influence of all co-resident children, not just siblings, because in this Tanzanian context (as in many others), a high proportion of children are co-resident with children other than siblings. Our study has implications for understanding gender and birth order biases in modernising contexts.

5.2.1. Parental investment biases

Economic models of the family have primarily focused on the role of siblings as competitors for finite parental resources, predicting a trade-off between the number of dependents and investment in each one, i.e. a quantity-quality trade-off (Becker, 1960). In studies of educational outcomes, this perspective is also referred to as resource dilution theory (Downey, 2001). All else being equal, children in larger families are predicted to be disadvantaged, with later-born children being particularly disadvantaged as, unlike earlier-born offspring, they experience sibling competition for finite parental resources without a period of exclusive parental investment (Hertwig et al., 2002; Parish & Willis, 1993). Evolutionary anthropologists have also modelled the trade-off between quantity and quality of offspring, and have similarly concluded that earlier-born children tend to be advantaged (Lawson & Borgerhoff Mulder, 2016). Furthermore, an evolutionary perspective predicts that parents will bias investment towards the children who will give the greatest return to investment, in terms of number of descendants, in the long-term (Trivers, 1972). Within a sibship, earlier-born children are closer to maturity, and have lower mortality risk than their later-born siblings, and therefore have greater 'reproductive value' (expected number of future children), so that parents can be more certain of the payoff to their investment (Jeon, 2008; Sear, 2011). Furthermore, biased investment in earlier-born children is anticipated in growing populations, where fitness is maximised by minimising generation time (Jones & Bliege Bird, 2014).

In support of predicted parental favouritism of early-born offspring, across human societies cultural preferences for earlier-born children are common (Rosenblatt & Skoogberg, 1974). Many empirical studies have also found that parental investment is greater in earlier-born children. In high-fertility subsistence populations, later-born males often receive lower wealth transfers at marriage and inheritance, and have lower reproductive success than earlier-born children (e.g. Borgerhoff Mulder, 1998a; Gibson

& Gurmu, 2011; Hrdy & Judge, 1993; Mace, 1996). In transitioning contexts in Ethiopia, Malawi, and Tanzania, later-born children were found to receive less educational investment, a bias most evident in wealthier households (Gibson & Lawson, 2011; Gibson & Sear, 2010; Hedges, Borgerhoff Mulder, James, & Lawson, 2016). Multiple studies in industrialised societies have also reported that later-born children receive less time investment from their parents and achieve relatively lower educational attainment (Lawson & Mace, 2009; Lawson et al., 2013; Price, 2008; Steelman, Powell, Werum, & Carter, 2002).

5.2.2. Labour substitution effects

The literature on parental investment biases has tended to neglect the fact that in subsistence contexts, children are producers as well as consumers, and their work may be very important in the household economy (Kramer, 2002). This observation leads to different predictions about the impact of birth order on schooling. Children's time allocation changes with age; very young children devote time largely to leisure, as they begin to develop skills by learning through play. Their ability to carry out productive work increases with age as they gain strength and skill, increasingly specialising in gender-specific tasks (Bock, 2002a; Gurven & Kaplan, 2006). In households with multiple children, earlier-born, i.e. relatively older, children, are expected to be more productive, and should therefore be preferentially allocated work. If earlier-born children are more likely to be allocated work, this should free later-born children's time to attend school in settings where formal education is available and desirable. Labour substitution therefore predicts, in opposition to parental investment biases, that later-born children will be more likely to be enrolled in school (Edmonds, 2006).

A number of studies have found patterns of work and education that support labour substitution effects. Studies in high-fertility populations have found that older children

make substantial contributions to the household economy, and that this work subsidises the costs of their younger siblings (Bereczkei & Dunbar, 2002; Kramer, 2002; Lee & Kramer, 2002; Turke, 1988). In more industrialised settings in the US and Fiji, earlier-born children were also found to work more (Cogle & Tasker, 1982; Mattison & Neill, 2013; White & Brinkerhoff, 1981). Labour substitution effects on schooling are suggested by several studies in Brazil, Nicaragua, Guatemala, Nepal, and Ethiopia, where earlier-born children were found to work more and be less likely to be enrolled in school (Dammert, 2010; Emerson & Souza, 2008; Fafchamps & Wahba, 2006; Haile & Haile, 2012). Many other studies have found that earlier-born children had less positive schooling outcomes, attributing this to potential labour substitution effects (Huisman & Smits, 2015; Kumar, 2016; Lindskog, 2013; Lloyd & Gage-Brandon, 1994; Parish & Willis, 1993; Rammohan & Dancer, 2008; Ryan, Koczberski, Curry, & Germis, 2017). Other studies in South Africa and Malawi have found that earlier-born children progress through school faster, possibly because parents prefer older children to complete their education faster in order to substitute for younger children's work (Liddell et al., 2003; Moyi, 2010). Similarly, in Kenya, earlier-born children attained more education, but this effect was lessened in larger families, possibly because older siblings who complete their education are able to work and thus subsidise younger siblings' education (Gomes, 1984).

Labour substitution effects are therefore not mutually exclusive from investment biases, and may differ by gender if boys and girls have different patterns of work. In many modernising contexts, the work that children do is predominantly household chores and childcare. These are often female responsibilities, and girls generally do more work than boys, meaning labour substitution effects may be seen more strongly for girls than for boys (Edmonds, 2006). Several studies have found evidence of earlier-born disadvantage in schooling or workload for girls but not boys (Dammert, 2010; Edmonds, 2006; Glick &

Sahn, 2000; Heissler & Porter, 2010; Kevane & Levine, 2003; Parish & Willis, 1993; Rosati & Rossi, 2003). Additionally, some studies have suggested that having sisters is particularly beneficial for schooling (Canagarajah & Coulombe, 1993; Morduch, 2000).

5.3. Setting and predictions

The question of how the presence of substitute workers affects children's work and education thus remains complicated. Addressing several limitations of existing research, we take a holistic approach to this research question, investigating how co-resident children affect the intra-household allocation of both work and education in a modernising context in Tanzania, using detailed data on children's time spent in household chores, farm work, market work, and leisure. Most previous studies have looked primarily at patterns of educational investment within households; very few have examined work patterns, making it difficult to assess the extent to which differences by birth order represent labour substitution or effects such as parental investment biases. Where work is investigated, many previous studies have looked only at paid or farm work rather than household chores (e.g. Emerson & Souza, 2008; Patrinos & Psacharopoulos, 1995), often using a binary outcome indicating whether a child works or not, which may obscure the nuances of intra-household time allocation. Studies are also often limited to how biological siblings influence each other (e.g. Huisman & Smits, 2015), but in contexts with child fostering and alternative living arrangements, this may miss many of the substitute workers available to children; we therefore include all children of school age within a household. The next section will describe the study setting before going on to outline the specific predictions to be investigated by this study.

In Tanzania, government primary schools do not charge school fees, but families must pay costs such as uniforms, stationery and exam entry fees. Children generally start

school at age seven, though delayed entry and grade repetition are common. There are seven years of primary education, four years of basic secondary education, and two years of advanced secondary education. Primary school is taught in Swahili, which may present a barrier for children who speak their local language at home; in this study, many households speak Sukuma, particularly in the rural village. Further language barriers are encountered at secondary level, where all classes and exams are done in English, with a negative impact on students' learning and academic achievement (Brock-Utne, 2007).

The quality of schooling provided is a cause for concern in Tanzania, with pass rates for secondary school exams being as low as 40%, and many children leaving primary school unable to read or write (Hivos/Twaweza, 2014; Pritchett, 2013). In our interviews with local teachers, the lack of school infrastructure and equipment was frequently cited as a challenge, with teachers struggling to maintain discipline in classes of up to 100 pupils. During focus groups, adolescents and parents cited the long distances to school and harsh punishments, including beatings, as challenges to school attendance. In this area, youth unemployment is common, and some parents complained that having sent their children to school, they were no longer willing to help with farming activities, and often sat idle at home.

In this area of north-western Tanzania, fostering is common even for children who have both parents alive, with many children residing with grandparents or other relatives, to provide better access to school, provide help with household work, or just because of family preferences (see also Lawson et al., 2017). In our sample only 65% of children are the biological child of the household head, meaning there is a large proportion of children who are living in alternative arrangements. Even among children who are the biological child of the household head there are many who are living with school-age

step-siblings, half-siblings, cousins, or nieces and nephews. We therefore do not focus on number of siblings or birth order, but instead look at age rank within the household, defining children resident in the same household as potential 'substitute labourers' according to their relative age and gender. We derive predictions on the basis of anticipated labour substitution effects, hypothesising that the availability of substitute workers within a household reduces the amount of time a child spends working, and increases the likelihood of a child being enrolled in school.

Children who are relatively older within the household are likely to be more efficient than younger children at various productive tasks. We therefore expect that households will favour allocating older children's time to production, freeing younger children's time for school, and predict that all else being equal *(1) increasing age order (i.e. living with older children) will be associated with increased probability of enrolment in school; decreased time spent in work; and increased leisure time.* Furthermore, those who are not enrolled in school are expected to substitute for the labour of children who are enrolled. Thus we predict that *(2) those not enrolled in school will work more when co-resident children are enrolled in school, while schoolchildren will work less when co-resident children are not enrolled.* Finally, in Sukuma society, work is gendered, with domestic work and childcare predominantly carried out by girls and women, and farm work and cattle herding being male activities (Hedges, Sear, Todd, Urassa, & Lawson, in press; Varkevisser, 1973). For both enrolled and unenrolled children, it is therefore predicted that *(3) the number of opposite-gender children will reduce time spent in gender-inappropriate work, i.e. the number of girls will reduce the time boys spend in household chores, while in households that farm or keep cattle, the number of boys will reduce the time girls spend in farm work*.

5.4. Data and Methods

5.4.1. Data collection

The data collection for this study took place at the Kisesa Health and Demographic Surveillance Site (HDSS) in Mwanza region, north-western Tanzania. The HDSS was set up in 1994 to collect demographic data in an area comprising six villages, chosen to be representative of rural Tanzania (Kishamawe et al., 2015). For this study, data were collected in two of the six villages, representing the most and least rural villages in the HDSS. The Sukuma are the main ethnic group in the area. Traditionally households were reliant on farming and cattle herding, living in dispersed homesteads, but livelihoods have now diversified, with many families engaged in petty trading and small businesses. The least rural village is now better described as a town, situated on the main road between Mwanza city and Kenya, with public transport links to the city and a central market. In the most rural village, the majority of households continue to farm and many own cattle (Hedges et al., in press).

The HDSS provided a sampling frame of all households with members aged between 7 and 19 (the ages of formal schooling in Tanzania), from which 550 households were randomly sampled. Households are self-defined in the HDSS as "a group of people living together in the same compound, who regularly eat together from the same pot" (Kishamawe et al., 2015). Household surveys were carried out using Google Nexus 7 tablets with Open Data Kit (ODK) Collect software (Brunette et al., 2013). The survey recorded information about household members' age and gender, adult members' education and occupation, and the household head's marital status, ethnicity, and religion. Then a series of questions was asked about the household's assets, land ownership and uses, livestock ownership, and business involvement. Based on observations made during fieldwork, assets were defined as 'basic' (chair, bed, mosquito

net), ‘intermediate’ (bicycle, radio, sofa, cupboard, clock, or sewing machine), or ‘high-value’ (TV, fridge, or motorbike). This was followed by a set of nine questions pertaining to food security, based on the Food and Agricultural Organization (FAO)’s Household Food Insecurity and Access Scale (Coates et al., 2007). This index asks questions about a household’s food security during the past month, including experiencing anxiety about food supply, limiting food quality and reducing food quantity, and the frequency with which these were experienced. For each child in the household aged 7 to 19, an additional survey was answered by their parent or guardian, collecting information on their parents’ marital status, education, and occupation, their siblings (though not whether siblings are co-resident), education, and work history.

Figure 5.1 Time allocation diagram

After the household and child surveys, eligible children were followed up where possible. 1,278 children were followed up out of a total of 1,387 eligible children (92.1%). The majority of those not followed up were away at boarding school (3.8% of

total sample) or travelling (2.6%). A further five children were dropped from the analysis, three who were listed as the spouse of the household head, and two who were employees of the household. During the time allocation interview, children were asked to remember everything they did on the previous weekday (or the previous Friday if the interview was done on a Monday), from when they woke up until they went to sleep. Time use was recorded through a diagram, with rows corresponding to different activities, and columns corresponding to half-hour time periods. The time and duration of different activities were indicated by shading the corresponding cells (see Figure 5.1). Data from the diagrams were coded into broader categories, including household chores, farm work, market work, and leisure time (see below).

5.4.2. Outcome variables

Whether a child was enrolled in school at the time of the study is used as a binary outcome, *enrolled,* where 1 indicates the child was enrolled. Time use was recorded in half-hour blocks, from 5am to 12am, giving a maximum of 38 blocks (equivalent to 19 hours) for any given activity. For each activity category, the outcome is therefore the total count of half-hour blocks spent in that activity. The activity categories used are as follows. *Household chores* include cleaning, cooking, collecting water or fuel, childcare, running errands, and food processing. *Farm work* includes *cattle herding* (also treated as a separate category in some analyses), working in the fields, feeding animals, and milking. *Market work* includes any work done outside the household, for example petty trading, shop keeping, and making things to sell (e.g. baskets, doughnuts, ice lollies). *Overall work* is the total sum of household chores, farm work, and market work. Finally, *leisure time* includes playing, watching TV, resting, walking, and visiting friends or family.

5.4.3. Explanatory variables

Ordering children residing in the same household by age and gender enabled us to sum the number of older and younger children for each child, and the number of older and younger boys and girls. Within households, the numbers of boys and girls enrolled in school were summed to give the total number of schoolboys and girls, and this number was subtracted from the total number of children in the household to give the number of out-of-school children. Similarly, the numbers of boys and girls within households were summed to give the total number of male and female children. We generated an 'age order' variable by numbering children so that the eldest child in the household has age order 1, the second child age order 2, and so on. We also generated an 'age order by gender' variable by ordering girls and boys separately by age and numbering them.

5.4.4. Data analysis

We have data on multiple children per household, and so explored using multi-level regression models to account for unobserved household effects. However, likelihood-ratio tests comparing multi-level models with ordinary least squares regression models indicated no significant difference. For enrolment analyses, we therefore use logistic regression models. Distributions of time use data usually contain many zeros. An individual child may not engage in certain activities, for example a child who is not enrolled in school does not spend time in education, while a child whose household does not keep cattle does not spend time cattle herding, leading to structural zeros. Additionally, sampling zeros arise because a child may not do the activity during the sampling period. These zeros violate the assumption of normality, making common approaches such as linear regression or tobit models inappropriate. Additionally, time use data are often right-skewed and over-dispersed. The Poisson-gamma distribution, or negative binomial regression, is more flexible and can model both exact zeros and a continuous component, so this is the approach we use here (Brown & Dunn, 2011).

All analyses are stratified by gender due to the different time allocation patterns for girls and boys in this area; we don't directly test for differences in outcomes between boys and girls because we have explored this in detail elsewhere (Hedges et al., in press). We also include covariates that we believe to be associated with the explanatory variables and outcomes of interest, including child's age and a dummy variable indicating town or village residence. Household resource availability is likely to be associated with household composition, and to affect educational investment and time allocation. In this context, food security was felt to be the best measure of household resources, as it provides a contemporary measure of resource availability, and is meaningful across the different livelihoods in this area. We also use a categorical asset variable, indicating whether households own basic, intermediate, or higher value assets. Time allocation analyses include a binary variable indicating whether the time allocation interview was done on a Monday or another day, to account for the longer recall period for children interviewed on a Monday, who were asked about the previous Friday rather than 'yesterday' as for other days.

In this area, fostering is relatively common, with many children living with close kin (mainly grandparents) and a few living with more distant relatives. As older children are more likely to be fostered, we include a control for child residence (with parents, close kin, or distant kin) in age order analyses, and also repeat age order analyses for non-fostered children only, in order to investigate whether age order effects are separate from fostering effects; otherwise, we explore fostering patterns further in a separate paper and so do not discuss these extensively here.

The effects of age order and the number of children are difficult to untangle, because, for example, a child can only be fifth in the age order of a household that has at least five children. Further, while age order captures the number of older children, it doesn't

capture the number of younger children; a fifth child has four older co-resident children, but the variable gives no information on the number of younger co-resident children. We therefore use the number of older children as a predictor together with the number of younger children, to compare the effects of having older substitutes with the effects of having younger children for whom to substitute. We also investigated the overall age order variable, adjusting for the number of children in the household in order to compare the effects of being later-born independently of the total number of children, acknowledging that there is some multicollinearity between these variables. We finally conducted additional analyses to explore age order effects in more detail by using a categorical age order variable to compare oldest, middle, and youngest children. All analyses are carried out in Stata version 15.

5.5. Results

5.5.1. Household and child characteristics

Household size ranges from 2 to 19 in our sample, with a mean of 7.6 members, and a mean of 3.1 children aged 7 to 19 (Table 5.1). Nearly three-quarters of households farm (i.e. grow crops or keep animals), while around a quarter of households keep cattle. 19% of households have only basic assets, 59% have intermediate assets such as a bicycle or a radio, and 21% have higher value assets such as a TV or fridge. Around half of households are classed as food insecure.

81% of children are currently enrolled in school, with enrolment being slightly higher for girls than for boys (Table 5.2; see also Hedges et al. in press). Very few children in our sample have no siblings. Around a third only have full siblings, while just over half have both full siblings and half siblings, and around 12% only have half siblings. However, as the household roster is completed with household members' relationship to the household head, we do not have direct information on the relationships of household

members to each other, and cannot therefore be sure which children have siblings or half-siblings resident. 26% of children live apart from their parents in a foster household; most of these children live with close kin (grandparents, aunts or uncles), while some live with more distant kin. Girls are slightly more likely than boys to live with distant kin.

Table 5.1 Household characteristics

Household composition	**Mean (SD)**	**Range**
Household size	7.6 (3.1)	2 – 19
Children aged 7-19	3.1 (1.7)	1 – 10
Household characteristics (% households)		
Residence		
Village	52.3%	
Town	47.7%	
Household farms		
No	26.6%	
Yes	73.4%	
Household keeps cattle		
No	73.9%	
Yes	26.1%	
Household assets		
Higher value	21.4%	
Intermediate	59.2%	
Basic	19.4%	
Household is food insecure		
No	50.3%	
Yes	49.7%	
N	441	

Seven per cent of children have no co-resident children aged 7-19; girls are slightly more likely than boys to be an only child (chi-squared = 3.7, p=0.06). We exclude these children from our main analyses as they do not have substitute labourers available. Those who are only children do not differ in their enrolment, but only-child girls do spend more time in household chores than girls with co-resident children (Supplementary Material (SM Table 5.1).

Table 5.2 Child characteristics by gender

	Male	Female	Total
N	632	641	1,273
Currently enrolled in education			
No	20.6%	17.5%	19.0%
Yes	79.4%	82.5%	81.0%
Age order within household			
Only child	5.5%	8.3%	6.9%
Oldest	26.3%	22.8%	24.5%
Middle child	41.5%	40.9%	41.2%
Youngest	26.7%	28.1%	27.4%
Child lives with			
Parent(s)	76.1%	72.4%	74.2%
Close kin	18.1%	18.9%	18.5%
Distant kin	5.9%	8.7%	7.3%
Types of siblings			
No siblings	3.2%	3.0%	3.1%
Only half-siblings	10.0%	13.1%	11.5%
Only full siblings	35.8%	32.0%	33.9%
Full siblings and maternal half-siblings	15.3%	14.8%	15.1%
Full siblings and paternal half-siblings	26.1%	25.6%	25.8%
Full siblings and both maternal and paternal half-siblings	9.7%	11.5%	10.6%

5.5.2. Prediction 1: Increasing age order (living with older children) will be associated with increased enrolment, decreased work, and increased leisure time

We find different effects of the number of older children for boys and girls (Table 5.3; Figure 5.2). For boys, in contrast to our prediction, an increasing number of older children (both boys and girls) is associated with a lower probability of enrolment, though this association is not statistically significant. The number of younger children in the household however is associated with a greater probability of enrolment. For girls the association is consistent with our prediction; the number of older children in the household increases the probability of enrolment. The same associations are seen when looking at number of older or younger children of the same gender. The effects of the

age order variables echo these findings; increasing age order is associated with lower probability of enrolment for boys, and higher probability of enrolment for girls (results shown in SM Table 5.2). For both boys and girls, living in town (versus village), and having more household assets increase the probability of being enrolled; while these associations are not always significant, the odds ratios indicate a greater effect for boys than for girls. There is some suggestion that being fostered by distant kin is negative for enrolment.

We further predicted that living with older children would be associated with doing less work and having more leisure time. Table 5.4 presents the incidence rate ratios (IRR) from negative binomial regression models of overall work and leisure time (for boys), and chores and leisure time (for girls). The IRR indicates the effect of the independent variable on the expected number of events. For example, in the first column, a boy enrolled in school experiences 0.3 times the events (half-hours of work) an out-of-school boy experiences. For both boys and girls, there is little association between the overall number of older and younger children and time spent in work or leisure time. However, as work is primarily shared between children of the same gender, it may be more relevant to examine the effect of older and younger children of the same gender. Again, for boys there is little association between number of older and younger boys and work or leisure time, though there is a non-significant trend of more work and less leisure as the number of younger boys increases. For girls, the number of older children is associated with marginally more leisure time (Table 5.4), while the number of older girls is associated with less time spent doing chores and more time spent in leisure (Figure 5.2). Living with distant kin is also associated with more leisure time for girls (Table 5.4). Models using age order and age order by gender give similar results; there are no associations between age order and work or leisure time for boys or girls, but increasing age order among household girls is associated with more chores and less leisure time for

girls, with oldest girls doing more chores and having least leisure time overall (SM Table 5.3). Additionally, girls who live only with boys appear to do slightly more work and have slightly less leisure time, while boys who reside only with girls appear to do slightly less productive work (SM Figure 3).

Table 5.3 Associations between (1) number of younger and older children, and (2) number of younger and older children of the same gender, and school enrolment

	Boys	**Boys**	**Girls**	**Girls**
	(1)	**(2)**	**(1)**	**(2)**
Number of younger children	1.38**		1.08	
	[1.11,1.72]		[0.87,1.33]	
Number of older children	0.9		1.58*	
	[0.70,1.16]		[1.08,2.31]	
Number of younger boys / girls		1.45**		0.91
		[1.12,1.88]		[0.69,1.22]
Number of older boys / girls		0.84		1.62+
		[0.61,1.16]		[0.95,2.75]
Child lives with (reference = parent(s))				
Close kin	0.82	0.75	2.06	2.06
	[0.41,1.63]	[0.38,1.48]	[0.81,5.24]	[0.82,5.17]
Distant kin	0.5	0.53	0.44+	0.46+
	[0.18,1.38]	[0.19,1.51]	[0.18,1.08]	[0.19,1.12]
Household food security	1.04+	1.04+	1.04	1.04
	[0.99,1.09]	[0.99,1.09]	[0.99,1.10]	[0.99,1.10]
Household assets (reference = basic)				
Higher value	2.87*	3.11*	1.52	1.8
	[1.01,8.17]	[1.10,8.82]	[0.48,4.84]	[0.57,5.67]
Intermediate value	1.81+	1.94+	1.62	1.83
	[0.91,3.58]	[0.99,3.82]	[0.69,3.81]	[0.78,4.28]
Town (reference = village)	5.40***	5.04***	2.53*	2.39*
	[2.73,10.67]	[2.60,9.75]	[1.23,5.19]	[1.17,4.87]
Age (years)	0.56***	0.58***	0.53***	0.53***
	[0.49,0.64]	[0.52,0.65]	[0.45,0.62]	[0.45,0.61]

N	590	590	578	578

Data shown are odds ratios (exponentiated coefficients); 95% confidence intervals in brackets
† p<0.10, * p<0.05, ** p<0.01, *** p<0.001

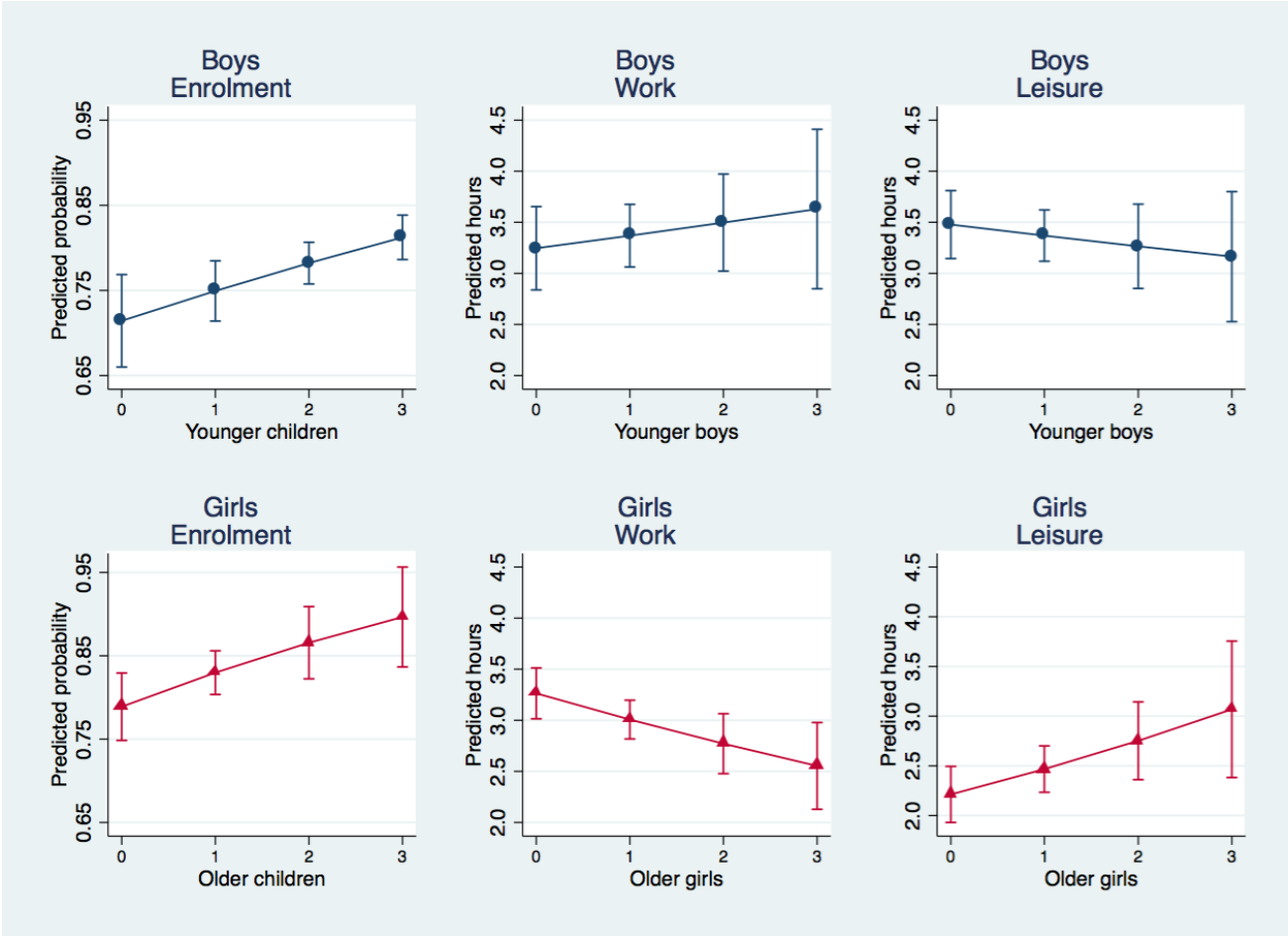
Table 5.4 Associations between (1) number of younger and older children, and (2) number of younger and older children of the same gender, and time spent in work and leisure for boys and girls

	Boys		**Girls**		**Boys**		**Girls**	
	Total work	**Leisure**	**Chores**	**Leisure**	**Total work**	**Leisure**	**Chores**	**Leisure**
	(1)				**(2)**			
Number of younger children	1.04 [0.97,1.12]	1.02 [0.96,1.09]	0.99 [0.94,1.04]	0.98 [0.91,1.06]				
Number of older children	0.98 [0.92,1.05]	1.01 [0.96,1.07]	0.99 [0.94,1.03]	1.07+ [1.00,1.14]				
Number of younger boys / girls					1.04 [0.94,1.14]	0.97 [0.89,1.05]	1.02 [0.95,1.09]	0.98 [0.87,1.09]
Number of older boys / girls					0.99 [0.90,1.09]	1 [0.93,1.08]	0.92* [0.86,0.99]	1.12* [1.01,1.23]
Child lives with (reference = parent(s))								
Close kin	1.02 [0.81,1.27]	0.94 [0.78,1.14]	1 [0.86,1.18]	1.04 [0.83,1.31]	1.01 [0.81,1.27]	0.96 [0.79,1.17]	1 [0.86,1.18]	1.05 [0.83,1.31]
Distant kin	1.14 [0.81,1.61]	1.19 [0.89,1.60]	1.07 [0.87,1.33]	1.51* [1.10,2.08]	1.14 [0.81,1.60]	1.2 [0.90,1.61]	1.08 [0.87,1.33]	1.50* [1.09,2.06]
Enrolled (reference = no)	0.34*** [0.27,0.43]	0.45*** [0.37,0.56]	0.58*** [0.49,0.70]	0.24*** [0.18,0.33]	0.34*** [0.27,0.43]	0.46*** [0.38,0.57]	0.58*** [0.49,0.69]	0.24*** [0.18,0.32]
Household food security	1.01 [0.99,1.02]	0.99 [0.98,1.00]	1 [0.99,1.01]	1.02+ [1.00,1.03]	1 [0.99,1.02]	0.99 [0.98,1.00]	1 [0.99,1.01]	1.02* [1.00,1.03]

Household assets (reference = basic)								
Higher value	0.91	1.11	0.81+	1.08	0.91	1.14	0.82	1.09
	[0.65,1.26]	[0.84,1.47]	[0.64,1.03]	[0.76,1.53]	[0.66,1.27]	[0.86,1.50]	[0.65,1.04]	[0.77,1.55]
Intermediate value	0.95	1.09	0.94	0.92	0.95	1.12	0.94	0.94
	[0.75,1.20]	[0.89,1.34]	[0.80,1.12]	[0.72,1.19]	[0.75,1.20]	[0.91,1.37]	[0.79,1.11]	[0.73,1.21]
Town (reference = village)	0.71**	1.07	0.98	0.98	0.71***	1.05	0.99	0.97
	[0.58,0.87]	[0.90,1.26]	[0.85,1.13]	[0.80,1.20]	[0.57,0.87]	[0.88,1.24]	[0.86,1.13]	[0.79,1.20]
Monday interview (reference = other day)	0.92	1	1.01	0.94	0.91	1	1.02	0.93
	[0.73,1.15]	[0.82,1.21]	[0.87,1.18]	[0.75,1.18]	[0.72,1.14]	[0.82,1.21]	[0.88,1.19]	[0.74,1.17]
Age (years)	0.98	0.94***	1.05**	0.88***	0.99	0.95***	1.03*	0.87***
	[0.95,1.03]	[0.90,0.97]	[1.02,1.08]	[0.84,0.92]	[0.96,1.03]	[0.92,0.97]	[1.01,1.06]	[0.84,0.91]
N	590	590	578	578	590	590	578	578

Data shown are incident rate ratios; 95% confidence intervals in brackets † p<0.10, * p<0.05, ** p<0.01, *** p<0.001

Figure 5.2 Association between younger children and boys' enrolment, work time and leisure time, and older children and girls' enrolment, chore time and leisure time



There is some evidence for labour substitution between girls within the same household, with both older girls, and those living only with boys working more. This appears to improve school enrolment for girls living with more older girls. For boys however, the association between number of older children and enrolment is the opposite to that predicted, and there is little evidence of labour substitution of older boys for younger ones. This may be because among the Sukuma, cattle herding has traditionally been allocated to younger boys. We therefore tested for an interaction between cattle ownership and number of younger boys, to see whether the positive effect of younger boys on enrolment is confined to households that own cattle, but the interaction was not significant (Table 5.5). We then looked at time spent herding in households that own cattle, to see if there is evidence of younger boys substituting for older boys' herding work. Having more younger boys in the household was associated with less time spent herding. This suggests that younger boys may substitute for older boys' herding.

Table 5.5 Association between number of younger boys and school enrolment for boys in all households, and number of younger boys and herding time for boys in cattle-owning households

	Enrolment (odds ratios)	**Time spent herding (incident rate ratios)**
Number of younger boys	1.37+	0.75*
	[0.98,1.91]	[0.57,0.99]
Cattle-owning household (reference = no cattle)	0.7	
	[0.33,1.49]	
Cattle-owning household # number of younger boys interaction	1.12	
	[0.72,1.76]	
Number of older boys	0.86	0.92
	[0.62,1.18]	[0.57,1.49]
Child lives with (reference = parent(s))		
Close kin	0.75	0.98
	[0.38,1.50]	[0.33,2.90]
Distant kin	0.54	0.71
	[0.19,1.52]	[0.11,4.56]
Household food security	1.04+	1.08+
	[0.99,1.09]	[1.00,1.17]
Household assets (reference = basic)		
Higher value	3.38*	0.06**
	[1.16,9.85]	[0.01,0.50]
Intermediate value	2.03*	0.68
	[1.01,4.06]	[0.19,2.49]
Town (reference = village)	4.40***	0.28
	[2.11,9.15]	[0.04,2.13]
Age (years)	0.58***	0.82*
	[0.52,0.65]	[0.71,0.96]
Enrolled (reference = no)		0.27*
		[0.09,0.79]
Monday interview (reference = other day)		0.96
		[0.37,2.52]
N	590	220

95% confidence intervals in brackets

† p<0.10, * p<0.05, ** p<0.01, *** p<0.001

5.5.3. Prediction 2: Substitution between schoolchildren and out-of-school children

Our second prediction was that out-of-school children would work more in households with more schoolchildren, while schoolchildren would work less in households with more out-of-school children. For out-of-school girls, living with more schoolboys marginally decreases time spent doing chores (Table 5.6). This is the opposite of what we expected. Out-of-school girls may take on schoolboys' other tasks, such as farming or market work, with schoolboys taking on girls' chores, which are more easily combined with school. However, we do not find other evidence of this, for example schoolboys do not affect out-of-school girls' time spent in farm work (results not shown). In line with our prediction, we do see that out-of-school girls do more chores when there are more schoolgirls, suggesting they may be preferentially allocated household chores. We find no evidence that the number of out-of-school children is associated with reduced work for schoolchildren (SM Table 5.6).

Table 5.6 Association between (1) number of schoolboys and time spent in work, and (2) number of schoolgirls and time spent in work, for out-of-school boys and out-of-school girls

	Out-of-school boys		**Out-of-school girls**	
	(1)	**(2)**	**(1)**	**(2)**
Number of schoolboys	1.04		0.87+	
	[0.93,1.17]		[0.75,1.01]	
Number of schoolgirls		0.97		1.23**
		[0.85,1.11]		[1.06,1.43]
Number of school-age children	1.01	1.03	0.98	0.86**
	[0.91,1.11]	[0.95,1.12]	[0.89,1.08]	[0.78,0.95]
Household food security	1	1	1	1
	[0.98,1.02]	[0.98,1.02]	[0.98,1.02]	[0.97,1.02]
Household assets (reference = basic)				
Higher value	1.52	1.54	0.9	0.88
	[0.88,2.62]	[0.88,2.69]	[0.58,1.40]	[0.57,1.35]
Intermediate value	1.07	1.08	1.07	1.02

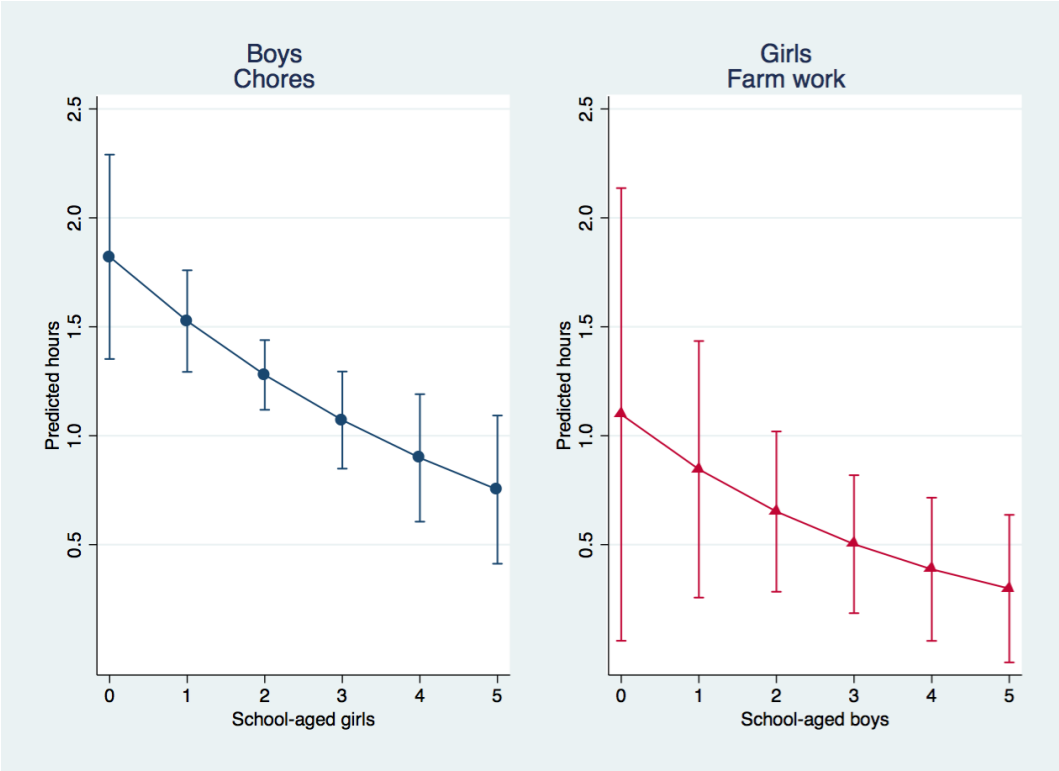
	[0.81,1.43]	[0.81,1.44]	[0.76,1.51]	[0.73,1.43]
Town (reference = village)	0.52***	0.51***	1.32*	1.28+
	[0.37,0.73]	[0.36,0.73]	[1.01,1.73]	[0.99,1.67]
Monday interview (reference = other day)	1.01	1.01	1.13	1.12
	[0.71,1.43]	[0.71,1.43]	[0.82,1.56]	[0.82,1.54]
Age (years)	1.02	1.02	1.04	1.04
	[0.98,1.05]	[0.98,1.06]	[0.98,1.11]	[0.98,1.10]
N	124	124	103	103

Data shown are incident rate ratios; 95% confidence intervals in brackets
† p<0.10, * p<0.05, ** p<0.01, *** p<0.001

5.5.4. Prediction 3: Substitution between boys and girls for gendered work

Finally, we predicted that girls would reduce boys' time spent in chores, while boys would reduce girls' time spent in farm work. Figure 5.3 indicates that girls do appear to substitute for boys' chores, with boys living with five co-resident girls spending around 2 hours less per day doing household chores compared to boys living with no co-resident girls. While the trend for girls suggests boys do substitute somewhat for girls' farm work, this result does not reach statistical significance (SM Table 5.7). This may be because girls and boys do different types of farm work. The confidence intervals for girls living with one or zero boys are also very large, suggesting that farming households may have more boys, meaning it is rare for girls to live in farming households with few boys. Households that farm do have slightly more boys on average (1.6 compared to 1.3, t=-1.79, p=0.04). This may explain why there is not strong evidence of boys substituting for girls' farm work.

Figure 5.3 Association between number of co-resident girls and boys' chore time, and between number of co-resident boys and girls' farm work time (95% confidence intervals shown)



5.6. Discussion

In contexts where households remain reliant on subsistence livelihoods, the relative value of children's work according to their age and gender is likely to be an important determinant of educational investment. Here, we looked for evidence of labour substitution between children in households in north-western Tanzania, and how this might affect children's education. Our first prediction was that older children would be preferentially allocated work and therefore be less likely to be enrolled in school. We found support for this prediction for girls only, finding that older girls are preferentially allocated work, and that the availability of older girls is associated with a higher probability of school enrolment for younger girls, who also spend less time in household chores and more time in leisure. For boys however, we find the opposite; older boys with more younger boys in the household, have the highest odds of school enrolment.

Older boys do not seem to work less than younger boys, however, except that younger boys in cattle-owning households are preferentially allocated herding work, suggesting that younger boys may be substituting for the labour of older boys in cattle-herding households at least. We discuss our interpretation of this pattern of results below.

Our second prediction was that out-of-school children would substitute for the work of schoolchildren, whose time spent in other activities such as studying might be more valuable. Overall, we did not find strong support for this prediction, although out-of-school girls do work more when there are more schoolgirls in the household, suggesting they may be taking over some of the schoolgirls' chores. However, we did not find evidence that schoolchildren work less in households with out-of-school children. Household responsibilities are valued as part of a child's socialisation and duties to their household, and parents say that children should help their household in order to stop them getting 'spoiled' (Varkevisser, 1973). During our study, the majority of parents or guardians agreed that it is important and useful for children to help with household work. Parents may expect all children to make certain contributions to household work, rather than preferring that unenrolled children substitute for schoolchildren.

Finally, we predicted that labour substitution would be gendered, given established differences in male and female work in this context (Hedges et al. in press). Supporting our prediction, we find that the availability of girls within a household reduces the time spent by boys in household chores. There is less evidence that boys substitute for girls in farm work. This may be due to preferential fostering of boys into farming households, although we lack supporting data to test this conjecture.

5.6.1. Why are results more consistent with labour substitution for girls than boys?

We predicted that work would be preferentially allocated to older individuals because skill and strength generally increase with age, meaning older individuals will be more efficient. For girls, this is the pattern that we observe. Among boys however, older boys were more likely to be in school; boys particularly seem to benefit in terms of school enrolment when there are more younger boys available in a household. This does not seem to be explained by younger boys substituting for older boys' work, as only in cattle-owning households is the number of younger boys associated with older boys doing less work. This pattern is the opposite to what we predicted, as embodied capital models predict that more skilled or productive individuals should be the preferred substitutes. It may instead reflect traditional practices regarding inheritance and age hierarchies within families. In traditional Sukuma law, early-born sons were favoured, inheriting more land and taking the role of household head if their father died (Varkevisser, 1973). This early-born preference is in line with evolutionary predictions about parental investment biases. In this area, a son's marriage requires parents to pay brideprice, whereas a daughter's marriage brings cattle or money into the household. Parents may therefore delay certain sons' marriages in order to afford the brideprice, whereas daughters' marriages are less restricted. As earlier-born boys can marry earlier, prioritising their marriage and reproduction gives the greatest return to investment in the long-term. A similar pattern was observed among Gabbra pastoralists in Kenya, where older sons had much higher reproductive success than younger sons, but daughters' reproduction wasn't much influenced by birth order (Mace, 1996). This preference for earlier-born sons may also manifest in the allocation of work to younger sons where possible, to free older sons' time for other activities, or just to relieve them from the discomforts of tasks such as cattle herding. This tradition of a family age

hierarchy appears to continue into the present day, with parents preferring to invest in earlier-born boys' education.

A lack of strong labour substitution effects overall for boys echoes findings from our previous study in this area, in which we showed minimal trade-offs between work and school for boys not involved in herding work (Hedges et al., in press). In the local area, livelihoods have shifted away from subsistence agriculture, and landholdings and herd sizes have decreased, reducing the demand for boys' work (Wijsen & Tanner, 2002). This appears to make boys' everyday work quite compatible with school, eliminating the need for substitution between boys not in cattle-owning households.

Girls' labour substitution appears to fit better with predictions from embodied capital models. Household chores such as food processing and cooking may be more sensitive to the gains in efficiency associated with gains in skill. Additionally, chores are frequently combined with being responsible for any other children present. In this case, it is beneficial to have the most senior girl available to do this, as she will have the most experience and authority. The value of older girls' work was also seen in our previous study, in which the trade-off between work and school was much greater among older than younger girls, suggesting that the opportunity costs of girls' work increase with age (Hedges et al., in press).

5.6.2. Birth order, education, and modernisation

Labour substitution effects may help to explain some of the varied results regarding differential investment by birth order reviewed in our introduction. In contexts where children are still producers, their work contributions are likely to influence decisions about investment in education, favouring children whose work is less important to the household. However, as livelihoods shift away from subsistence agriculture towards market integration or formal work, and children's contributions become less important

to their households, parents may invest more in earlier-born children. This may explain why early-born biases in education are more evident in industrialised countries, where children are primarily consumers and make negligible work contributions to their households. Studies in lower-income settings have found that age order biases in education are more evident in wealthier households (Gibson & Lawson, 2011; Gibson & Sear, 2010; Hedges et al., 2016). This may be because wealthier households are less reliant on children's work, being more able to hire outside help.

This may also help to explain the differing effects of family size on education during the course of the demographic transition. Economic theory predicts a quantity-quality trade-off between family size and educational investment, such that in larger families, there are fewer resources available per child, and so children are less likely to be educated (Becker, 1960). However, in many pre-transition societies children are producers as well as consumers, alleviating the trade-off between quantity and quality of children. Across sub-Saharan Africa, there is actually a positive effect of the number of siblings or co-resident children on schooling, perhaps because children have a lower individual burden of work (Al-Samarrai & Peasgood, 1998; Chernichovsky, 1985; Cornwell, Inder, Maitra, & Rammohan, 2005; Gomes, 1984; Lloyd & Blanc, 1996; Roth, 1991). However, this effect appears to reduce and reverse as modernisation and fertility decline occur (Eloundou-Enyegue & Williams, 2006; Marteleto, 2010). In pre-transition settings, the payoffs to education are frequently uncertain due to poor quality schools and high youth unemployment, meaning parents may benefit more by pursuing a 'bet-hedging' strategy, or by using older children's work to reduce the opportunity costs of younger children's schooling (Liddell et al., 2003). Both wealth and modernisation improve the payoffs to education, and reduce the value of children's work, as households become less reliant on subsistence farming, and no longer have to fetch water and fuel. As

modernisation occurs, it may therefore become more beneficial to parents to bias investment towards earlier-born children, and ultimately to limit fertility.

5.6.3. Limitations

It should be noted that the analysis presented here is part of a larger body of work conducted using the same dataset, and hence that additional hypotheses were tested in addition to those presented here. A limitation of this analysis is therefore that the rate of Type I errors may have been inflated above the assumed level of $\alpha = 0.05$. This should be considered when reading the results.

In line with previous demographic data collection at this site, and in demographic surveys more broadly, data on household composition were collected through a household roster, with all individuals in the household linked to the household head. However, this means it is difficult to subsequently relate other individuals within the household to one another. We can link biological children of the household head together as siblings, but we do not know whether they are half or full siblings, and for other children, it is difficult to reconstruct relationships to others in the household. This is a common limitation of demographic data, but one which has not often been questioned. Collecting data on relationships between all household members, or identifying smaller units within households, for example parents and their dependent children, is time-consuming, but would provide a better measure of household composition and structure (Madhavan, Myroniuk, Kuhn, & Collinson, 2017; Randall, Coast, & Leone, 2011). Additionally, we examine only one measure of educational investment, school enrolment. Progression through school or academic attainment may show different associations with household composition and could be investigated in future research. Finally, because this analysis set out to test labour substitution effects, we used the number of co-resident children as the most appropriate measure of the

availability of substitute labourers in this context, but this does limit comparability with previous analyses of birth order, many of which limit their analysis to sets of siblings due to their focus on parental investment biases.

5.7. Conclusion and Implications

There is a huge body of literature and research on children's education, and how it varies between children. Considerably less research has been done on children's work, and where work has been examined, it is frequently problematised, with studies focusing on harmful child labour, or work as a barrier to schooling. Yet in modernising contexts, where the payoffs to education are unclear and households remain reliant on subsistence livelihoods, children's work is valuable, both to their household economy, and in their own skill acquisition and socialisation. Framing children as passive recipients of parental investment risks overlooking the role that children's work plays in shaping decisions about education, and time allocation among children within households. In this study, we present a more holistic view of intra-household variation in time allocation, showing that the presence and characteristics of co-resident children can have important implications for children's work and education. We demonstrate the importance of girls' work within their households, with older girls subsidising younger girls' time to attend school, and out-of-school girls alleviating the burden of household chores for schoolgirls. For boys, traditional age hierarchies appear to favour older boys in education access, while a gendered allocation of household work is seen, with girls substituting for boys' household chores. This study highlights the complexities of decision-making regarding educational investment and children's time allocation in transitioning contexts, demonstrating that multiple factors may influence these decisions, from the availability of substitute workers, the relative value of a child's work contributions according to their age and gender, to traditional gender and family norms.

We reinforce the importance of including work in studies of children's education in modernising contexts, particularly recognising the value of children's work and its role in influencing education decisions within households.

5.8. Acknowledgements and funding

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5.9. Supplementary Material

SM Table 5.1 Association between being the only child in the household and enrolment, work time, and leisure time

	Enrolment (odds ratios)		Time spent in activity (incidence rate ratios)			
	Boys	**Girls**	**Boys (overall work)**	**Boys (leisure)**	**Girls (chores)**	**Girls (leisure)**
Only child (reference = no)	2.62	1.31	0.93	1.02	1.26*	0.97
	[0.73,9.39]	[0.37,4.70]	[0.64,1.37]	[0.73,1.43]	[1.00,1.59]	[0.69,1.37]
Child lives with (reference = parent(s))						
Close kin	0.78	2.10+	1.03	0.94	1	1.05
	[0.40,1.51]	[0.88,5.02]	[0.83,1.27]	[0.78,1.14]	[0.86,1.17]	[0.84,1.30]
Distant kin	0.54	0.42*	1.13	1.19	1.08	1.43*
	[0.20,1.48]	[0.19,0.96]	[0.81,1.59]	[0.89,1.60]	[0.88,1.32]	[1.06,1.93]
Number of school-age children	1.19*	1.18+	1.01	1.02	0.99	1.03
	[1.01,1.39]	[0.98,1.42]	[0.96,1.06]	[0.98,1.06]	[0.95,1.02]	[0.98,1.08]
Household food security	1.04	1.04	1	0.99	1	1.01+
	[0.99,1.09]	[0.99,1.09]	[0.99,1.02]	[0.98,1.00]	[0.98,1.01]	[1.00,1.03]
Household assets (reference = basic)						
Higher value	2.33+	1.83	0.94	1.14	0.82+	1.12
	[0.85,6.40]	[0.63,5.34]	[0.68,1.29]	[0.86,1.50]	[0.65,1.03]	[0.81,1.56]
Intermediate value	1.74	1.76	0.97	1.07	0.97	0.98
	[0.89,3.39]	[0.79,3.91]	[0.77,1.22]	[0.88,1.31]	[0.82,1.14]	[0.77,1.25]
Town (reference = village)	5.01***	2.86**	0.72**	1.03	0.96	1

	[2.63,9.55]	[1.45,5.65]	[0.59,0.87]	[0.87,1.21]	[0.84,1.10]	[0.82,1.21]
Age (years)	0.62***	0.52***	1	0.94***	1.05***	0.86***
	[0.57,0.68]	[0.46,0.59]	[0.98,1.03]	[0.92,0.96]	[1.03,1.07]	[0.83,0.89]
Enrolled (reference = no)			0.34***	0.46***	0.58***	0.25***
			[0.27,0.42]	[0.38,0.57]	[0.49,0.69]	[0.19,0.32]
Monday interview (reference = other			0.93	0.97	1.01	0.95
day)			[0.75,1.16]	[0.80,1.18]	[0.88,1.17]	[0.76,1.18]
N	624	631	624	624	631	631

† p<0.10, * p<0.05, ** p<0.01, *** p<0.001

Data shown are odds ratios / incidence rate ratios; 95% confidence intervals in brackets

SM Table 5.2 Association between (1) continuous age order and enrolment and (2) categorical age order and enrolment, for boys and girls, from multilevel logistic regression

	Boys	**Boys**	**Girls**	**Girls**
	(1)	**(2)**	**(1)**	**(2)**
Age order (continuous)	0.61**		1.47+	
	[0.43,0.86]		[0.97,2.23]	
Age order (reference = youngest)				
Middle child		0.75		1.48
		[0.39,1.42]		[0.71,3.07]
Youngest		0.38*		3.23+
		[0.15,1.00]		[0.83,12.53]
Number of children	1.43**	1.18+	1.08	1.18
	[1.15,1.79]	[0.99,1.41]	[0.87,1.34]	[0.95,1.48]
Child lives with (reference = parent(s))				
Close kin	0.8	0.83	2.04	2.08
	[0.40,1.59]	[0.41,1.65]	[0.80,5.18]	[0.80,5.37]
Distant kin	0.44	0.48	0.42+	0.45+
	[0.15,1.22]	[0.17,1.36]	[0.17,1.03]	[0.19,1.10]
Household food security	1.04+	1.04+	1.04	1.04
	[0.99,1.09]	[1.00,1.09]	[0.99,1.10]	[0.99,1.10]
Household assets (reference = basic)				
Higher value	2.99*	2.63+	1.49	1.55
	[1.04,8.54]	[0.93,7.39]	[0.47,4.77]	[0.48,4.97]
Intermediate value	1.83+	1.77	1.64	1.63
	[0.92,3.64]	[0.90,3.49]	[0.70,3.88]	[0.68,3.91]
Town (reference = village)	5.58***	5.07***	2.55*	2.54*
	[2.81,11.07]	[2.61,9.84]	[1.24,5.24]	[1.24,5.22]
Age (years)	0.54***	0.59***	0.53***	0.52***
	[0.47,0.62]	[0.52,0.66]	[0.46,0.63]	[0.45,0.61]
N	590	590	578	578

Data shown are odds ratios (exponentiated coefficients); 95% confidence intervals in brackets; † p<0.10, * p<0.05, ** p<0.01, *** p<0.001

SM Table 5.3 Association between (1) age order and (2) age order by gender, and time spent in work and leisure for boys and girls, from negative binomial regression models

	Boys				Girls			
	Work	**Leisure**	**Work**	**Leisure**	**Chores**	**Leisure**	**Chores**	**Leisure**
	(1)	**(1)**	**(2)**	**(2)**	**(1)**	**(1)**	**(2)**	**(2)**
Age order	0.92	0.98			1.01	1.08		
	[0.83,1.02]	[0.90,1.07]			[0.94,1.08]	[0.97,1.21]		
Age order by gender			0.96	0.99			0.91*	1.1
			[0.85,1.07]	[0.90,1.08]			[0.84,0.98]	[0.98,1.23]
Enrolled (reference = no)	0.33***	0.45***	0.34***	0.45***	0.58***	0.24***	0.58***	0.24***
	[0.26,0.42]	[0.36,0.56]	[0.27,0.43]	[0.37,0.56]	[0.49,0.70]	[0.18,0.32]	[0.48,0.69]	[0.18,0.32]
Number of school-age children	1.06	1.03	1.02	1.02	0.98	0.98	1.01	1.01
	[0.98,1.13]	[0.96,1.09]	[0.97,1.08]	[0.97,1.07]	[0.93,1.04]	[0.90,1.07]	[0.97,1.05]	[0.95,1.07]
Child lives with (reference = parent(s))								
Close kin	1.02	0.94	1.02	0.94	1	1.05	1.02	1.04
	[0.81,1.27]	[0.77,1.14]	[0.81,1.27]	[0.77,1.14]	[0.86,1.18]	[0.83,1.32]	[0.87,1.19]	[0.83,1.31]
Distant kin	1.14	1.19	1.13	1.19	1.07	1.52*	1.07	1.50*
	[0.81,1.61]	[0.89,1.59]	[0.80,1.60]	[0.89,1.60]	[0.87,1.33]	[1.10,2.09]	[0.87,1.33]	[1.09,2.07]
Household food security	1.01	0.99	1	0.99	1	1.02+	1	1.02*
	[0.99,1.02]	[0.98,1.00]	[0.99,1.02]	[0.98,1.00]	[0.99,1.01]	[1.00,1.03]	[0.99,1.01]	[1.00,1.03]
Household assets (reference = basic)								
Higher value	0.91	1.11	0.91	1.11	0.81+	1.09	0.83	1.07
	[0.65,1.26]	[0.84,1.47]	[0.65,1.27]	[0.84,1.47]	[0.64,1.03]	[0.77,1.54]	[0.65,1.05]	[0.76,1.52]
Intermediate value	0.95	1.09	0.95	1.09	0.94	0.93	0.94	0.93
	[0.75,1.21]	[0.89,1.34]	[0.75,1.20]	[0.89,1.34]	[0.80,1.12]	[0.72,1.20]	[0.80,1.12]	[0.72,1.19]
Town (reference = village)	0.71**	1.07	0.70***	1.06	0.98	0.98	0.97	0.99
	[0.58,0.87]	[0.90,1.26]	[0.57,0.87]	[0.90,1.26]	[0.85,1.12]	[0.80,1.20]	[0.85,1.12]	[0.81,1.22]
Monday interview (reference = other day)	0.92	1	0.92	1	1.01	0.94	1.02	0.93

	[0.73,1.15]	[0.82,1.21]	[0.73,1.15]	[0.82,1.21]	[0.87,1.18]	[0.75,1.18]	[0.88,1.19]	[0.74,1.16]
Age (years)	0.98	0.94***	0.99	0.94***	1.05***	0.88***	1.04**	0.87***
	[0.94,1.02]	[0.90,0.97]	[0.96,1.03]	[0.91,0.96]	[1.02,1.08]	[0.84,0.92]	[1.01,1.06]	[0.84,0.90]
N	590	590	590	590	578	578	578	578

Data shown are incident rate ratios; 95% confidence intervals in brackets

† p<0.10, * p<0.05, ** p<0.01, *** p<0.001

SM Table 5.4 Associations between (1) number of younger and older children, and (2) number of younger and older children of the same gender, and school enrolment, for non-fostered children only

	Boys	**Boys**	**Girls**	**Girls**
	(1)	**(2)**	**(1)**	**(2)**
Number of younger children	1.47**		1.1	
	[1.14,1.90]		[0.85,1.43]	
Number of older children	0.8		2.08**	
	[0.59,1.08]		[1.29,3.33]	
Number of younger boys / girls		1.67**		0.86
		[1.23,2.27]		[0.62,1.18]
Number of older boys / girls		0.75		1.61
		[0.52,1.10]		[0.90,2.91]
Household food security	1.02	1.02	1.03	1.04
	[0.96,1.08]	[0.97,1.08]	[0.97,1.10]	[0.98,1.11]
Household assets (reference = basic)				
Higher value	4.03*	4.24*	1.25	1.44
	[1.14,14.22]	[1.20,14.96]	[0.32,4.82]	[0.38,5.42]
Intermediate value	1.96	1.99+	2.07	2.32+
	[0.88,4.39]	[0.89,4.47]	[0.79,5.37]	[0.91,5.94]
Town (reference = village)	4.45***	4.22***	2.74*	2.54*
	[2.05,9.67]	[2.00,8.91]	[1.16,6.46]	[1.10,5.84]
Age (years)	0.53***	0.56***	0.56***	0.55***
	[0.45,0.62]	[0.49,0.64]	[0.47,0.67]	[0.46,0.64]
N	453	453	425	425

Data shown are odds ratios (exponentiated coefficients); 95% confidence intervals in brackets

† p<0.10, * p<0.05, ** p<0.01, *** p<0.001

SM Table 5.5 Associations between (1) number of younger and older children, and (2) number of younger and older children of the same gender, and time spent in work and leisure for boys and girls, for non-fostered children only

	Boys		Girls		Boys		Girls	
	Total work	**Leisure**	**Chores**	**Leisure**	**Total work**	**Leisure**	**Chores**	**Leisure**
	(1)				**(2)**			
Number of younger children	1.05	1.04	0.96	1.03				
	[0.97,1.14]	[0.96,1.12]	[0.90,1.02]	[0.93,1.15]				
Number of older children	1.01	1	1	1.07				
	[0.93,1.09]	[0.94,1.07]	[0.94,1.05]	[0.98,1.17]				
Number of younger boys / girls					1.05	0.95	1	1.01
					[0.94,1.17]	[0.86,1.05]	[0.93,1.08]	[0.88,1.15]
Number of older boys / girls					1.01	1	0.92*	1.11+
					[0.90,1.14]	[0.91,1.09]	[0.85,0.99]	[0.99,1.25]
Enrolled (reference = no)	0.35***	0.41***	0.55***	0.23***	0.35***	0.43***	0.55***	0.23***
	[0.27,0.46]	[0.32,0.52]	[0.45,0.67]	[0.16,0.33]	[0.27,0.46]	[0.34,0.55]	[0.45,0.66]	[0.17,0.33]
Household food security	1	0.99	1	1.01	1	0.99	1	1.01
	[0.99,1.02]	[0.97,1.00]	[0.99,1.02]	[0.99,1.03]	[0.99,1.02]	[0.97,1.00]	[0.99,1.02]	[0.99,1.03]
Household assets (reference = basic)								
Higher value	0.94	1.1	0.77+	1.21	0.96	1.12	0.80+	1.22
	[0.64,1.37]	[0.79,1.53]	[0.59,1.01]	[0.80,1.84]	[0.66,1.39]	[0.81,1.56]	[0.61,1.04]	[0.80,1.85]
Intermediate value	1.08	1.1	1.02	0.96	1.09	1.13	1.02	0.98
	[0.82,1.43]	[0.87,1.41]	[0.85,1.23]	[0.71,1.29]	[0.83,1.44]	[0.89,1.45]	[0.85,1.23]	[0.73,1.31]
Town (reference = village)	0.71**	1.06	0.98	1.11	0.70**	1.04	0.99	1.09
	[0.56,0.89]	[0.88,1.29]	[0.84,1.14]	[0.87,1.41]	[0.56,0.88]	[0.86,1.26]	[0.85,1.15]	[0.85,1.39]
Monday interview (reference = other	0.87	0.93	1.02	1.03	0.85	0.93	1.03	1.02
day)	[0.67,1.13]	[0.74,1.18]	[0.86,1.20]	[0.79,1.35]	[0.65,1.11]	[0.74,1.17]	[0.87,1.21]	[0.78,1.33]
Age (years)	0.98	0.93***	1.06***	0.85***	0.99	0.95**	1.03*	0.86***
	[0.94,1.03]	[0.89,0.97]	[1.02,1.09]	[0.81,0.90]	[0.96,1.03]	[0.92,0.98]	[1.01,1.06]	[0.82,0.90]
N	453	453	425	425	453	453	425	425

Data shown are incident rate ratios; 95% confidence intervals in brackets † p<0.10, * p<0.05, ** p<0.01, *** p<0.001

SM Table 5.6 Association between (1) number of out-of-school boys and time spent in work and (2) number of out-of-school girls and time spent in work, for schoolboys and schoolgirls

	Schoolboys		**Schoolgirls**	
	(1)	**(2)**	**(1)**	**(2)**
Number of out-of-school boys	1.03		1.08	
	[0.85,1.23]		[0.97,1.20]	
Number of out-of-school girls		0.91		0.99
		[0.74,1.11]		[0.88,1.12]
Number of school-age children	1.01	1.02	0.99	1
	[0.95,1.07]	[0.96,1.08]	[0.95,1.03]	[0.96,1.04]
Household food security	1.01	1.01	1	1
	[0.99,1.03]	[0.99,1.02]	[0.98,1.01]	[0.98,1.01]
Household assets (reference = basic)				
Higher value	0.82	0.82	0.83	0.83
	[0.55,1.22]	[0.55,1.22]	[0.63,1.10]	[0.63,1.09]
Intermediate value	0.89	0.9	0.92	0.92
	[0.65,1.20]	[0.66,1.22]	[0.76,1.11]	[0.76,1.11]
Town (reference = village)	0.76*	0.75*	0.91	0.89
	[0.59,0.98]	[0.59,0.96]	[0.77,1.07]	[0.76,1.05]
Monday interview (reference = other day)	0.9	0.91	0.98	0.98
	[0.68,1.19]	[0.69,1.20]	[0.83,1.16]	[0.83,1.16]
Age (years)	0.99	0.99	1.05***	1.05***
	[0.96,1.03]	[0.96,1.03]	[1.03,1.08]	[1.03,1.08]
N	466	466	475	475

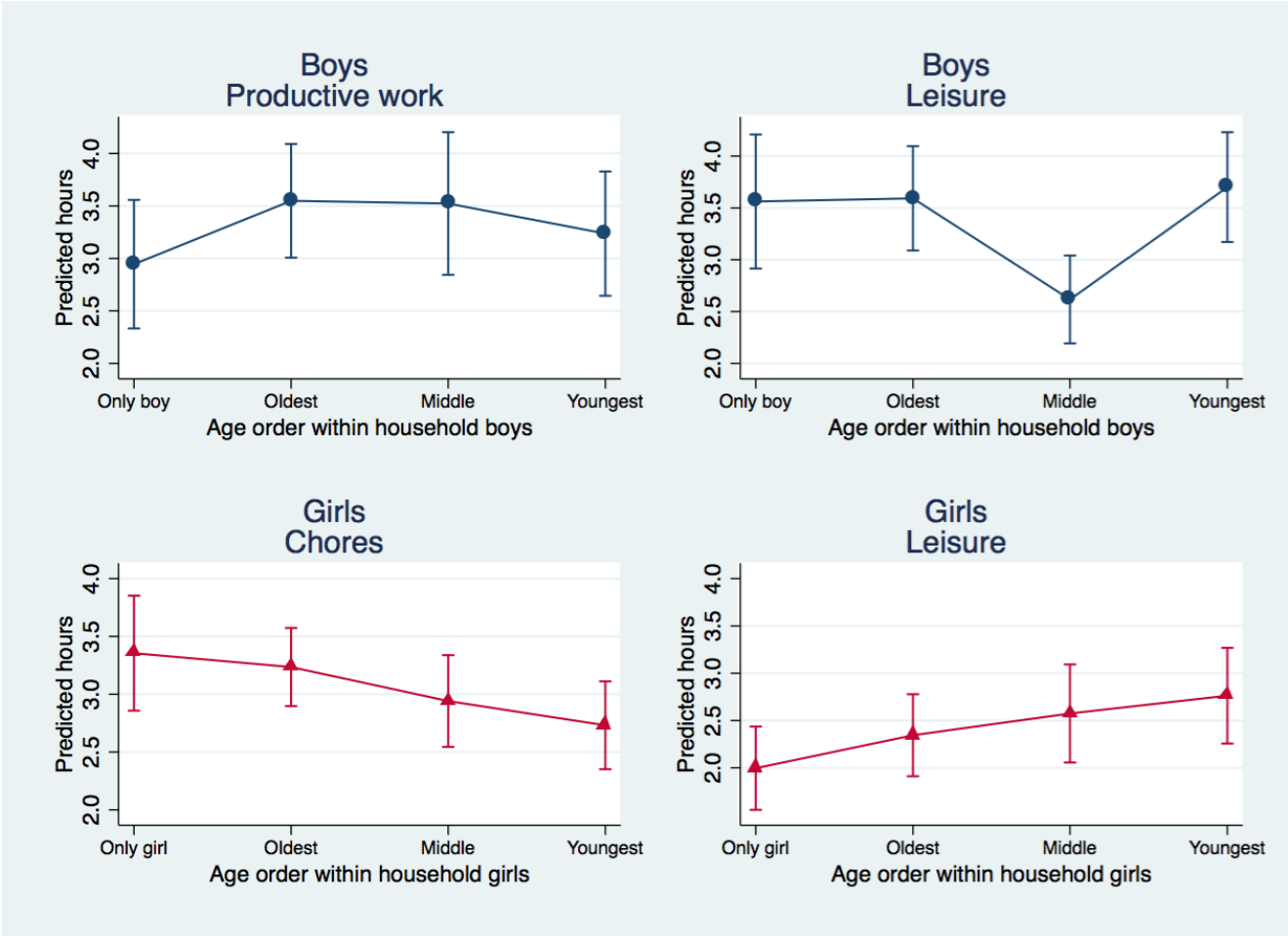
Data shown are incident rate ratios; 95% confidence intervals in brackets; † p<0.10, * p<0.05, ** p<0.01, *** p<0.001

SM Table 5.7 Association between number of co-resident girls and boys' time spent in household chores, and number of co-resident boys and girls' time spent in farm work

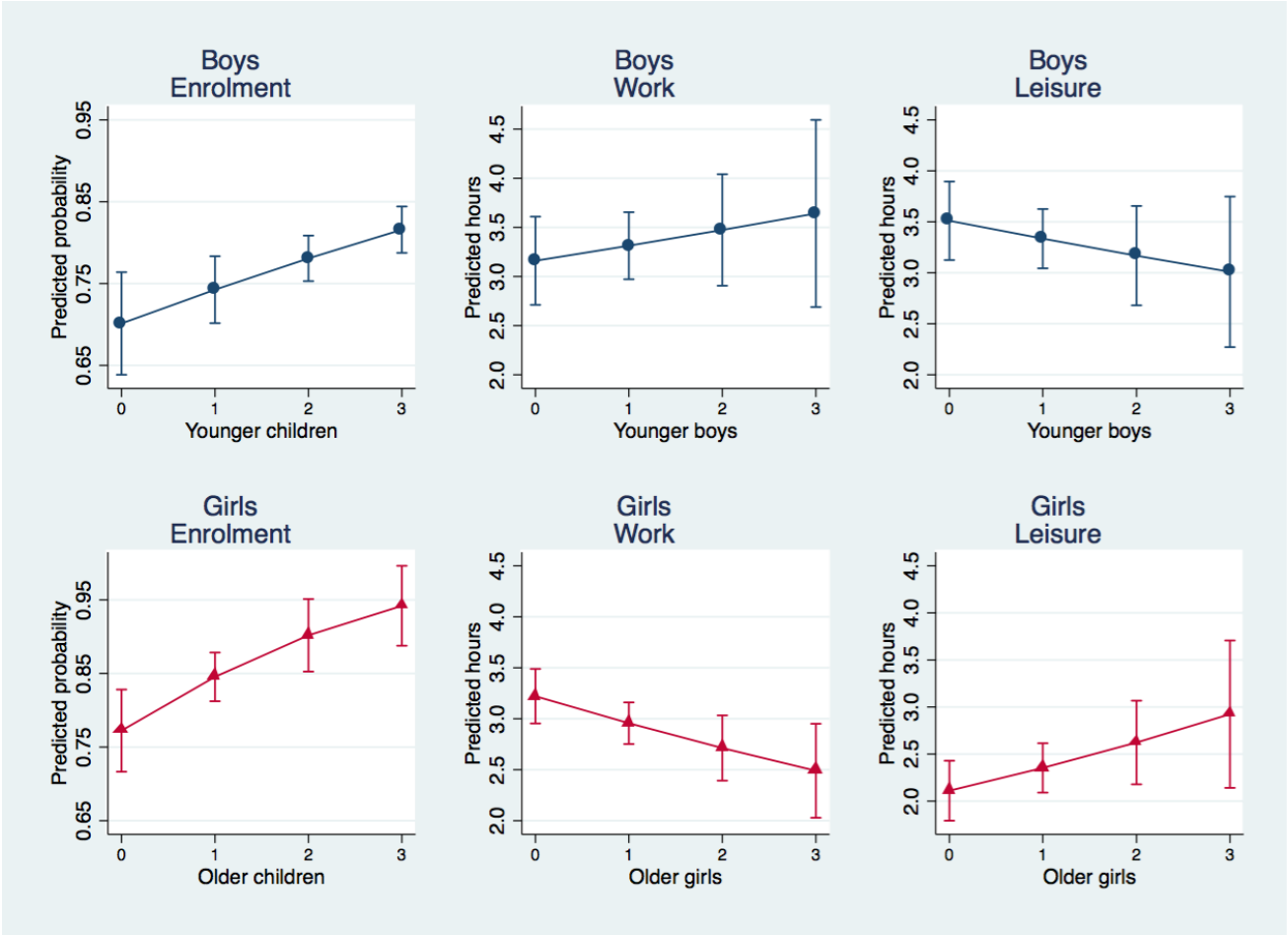
	Boys	**Girls**
Number of co-resident girls	0.84**	
	[0.73,0.96]	
Number of co-resident boys		0.77
		[0.54,1.09]
Number of school-age children	1.09	1.19
	[0.98,1.20]	[0.90,1.55]
Enrolled (reference = no)	0.70*	0.10***
	[0.49,0.99]	[0.04,0.26]
Household food security	1	0.99
	[0.98,1.02]	[0.93,1.04]
Household assets (reference = basic)		
Higher value	1.08	0.19*
	[0.68,1.72]	[0.05,0.73]
Intermediate value	1.07	1.1
	[0.77,1.48]	[0.47,2.58]
Town (reference = village)	1.73***	0.08***
	[1.31,2.29]	[0.04,0.18]
Monday interview (reference = other day)	0.79	1.03
	[0.57,1.11]	[0.50,2.13]
Age (years)	0.99	1.05
	[0.95,1.03]	[0.93,1.19]
N	625	631

Data shown are incident rate ratios; 95% confidence intervals in brackets
† p<0.10, * p<0.05, ** p<0.01, *** p<0.001

SM Figure 3 Association between categorical age order by gender and time spent in work and leisure for boys and girls (95% confidence intervals shown)



SM Figure 4 Association between younger children and boys' enrolment, work time and leisure time, and older children and girls' enrolment, chore time and leisure time, for non-fostered children only



6. EARNING THEIR KEEP? FOSTERING, CHILDREN'S EDUCATION AND WORK IN NORTH-WESTERN TANZANIA

RESEARCH PAPER COVER SHEET

PLEASE NOTE THAT A COVER SHEET MUST BE COMPLETED <u>FOR EACH</u> RESEARCH PAPER INCLUDED IN A THESIS.

<u>SECTION A – Student Details</u>

Student	Sophie Hedges
Principal Supervisor	Rebecca Sear
Thesis Title	Children's work and parental investment in education in north-western Tanzania

<u>If the Research Paper has previously been published please complete Section B, if not please move to Section C</u>

<u>SECTION B – Paper already published</u>

Where was the work published?			
When was the work published?			
If the work was published prior to registration for your research degree, give a brief rationale for its inclusion			
Have you retained the copyright for the work?*		Was the work subject to academic peer review?	

**If yes, please attach evidence of retention. If no, or if the work is being included in its published format, please attach evidence of permission from the copyright holder (publisher or other author) to include this work.*

SECTION C – Prepared for publication, but not yet published

Where is the work intended to be published?	Demographic Research
Please list the paper's authors in the intended authorship order:	Hedges, Sear, Todd, Urassa, & Lawson
Stage of publication	**Submitted**

SECTION D – Multi-authored work

For multi-authored work, give full details of your role in the research included in the paper and in the preparation of the paper. (Attach a further sheet if necessary)	I was responsible for the research design, and conducted the statistical analysis. I was also primarily responsible for writing this work. My co-authors supported this work in an advisory capacity and helped to edit the writing.

Student Signature: [redacted] **Date:** 29/06/2018

Supervisor Signature: [redacted] **Date:** 29/06/2018

6.1. Abstract

Objective: We investigate the relationship between fostering, education, and children's work in north-western Tanzania.

Background: Fostering, raising children that are not one's biological children, is common in many societies worldwide, presenting a challenge to evolutionary models of parental investment. Furthermore, despite predicted lower investment in non-biological offspring, numerous studies report no obvious well-being penalty for fostered children. Building on prior research, we suggest children's work contributions underwrite fostering costs, particularly if children are fostered by close kin.

Method: We used multilevel logistic and fractional multinomial regression analyses to investigate the association between fostering, educational investment and time allocation in a sample of 1,273 Sukuma children (aged 7-19) from north-western Tanzania, where fostering is traditionally common.

Results: 26% of children are fostered, of whom the majority have at least one parent living. Children fostered by close kin do not receive less educational investment, but those fostered by distant kin are less likely to be enrolled or to progress to secondary school. Overall fostered children are more likely to do farm work; however differences in work are limited when only weekdays, on which work conflicts with school, are considered. We further find that orphans are not particularly disadvantaged compared to other fostered children.

Conclusion: Being fostered by close kin does not appear to disadvantage children, and buffers orphans from parental death. Fostered children may offset some of their costs through increased farm work.

6.2. Background

Fostering, i.e. permanently or temporarily raising children that are not one's biological children, is common in many societies worldwide (Scelza & Silk, 2014; Silk, 1980). Across 40 countries in sub-Saharan Africa, 8.6% of children aged 15 and under were estimated to be fostered in 2002, and this number has grown in regions where HIV has increased rates of orphanhood (Monasch & Boerma, 2004: S58). In societies with strong traditions of fostering, fostering can begin at young ages, and frequently occurs even when both parents are alive. Lawson et al. (2017), for example, report that in northern Tanzania, 6% of children under five years of age resided apart from both living parents, most often with grandparents. In eastern Tanzania, 25% of children experienced maternal absence, and 40% paternal absence, by age 10 (Gaydosh, 2015). The widespread practice of fostering has long puzzled evolutionary anthropologists because it seemingly contradicts the otherwise well-supported assumption that parental care is incentivised by close genetic relatedness between caretaker and child (Hamilton, 1964; Silk, 1980). In this paper, we consider the possibility that, in addition to foster parents usually being close kin, foster children offset the costs of their care through contributions to household labour. In doing so, we present novel data on children's time allocation in a rural Sukuma population from north-western Tanzania. We begin by first reviewing past research on parental motivations for out-fostering children and the well-being implications for fostered children, before considering the incentives for foster parents. We then introduce our study context and predictions.

Anthropological accounts of fostering have highlighted the potential benefits parents may derive from out-fostering children, even if it disadvantages children. Potential benefits include forging advantageous alliances with other households, alleviating resource scarcity if they cannot support all their children, or adjusting the sex ratio of

their household (Franklin & Volk, 2016; Goody, 1982). The overall benefits to parents of out-fostering may therefore outweigh any potential negative impacts on the well-being of an individual child. Among the Mende in Sierra Leone, Bledsoe (1990) reported that foster children receive harsh treatment, but that parents value the status gains made by out-fostering children to wealthier households. Among the Himba in Namibia, Scelza & Silk (2014) found that out-fostering children was associated with higher reproductive success for mothers (i.e. a greater number of surviving children), but was associated with an increased risk of stunting and being underweight for foster children. Consistent with the notion that fostering entails some cost to children, several studies have also reported that fostered children are less likely to be enrolled in school (Assaad et al., 2010; Moyi, 2010; Novella, 2018; Roby, Erickson, & Nagaishi, 2016; Urassa et al., 1997).

However, there is also considerable evidence that foster children may not always be disadvantaged, particularly when fostered by close kin, as is most common across sub-Saharan Africa (Monasch & Boerma, 2004). Studies in several countries have found that children fostered by grandparents and other close relatives are not disadvantaged, but that fosterage by more distant kin or non-relatives is associated with a lower probability of school enrolment (Ainsworth, Beegle, & Koda, 2002; Burke & Beegle, 2004; Chuong & Operario, 2012; Fleisch, Shindler, & Perry, 2012; Madhavan, Myroniuk, et al., 2017; Parker & Short, 2009; Shapiro & Tambashe, 2001). Multiple studies in northern Tanzania have found that fostered children are not disadvantaged in terms of mortality, anthropometric scores, or educational investment compared to biological children (Burke & Beegle, 2004; Lawson et al., 2017; Urassa et al., 1997). In Mozambique, fostered children were not less likely to attend school than biological children within the same household (Lopus, 2017). These studies suggest that fostering children need not always come at the cost of a child's well-being. Indeed, some studies have highlighted that being fostered into wealthier or urban households can actually facilitate access to

schooling, and may benefit children more than remaining with their parents (Akresh, 2004; Eloundou-Enyegue & Shapiro, 2002; Zimmerman, 2003).

6.2.1. Why care for foster children?

In certain circumstances therefore, both biological parents and children may benefit from fostering arrangements. The puzzle remains as to what benefit foster parents derive from investing in children other than their own biological offspring. Two explanations have been suggested to resolve this puzzle. First, fostering a genetically related child may increase a foster parent's inclusive fitness, i.e. the probability of genetic representation in future generations (Hamilton, 1964). This explanation is supported by the fact that traditional forms of fostering are almost always confined to close biological kin (Franklin & Volk, 2016; Silk, 1980). It is also consistent with the findings described above indicating that foster children's well-being is most likely to be unaffected when they reside with close, as opposed to distant kin (Franklin & Volk, 2016). However, genetic relatedness is still higher between biological parents and child, compared to that between grandparents and grandchild, or aunt/uncle and niece/nephew. This explanation therefore cannot completely explain why the well-being of fostered children is often indistinguishable from biological children, who by the same logic should be prioritized within fostering households.

A second, complementary but to date less well-explored, explanation is that in subsistence contexts where households largely produce their own food, children can work to offset their own costs, and may even be regarded as an economic asset to the fostering household (Abebe, 2012). Consistent with this explanation, several ethnographic accounts of fostering have described households recruiting children in order to meet work demands, for example helping older or childless individuals, or assisting with farm work ('purposive fostering' (Hampshire, Porter, Agblorti, Munthali, &

Abane, 2015)). Qualitative accounts have suggested that fostered children do bear high workloads, and that this may impact their schooling (Hampshire et al., 2015; Oleke, Blystad, Fylkesnes, & Tumwine, 2007). However, there have been very few quantitative studies of fostered children's work patterns. In Egypt, fostered girls were found to spend more time doing household chores than girls living with both biological parents (Assaad et al., 2010). In Ghana, sons of the household head did less farm work than fostered boys, while in Nepal the household head's children worked less, though there was no difference in farm work (Bhalotra & Heady, 2001; Fafchamps & Wahba, 2006). However, in Pakistan foster children actually spent less time doing farm work, while in South Africa, foster children did not spend more time collecting water or wood than children living with their biological parents (Bhalotra & Heady, 2001; Zimmerman, 2003).

6.2.2. Study context & predictions

Here we investigate the differences between fostered and non-fostered children in educational investment and work, using detailed time allocation data from children in Sukuma households from the Mwanza region of north-western Tanzania. The Sukuma have a long history of fostering, and children traditionally moved frequently between households (Varkevisser, 1973: 87-88). Orphanhood in response to HIV mortality has increased in recent years, with a likely corresponding increase in fostering, though HIV mortality has begun to decline in recent years (Kanjala et al., 2014; Kishamawe et al., 2015). We collected data on children's residence and parents' vital status and so can distinguish between fostered non-orphans and orphans, but did not collect information on the reasons for children living away from their living parents.

In this area, the majority of children attend primary school, though progression to secondary school is less common. Despite national-level data suggesting that boys are more likely to be enrolled than girls, in this context enrolment is generally equal, or

higher for girls in more rural areas where boys' cattle herding work is less compatible with school attendance (Authors, in press). Children are expected to contribute to their households by doing farm work or household chores, and these activities are valued both in their use to children's families, and in teaching important skills. Children work more in more rural households, and girls work more than boys. School attendance reduces work, but primarily impacts children's leisure time, indicating that the opportunity costs of education in this area are lower than anticipated. Traditionally households were reliant on farming and cattle herding, living in dispersed homesteads, but livelihoods have now diversified, with many families engaged in petty trading and small businesses.

We test a number of predictions grounded in the expectation that the care of foster children is motivated by both close genetic relatedness and by the economic contributions of children. Our study has some advantages over past studies in that we collected detailed data on multiple measures of educational attainment and time allocation data corresponding to a complete day. Compared to many other anthropological studies of fostering, our sample size is also relatively large (n=1,273 children). First, we predict that fostered children will receive less educational investment and do more work than children living with both biological parents. We expect this to be particularly true for those children who are fostered by more distant kin as compared to close kin, since lower genetic relatedness should reduce the incentive for investment. Second, we predict that among fostered children, orphans will be particularly disadvantaged, as they do not have the protection or additional investment of a parent outside the household, and may represent a situation of 'crisis fostering' rather than 'purposive fostering' so that children are less likely to have moved into households that can economically support them.

6.3. Methods

6.3.1. Data collection

Household surveys were conducted in two villages in the Kisesa Health and Demographic Surveillance System (HDSS) (Kishamawe et al., 2015) in the Mwanza region of Tanzania during 2016. Data collection was carried out in two locations within the HDSS, in the most rural village, and the least rural settlement, a small town. This sampling strategy was originally chosen in order to consider the impact of urbanisation on children's time allocation, the subject of a previous publication (Authors, in press). The HDSS provided a sampling frame of all households in both locations with members aged between 7 and 19 (the ages of formal schooling in Tanzania), from which 550 households were randomly sampled. We collected data on household members, including age, gender, education, and occupation, as well as the household's livelihood and asset ownership. Based on observations made during fieldwork, assets were defined as 'basic' (chair, bed, mosquito net), 'intermediate' (bicycle, radio, sofa, cupboard, clock, or sewing machine), or 'high-value' (TV, fridge, or motorbike). This was followed by a set of nine questions pertaining to food security during the past month (Coates et al., 2007).

For each household member aged 7 to 19, an additional survey was answered by their parent or guardian, collecting information on their biological parents' vital and marital status, and the educational attainment and enrolment of the child. In total, this provided data on 1,387 children. 1,278 children (92.1%) were then followed up for a time allocation interview; among those who could not be interviewed, 52 children were at boarding school, 48 were travelling, two were ill and seven refused to participate. Five children were excluded from further analysis, three who were married, and two who were employees of their household. In the time allocation interview, children were first asked whether they had done farm work, herding, or any kind of work for pay (e.g. petty

trading, casual labouring, working in a shop) during the past week. They were then asked to describe the time and duration of all activities done on the previous weekday, enabling a specific consideration of the trade-off between work activities and schooling. These time allocation data were subsequently coded into three broad categories: (i) education (school, tuition, studying); (ii) productive work (household chores e.g. cleaning, cooking, water and fuel collection; farm work, and market work (e.g. petty trading, working in shop), and (iii) personal or 'leisure time' (playing, resting, eating, bathing) (see also Authors in press for more details).

6.3.2. Data analysis

We define foster children as those children who do not currently reside with either biological parent, regardless of the vital status of each parent (i.e. fostered children include orphans). We class those living with a grandparent, sibling, aunt or uncle as living with 'close kin', while those living with other relatives are classed as living with 'distant kin'. The small number of children living with non-relatives (n=11) precluded analysing them separately, and so they were grouped with 'distant kin'. On the basis of data on parental vital status, children are then further classified as either a non-orphan, maternal orphan (mother dead or unknown), paternal orphan (father dead or unknown), or double orphan (both parents dead or unknown).

Investment in education was measured using three binary variables reflecting: (i) whether a child is currently enrolled in school; (ii) grade for age, where those who are enrolled in school are coded as 0 if they are below their recommended grade and 1 if they are at the correct grade or above, based on the school start age of seven; and (iii) progression to secondary school ('progressed'), those aged 14 or over are coded as 0 if they are still enrolled in primary school or have dropped out of school, and 1 if they are or have been enrolled in secondary school.

Time allocation to work was measured in two ways. First, two binary variables reflect (i) whether a child had done farm work in the previous week, and (ii) whether a child had done paid work during the previous week. The survey did not collect data on household work done over the past week, as pilot work indicated that the majority of children engaged in some household work over the course of a week, but found it difficult to estimate the amount of time. Second, time allocation data provides the proportion of time spent in education, leisure or personal activities, and productive work on the previous weekday. These data were only collected for weekdays because children only attend school on weekdays.

For each set of outcomes (education, work during past week, and time allocation on previous weekday), models first examined the impact of child's residence for the full sample of children, controlling for factors associated with both fostering, and education and work, including child's age and gender, residence in town or village, and household food security, size and assets. We also include a variable indicating whether a child is the oldest, middle, or youngest child in the household, as our previous work has demonstrated age order differences in enrolment and work patterns. In analyses using the full sample, we used children living with both parents as the reference category, and test for differences in each outcome (described above) between this reference category and four other categories of residence: with mother, with father, fostered by close kin and fostered by distant kin (note that these categories don't specify how many adults children live with, e.g. living 'with mother' does not imply living with mother alone, as other adults could also be resident in the household). A second set of models was then run for the sub-sample of fostered children, to investigate whether there were differences between children living with distant versus close kin, and whether there were associations between orphan status and outcome variables.

Multilevel logistic regression was used to consider the relationship between fostering and enrolment, grade for age, and whether or not a child had worked during the past week (where farm work and paid work were analysed separately). These models include a random effect for household. Standard logistic regression was used to consider the relationship between fostering and progression to secondary school (which includes only 14 to 19 year olds), and also in analyses restricted to fostered children. These analyses are not multilevel, as the reduced sample size means that the number of children per household is small, which can lead to misestimation of parameter values (Clarke, 2008). Fractional multinomial logistic regression was used to investigate time allocation on the previous weekday, where the outcome variables are the proportions of time spent in education, leisure or personal activities, productive work, adding up to 1 for each child. This approach models the trade-off between children's work and other activities on a weekday, and accounts for autocorrelation between time uses, as time spent in one activity automatically reduces the time available for other activities (Buis, 2017, see also Authors in press). All analyses were carried out in Stata version 15.

6.4. Results

6.4.1. Descriptive results

6.4.1.1. Comparison of households with and without foster children

We first compared households with and without fostered children, to determine whether there were any notable differences between them. Households with foster children do not differ from those without foster children in terms of wealth measures, with the exception that they are more likely to own land (Table 6.1). Fostering was equally common in the village and town. The main differences are in household size and composition; households with foster children are larger, with more children and more older individuals (age 60 and over) than households that do not contain foster children.

Households with foster children are also less likely to have an adult man or woman aged 20-59.

Table 6.1 Comparison of households with and without foster children

	Household has foster children?			
	No	Yes	Total	
N	265	180	445	
	N (%)	N (%)	N (%)	p^a
Location				0.161
Village	146 (55.1)	87 (48.3)	233 (52.4)	
Town	119 (44.9)	93 (51.7)	212 (47.6)	
Household farms				0.210
No	76 (28.7)	42 (23.3)	118 (26.5)	
Yes	189 (71.3)	138 (76.7)	327 (73.5)	
Household owns cows				0.370
No	200 (75.5)	129 (71.7)	329 (73.9)	
Yes	65 (24.5)	51 (28.3)	116 (26.1)	
Household owns land				0.005
No	51 (19.2)	17 (9.4)	68 (15.3)	
Yes	214 (80.8)	163 (90.6)	377 (84.7)	
Household assets				0.668
Higher value	54 (20.4)	42 (23.3)	96 (21.6)	
Intermediate value	161 (60.8)	102 (56.7)	263 (59.1)	
Basic	50 (18.9)	36 (20)	86 (19.3)	
Household is food secure				0.727
No	187 (71.1)	130 (72.6)	317 (71.7)	
Yes	76 (28.9)	49 (27.4)	125 (28.3)	
Household has adult female (aged 20-59)				0.001
No	9 (3.4)	21 (11.7)	30 (6.7)	
Yes	256 (96.6)	159 (88.3)	415 (93.3)	
Household has adult male (aged 20-59)				<0.001
No	26 (9.8)	50 (27.8)	76 (17.1)	
Yes	239 (90.2)	130 (72.2)	369 (82.9)	
	Mean (SD)	Mean (SD)	Mean (SD)	p^b
Household size	7.2 (2.5)	8.2 (3.8)	7.6 (3.1)	<0.001
Number of children <7 years old	1.7 (1.4)	1.5 (1.5)	1.6 (1.4)	0.061
Number of children 7-19 years old	2.7 (1.4)	3.6 (2.1)	3.1 (1.7)	<0.001
Number of adults 20-59 years old	2.6 (1.1)	2.6 (1.7)	2.6 (1.4)	0.955
Number of adults 60+ years old	0.1 (0.4)	0.5 (0.7)	0.3 (0.6)	<0.001
Number of cows	2.5 (0.4)	2.6 (0.5)	2.5 (0.3)	0.938
Land owned (hectares)	1.9 (0.14)	2.5 (0.3)	2.2 (0.1)	0.062
Food security score[c]	17.8 (0.4)	17.7 (0.5)	17.8 (0.3)	0.862

[a] p chi-squared test
[b] p t-test
[c] Higher value indicates household is more food secure

For households with foster children, we also looked at household composition excluding foster children, in order to see if the addition of foster children makes them more or less similar to non-foster households in age and gender composition. Non-foster households are significantly more likely to have younger boys and girls than non-foster households when discounting foster children (Table 6.2); this difference disappears when including foster children, suggesting that younger children may be fostered by households who lack younger children, either because they have greater capacity or because households value the presence of younger children. In terms of older children, fostering appears to give foster households an 'excess' of older girls in comparison to non-foster households. As we saw in Table 6.1, foster households are less likely to have an adult female; older girls may therefore be fostered to fill that role.

Table 6.2 Comparing age and gender composition of non-foster households with foster households excluding foster children and foster households including foster children

	Non-foster household	Foster household (excluding foster children)	Foster household (including foster children)
	(1)	(2)	(3)
N	265	180	180
% households with:			
7 to 13 year old boy	57.7	42.2**[a]	60.6 [b]
7 to 13 year old girl	61.5	50.0* [a]	68.9 [b]
14 to 19 year old boy	38.5	33.9 [a]	42.8 [b]
14 to 19 year old girl	30.2	34.4 [a]	48.3** [b]

* p<0.05, ** p<0.01

[a] p chi-squared test comparing columns 1 and 2

[b] p chi-squared test comparing columns 1 and 3

Table 6.3 Child characteristics by residence

	Child lives with					
	Both parents	Mother	Father	Close kin	Distant kin	Total
N	638	226	78	236	95	1,273
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
Gender						
Male	337 (52.8)	107 (47.3)	35 (44.9)	114 (48.3)	39 (41.1)	632 (49.6)
Female	301 (47.2)	119 (52.7)	43 (55.1)	122 (51.7)	56 (58.9)	641 (50.4)
Age group						
7 to 13	416 (65.2)	149 (65.9)	51 (65.4)	177 (75)	41 (43.2)	834 (65.5)
14 to 19	222 (34.8)	77 (34.1)	27 (34.6)	59 (25)	54 (56.8)	439 (34.5)
Orphan status						
Non-orphan	638 (100)	149 (65.9)	63 (80.8)	145 (61.4)	55 (57.9)	1,050 (82.5)
Paternal orphan	-	77 (34.1)	-	54 (22.9)	22 (23.2)	153 (12)
Maternal orphan	-	-	15 (19.2)	16 (6.8)	5 (5.3)	36 (2.8)
Double orphan	-	-	-	21 (8.9)	13 (13.7)	34 (2.7)
Age order within household						
Oldest	184 (28.8)	78 (34.5)	27 (34.6)	66 (28)	45 (47.4)	400 (31.4)
Middle child	275 (43.1)	83 (36.7)	31 (39.7)	101 (42.8)	34 (35.8)	524 (41.2)
Youngest	179 (28.1)	65 (28.8)	20 (25.6)	69 (29.2)	16 (16.8)	349 (27.4)
Currently enrolled						
No	116 (18.2)	45 (19.9)	14 (17.9)	34 (14.4)	33 (34.7)	242 (19)
Yes	522 (81.8)	181 (80.1)	64 (82.1)	202 (85.6)	62 (65.3)	1031 (81)
At correct grade for age						
No	261 (47.9)	87 (46)	38 (56.7)	111 (54.7)	41 (63.1)	538 (50.3)
Yes	284 (52.1)	102 (54)	29 (43.3)	92 (45.3)	24 (36.9)	531 (49.7)
Progressed to secondary school						
No	114 (51.6)	33 (43.4)	13 (48.1)	29 (49.2)	36 (67.9)	225 (51.6)
Yes	107 (48.4)	43 (56.6)	14 (51.9)	30 (50.8)	17 (32.1)	211 (48.4)

	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Mean hours spent in						
Education	5.9 (4.3)	6.1 (4.4)	5.9 (4.4)	6.2 (4.3)	4.4 (4.6)	5.9 (4.3)
Leisure	9.5 (3.5)	9.7 (3.7)	9.7 (3.6)	9.6 (3.3)	10 (3.7)	9.6 (3.5)
Chores	2.2 (2.4)	2.1 (1.9)	2.5 (2.6)	2.1 (2.3)	3.2 (3.1)	2.3 (2.4)
Farm work	1.2 (2.6)	1 (2.6)	0.8 (1.9)	1.1 (2.5)	1 (2.3)	1.1 (2.5)
Market work	0.2 (1.2)	0.1 (1)	0.1 (0.6)	0.1 (0.9)	0.4 (1.6)	0.2 (1.1)
Total work	3.6 (3.3)	3.2 (3.1)	3.4 (3.2)	3.3 (3.1)	4.6 (3.7)	3.5 (3.3)

6.4.1.2. Child characteristics

Approximately half of the children in our sample currently live with both their biological mother and their father, with around a quarter living with one parent only, usually their mother. The remaining quarter (26%) of children are fostered. Among fostered children, 71% (n=236) live with close kin, 214 with a grandparent, 6 with a sibling, and 16 with an aunt or uncle; among the remaining 29%, 84 live with distant relatives, while 11 live in a non-relative's household (but may have kin resident in the household). Child characteristics vary depending on residence (Table 6.3). Children fostered by distant kin are more likely to be female, to be both older in age and the oldest child in the household, and to be an orphan. The majority of fostered children are non-orphans. A greater proportion of those living with their mother but not their father are orphans, compared to those living with just their father, suggesting that paternal orphans are more likely to remain with their mother, while maternal orphans are more likely to be fostered. Fostering was equally common among children under 14 years compared to children aged 14-19 years.

6.4.2. Educational outcomes

The relationship between fostering and education outcomes is dependent on whether children are fostered by close or distant kin. Children fostered by close kin do not differ from children living with both biological parents in terms of either enrolment or progression to secondary school (Table 6.4; Figure 6.1). Children fostered by more

distant kin, on the other hand, experience relatively poor educational outcomes across all three measures compared to children living with both parents (Table 6.4; Figure 6.1). Children fostered by both close and distant kin have lower odds of being at the correct grade for age. Children fostered by distant kin have a significantly later age at starting school (8.3 years, S.D. 1.4) compared both to non-fostered children ($p<0.001$; 7.7 years, S.D. 1.3) and to children fostered by close kin ($p<0.001$; 7.8 years, S.D. 1.3). Children fostered by close kin however do not appear to start school at a different age. For those fostered by close kin, their lower grade for age may reflect disruptions to education after starting school, while those fostered by distant kin appear to experience a delay in starting school. As these children tend to be older, this could reflect a secular trend of decreasing age at starting school, or it could be that these children begin attending school after being fostered. Among children living with just one biological parent, we also observe some evidence that children living with their father have lower odds of being at the correct grade for age.

We predicted that among fostered children, orphans would be most disadvantaged as they are likely to receive reduced or non-existent parental investment. We therefore investigated whether being an orphan accounts for some of the educational disadvantage seen among fostered children. There is suggestive evidence (i.e. $p<0.1$) that double orphans have lower odds of being at the correct grade for age, perhaps reflecting greater disruption to their studies as a result of two parental deaths. Maternal orphans are more disadvantaged than paternal orphans, though this effect does not reach statistical significance, perhaps because maternal orphans are also more likely to be fostered by more distant kin. Children fostered by distant kin have lower odds of all educational outcomes compared to those fostered by close kin.

6.4.3. Farm and paid work during past week

Compared to children living with both parents, fostered children were more likely to report having done farm work during the past week (Table 6.5, Model 1; Figure 6.2). However, there was no evidence of an association between fostering and paid work, though the prevalence of paid work is very low overall in this context. Among fostered children (Table 6.5, Model 2), there is no evidence that those fostered by distant kin are more likely to have worked than those fostered by close kin. Contrary to our predictions, orphans are actually less likely to have worked in the past week compared to non-orphans, though this effect is not statistically significant other than for paternal orphans.

Table 6.4 Summary of logistic regression analysis predicting (1) enrolment (n=1,256), grade for age (n=1,053) and progression to secondary school (n=432) for all children, and (2) enrolment (n=326), grade for age (n=263) and progression to secondary school (n=111) among fostered children only

	1			2		
	Enrolment	Grade for age	Progression	Enrolment	Grade for age	Progression
Child lives with (ref=both parents)						
Mother	0.98	0.99	1.54			
	[0.52,1.83]	[0.62,1.59]	[0.83,2.86]			
Father	0.77	0.50+	0.8			
	[0.31,1.91]	[0.25,1.00]	[0.31,2.06]			
Close kin	1.09	0.51**	0.96			
	[0.58,2.06]	[0.32,0.80]	[0.49,1.90]			
Distant kin	0.40*	0.29***	0.30**			
	[0.19,0.84]	[0.15,0.57]	[0.14,0.64]			
Fostered by distant kin (ref=close kin)				0.39*	0.79	0.33*
				[0.17,0.91]	[0.41,1.52]	[0.12,0.86]
Orphan status (ref=non-orphan)						
Paternal orphan				1.25	0.78	2.08
				[0.47,3.35]	[0.41,1.50]	[0.61,7.07]
Maternal orphan				0.32	1.73	0.49
				[0.08,1.26]	[0.49,6.17]	[0.09,2.57]
Double orphan				1.06	0.44+	0.82
				[0.32,3.48]	[0.17,1.14]	[0.19,3.55]
Female (ref=male)	1.3	1.46*	1.33	1.46	1.88*	1.36
	[0.85,1.97]	[1.08,1.97]	[0.85,2.09]	[0.69,3.12]	[1.09,3.24]	[0.52,3.58]
Household assets (ref=basic)						
Higher value	2.57*	1.33	3.80**	2.85	0.92	1.17
	[1.03,6.43]	[0.67,2.66]	[1.51,9.59]	[0.69,11.82]	[0.33,2.53]	[0.19,7.08]
Intermediate value	2.15*	0.9	1.35	1.86	1.22	1.37

	[1.14,4.06]	[0.53,1.51]	[0.66,2.77]	[0.68,5.08]	[0.56,2.63]	[0.30,6.19]
Household food security	1.03	1.03+	1.06**	1.05	0.99	1.04
	[0.99,1.07]	[1.00,1.06]	[1.01,1.10]	[0.98,1.12]	[0.94,1.04]	[0.96,1.13]
Household size	1.01	0.99	0.96	0.99	0.97	1.02
	[0.94,1.09]	[0.94,1.05]	[0.89,1.03]	[0.88,1.10]	[0.90,1.05]	[0.89,1.16]
Age order (ref = oldest)						
Middle child	1.34	0.67+	1.17	1.19	0.78	1.08
	[0.82,2.18]	[0.44,1.01]	[0.68,2.01]	[0.45,3.14]	[0.36,1.70]	[0.31,3.76]
Youngest child	0.83	1.04	1.09	0.83	1.17	1.35
	[0.39,1.79]	[0.64,1.68]	[0.33,3.59]	[0.22,3.13]	[0.50,2.73]	[0.18,10.11]
Town	4.50***	4.34***	4.51***	4.81***	3.61***	9.08***
	[2.52,8.04]	[2.82,6.68]	[2.72,7.48]	[1.93,11.95]	[1.84,7.07]	[2.89,28.48]
Age	0.55***	0.87***	1.34***	0.57***	0.89*	1.46*
	[0.49,0.61]	[0.82,0.93]	[1.16,1.56]	[0.48,0.67]	[0.80,0.99]	[1.01,2.11]
Household random effect	0.96***	0.85***	-	-	-	-
	[0.38,2.44]	[0.43,1.68]	-	-	-	-

Data shown are odds ratios (exponentiated coefficients); 95% confidence intervals in brackets
+ p<0.10, * p<0.05, ** p<0.01, *** p<0.001

Figure 6.1 Predicted probability of educational outcomes by child residence (predicted probabilities from Model 1 in Table 3; 95% confidence intervals; control variables are mean centred)

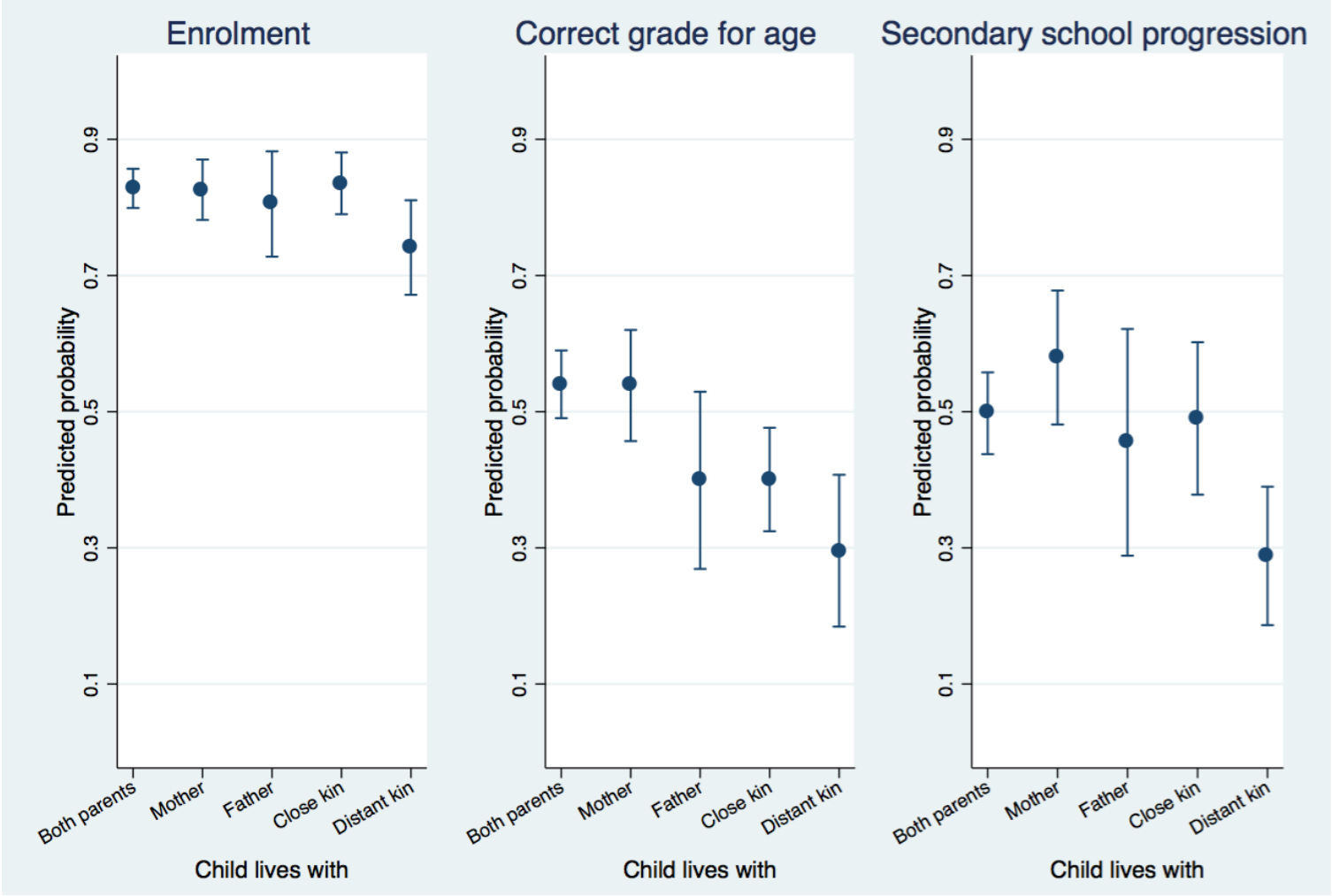


Table 6.5 Summary of logistic regression analyses predicting (1) farm work and paid work during past week (n=1,256) for all children and (2) farm work and paid work during past week (n=326) among fostered children only

	1		2	
	Farm work	Paid work	Farm work	Paid work
Child lives with (ref=both parents)				
Mother	1.03	0.79		
	[0.61,1.74]	[0.37,1.69]		
Father	1.03	1.04		
	[0.47,2.27]	[0.35,3.10]		
Close kin	1.93*	1.39		
	[1.16,3.22]	[0.72,2.71]		
Distant kin	2.09*	1.25		
	[1.07,4.06]	[0.55,2.87]		
Fostered by distant kin (ref=close kin)			1.06	1.13
			[0.56,2.00]	[0.44,2.90]
Orphan status (ref=non-orphan)				
Paternal orphan			0.49*	0.61
			[0.25,0.97]	[0.21,1.75]
Maternal orphan			0.67	0.8
			[0.22,2.02]	[0.16,4.04]
Double orphan			0.59	1.2
			[0.22,1.54]	[0.35,4.10]
Female (ref=male)	0.31***	0.86	0.27***	0.97
	[0.22,0.43]	[0.53,1.39]	[0.15,0.46]	[0.43,2.16]
Household assets (ref=basic)				
Higher value	0.7	1.41	1.25	0.44
	[0.31,1.59]	[0.52,3.80]	[0.44,3.54]	[0.12,1.68]
Intermediate value	1.22	0.98	1.12	0.15**
	[0.69,2.15]	[0.45,2.12]	[0.54,2.34]	[0.05,0.50]
Household food security	0.96*	0.96	0.96	1.01
	[0.93,1.00]	[0.92,1.01]	[0.92,1.01]	[0.93,1.08]
Household size	1.01	1.03	1	1.03
	[0.95,1.08]	[0.95,1.12]	[0.93,1.08]	[0.92,1.15]
Age order (ref = oldest)				
Middle child	1.42	0.71	2.32*	1.09
	[0.93,2.18]	[0.39,1.30]	[1.08,4.96]	[0.38,3.14]
Youngest child	1.13	0.76	1.73	0.91
	[0.66,1.95]	[0.32,1.78]	[0.69,4.35]	[0.24,3.51]
Town (ref=village)	0.08***	1.53	0.15***	2.58+
	[0.05,0.14]	[0.84,2.81]	[0.08,0.29]	[0.92,7.23]
Age	1.25***	1.19***	1.28***	1.16+
	[1.17,1.33]	[1.08,1.30]	[1.14,1.42]	[0.99,1.35]
Household random effect	1.55***	0.86**	-	-
	[0.92,2.61]	[0.25,2.94]		

Data shown are odds ratios (exponentiated coefficients); 95% confidence intervals in brackets

+ p<0.10, * p<0.05, ** p<0.01, *** p<0.001

Figure 6.2 Predicted probability of doing farm work and paid work during past week, by child residence (predicted probabilities from Model 1 in Table 4; 95% confidence intervals; control variables are mean centred)

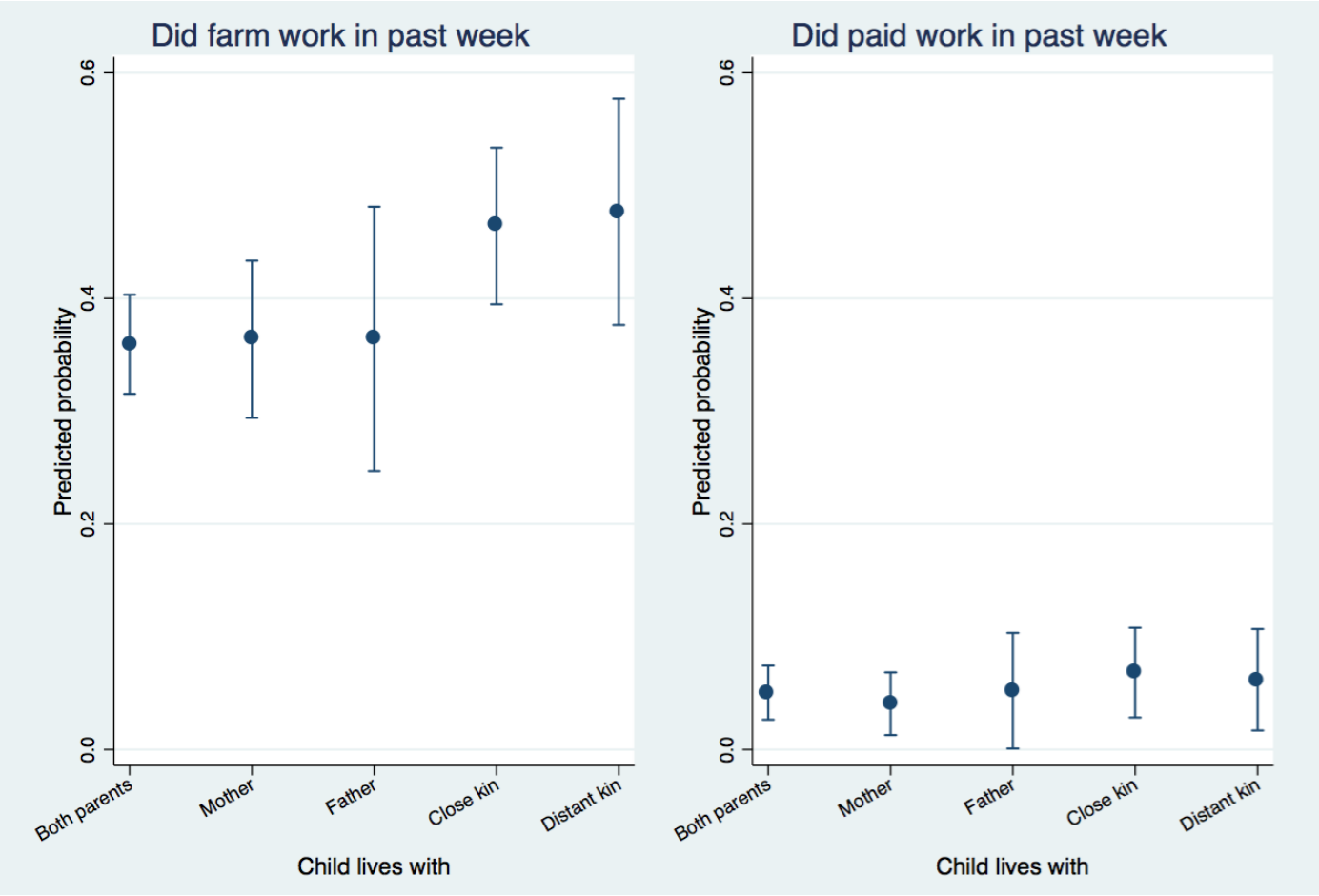


Table 6.6 Summary of fractional multinomial logistic regression analyses for (1) the association between child residence and time allocation (n=1,256) and (2) the association between child residence, orphan status and time allocation (n=326)

	1			2		
	Change in leisure from education	Change in work from education	Change in work from leisure	Change in leisure from education	Change in work from education	Change in work from leisure
Child residence (ref=both parents)						
Mother	0.06	-0.06	-0.12			
	[-0.12,0.24]	[-0.3,0.19]	[-0.29,0.05]			
Father	0.12	0.01	-0.12			
	[-0.14,0.39]	[-0.36,0.38]	[-0.37,0.14]			
Close kin	0.06	0.01	-0.05			
	[-0.1,0.22]	[-0.22,0.23]	[-0.2,0.1]			
Distant kin	0.55**	0.5*	-0.06			
	[0.23,0.87]	[0.09,0.9]	[-0.29,0.18]			
Fostered by distant kin (ref=close kin)				0.51**	0.61**	0.11
				[0.15,0.86]	[0.17,1.05]	[-0.15,0.36]
Orphan status (ref=non-orphan)						
Maternal orphan				0.42	0.83*	0.41*
				[-0.22,1.06]	[0.05,1.61]	[0.07,0.76]
Paternal orphan				-0.01	-0.06	-0.05
				[-0.31,0.3]	[-0.47,0.36]	[-0.35,0.25]
Double orphan				0.43+	0.31	-0.12
				[-0.08,0.94]	[-0.35,0.96]	[-0.45,0.2]
Female (ref=male)	-0.22***	0.02	0.24***	-0.1	0.02	0.12
	[-0.34,-0.1]	[-0.15,0.19]	[0.13,0.36]	[-0.35,0.15]	[-0.33,0.37]	[-0.11,0.35]
Household assets (ref=basic)						

Intermediate	-0.13	-0.24+	-0.11	-0.06	-0.31	-0.25+
	[-0.31,0.06]	[-0.49,0.01]	[-0.27,0.05]	[-0.39,0.26]	[-0.8,0.17]	[-0.54,0.04]
Higher value	-0.15	-0.42*	-0.27*	0.08	-0.25	-0.33+
	[-0.4,0.1]	[-0.76,-0.08]	[-0.5,-0.05]	[-0.38,0.54]	[-0.88,0.38]	[-0.71,0.05]
Household food security	-0.01*	-0.01+	0	-0.02	-0.03+	-0.01
	[-0.02,0]	[-0.03,0]	[-0.01,0.01]	[-0.04,0.01]	[-0.06,0]	[-0.03,0.01]
Household size	0.04**	0.04*	0	0.04+	0.02	-0.02
	[0.02,0.06]	[0.01,0.07]	[-0.02,0.02]	[0,0.08]	[-0.03,0.08]	[-0.05,0.02]
Age order (ref = oldest)						
Middle child	-0.33***	-0.4**	-0.06	-0.44*	-0.42+	0.02
	[-0.51,-0.16]	[-0.63,-0.17]	[-0.21,0.08]	[-0.84,-0.04]	[-0.91,0.07]	[-0.25,0.29]
Youngest child	0.03	-0.19	-0.21*	-0.07	-0.26	-0.19
	[-0.17,0.22]	[-0.45,0.08]	[-0.4,-0.03]	[-0.5,0.36]	[-0.86,0.34]	[-0.59,0.21]
Town (ref=village)	-0.38***	-0.68***	-0.3***	-0.61***	-0.84***	-0.23+
	[-0.52,-0.23]	[-0.88,-0.48]	[-0.45,-0.16]	[-0.91,-0.31]	[-1.26,-0.41]	[-0.49,0.04]
Child age	0	0.11***	0.11***	-0.02	0.09**	0.11***
	[-0.02,0.03]	[0.08,0.14]	[0.09,0.13]	[-0.07,0.03]	[0.02,0.15]	[0.06,0.15]
Monday interview (ref = other day)	-0.16*	-0.21*	-0.05	-0.13	-0.07	0.06
	[-0.31,-0.02]	[-0.42,-0.01]	[-0.19,0.09]	[-0.42,0.17]	[-0.47,0.33]	[-0.19,0.3]
Constant	0.85***	-1.29***	-2.13***	1.22*	-0.56	-1.79***
	[0.42,1.28]	[-1.87,-0.7]	[-2.55,-1.72]	[0.29,2.16]	[-1.66,0.54]	[-2.51,-1.06]

+ p<0.10, * p<0.05, ** p<0.01, *** p<0.001

6.4.4. Trade-off between work and education

Finally, we also investigated children's time allocation on the previous weekday according to residence and orphanhood status, to determine whether fostered or orphaned children work more on weekdays, and whether this work trades off with time allocated to schooling. Table 6.6 shows each trade-off in time use, i.e. between leisure and education, leisure and work, and work and education, from fractional multinomial logistic regression models. These are the relative differences; a negative coefficient indicates a reduction in time spent in that activity relative to the other activity, while a positive coefficient indicates an increase in time. For example, in the first column we see that children living with distant kin spend more time in leisure relative to education, and more time in work relative to education, compared to children living with both parents. Figure 6.3 shows the absolute difference in hours of education, leisure and work between non-fostered and fostered children. Zero represents the reference category of children living with both parents; confidence intervals which cross zero indicate a non-significant difference. Children fostered by distant kin spend less time in education than non-fostered children, and appear to trade this off with more time spent in leisure. There is a suggestion that they spend more time in work also, though this difference does not reach statistical significance (p=0.233). No other differences in time allocation are apparent, with the exception that those living with just their mother spend slightly less time working than those living with both biological parents.

Figure 6.4 shows the difference between orphaned and non-orphaned children among fostered children only. A number of differences are notable. Double orphans spend less time in education and have more leisure time than children with living parents, but do not appear to work more. Maternal orphans spend more time working than children living with both parents, trading this off against marginally reduced time in education and leisure. Paternal orphans do not appear to differ from non-orphans in their time

allocation. Those fostered by distant kin spend more time in leisure and work, and less time in education, relative to those fostered by close kin (Table 6.6, Model 2).

Figure 6.3 Difference between non-fostered and fostered children in hours spent in education, leisure and work on previous week-day (n=1,256), from fractional multinomial logistic regression models adjusting for child age, gender, age order, town residence, household food security, assets, and size, and interviews done on a Monday

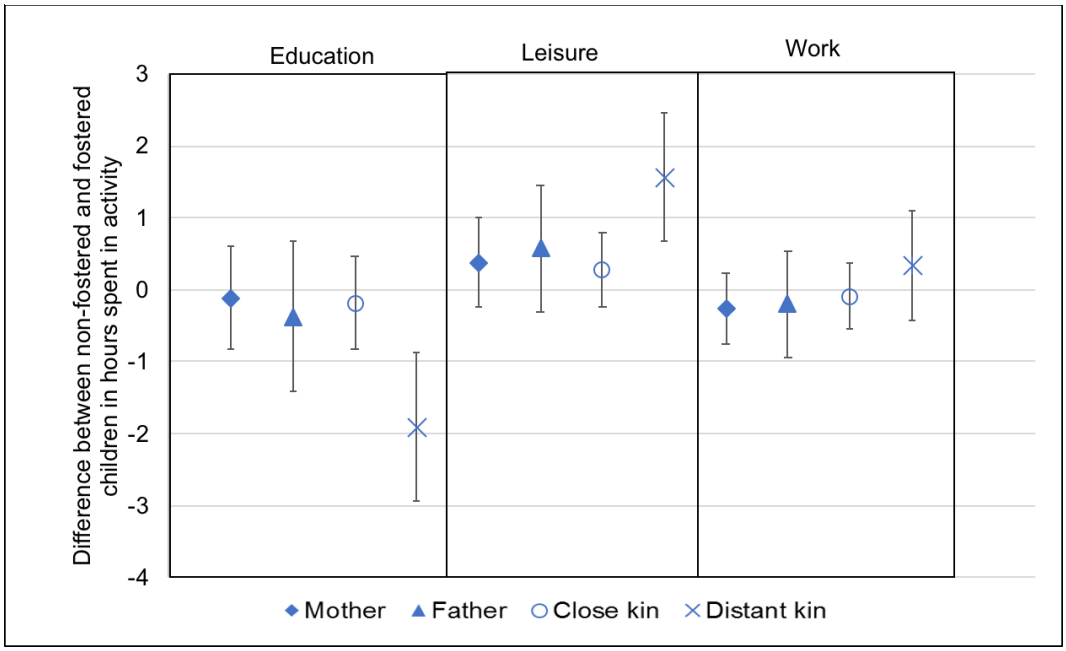
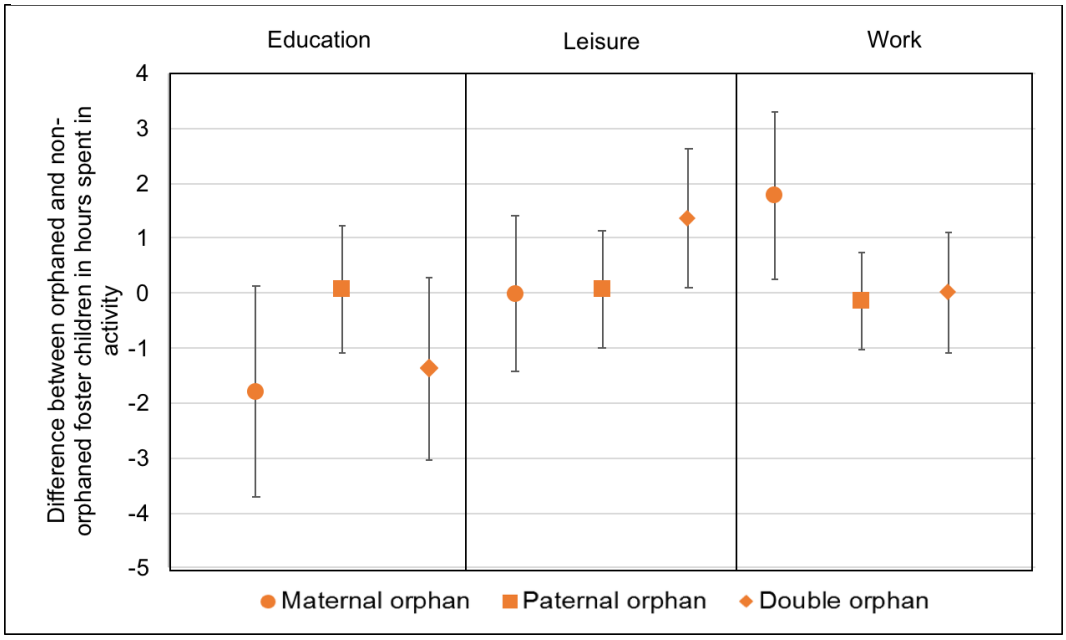


Figure 6.4 Among fostered children only (n=326), difference between orphaned and non-orphaned foster children in hours spent in education, leisure and work on previous week-day, from fractional multinomial logistic regression models adjusting for child age, gender, residence with distant kin, age order, town residence, household food security, assets, and size, and for interviews done on a Monday



6.5. Discussion

Our results suggest that both genetic relatedness and children's work contributions play an important role in explaining variation in child time allocation and education among fostered children. The large majority of children in this society are fostered with close kin and, in line with previous studies of fostering in Tanzania (Ainsworth et al., 2002; Burke & Beegle, 2004), children fostered with close kin receive similar levels of educational investment as children living with their biological parents. It is only when living with distant kin that fostered children experience lower odds of school enrolment and progression to secondary school. We also find that children fostered by either close kin or distant kin are more likely to report doing farm work in the previous week than other children, although we detect no differences between fostered and non-fostered children in time allocation to work when reporting on the previous weekday. This is likely to be because the previous week variable captures farm work done on weekends;

it may be that foster children's time is protected during the week when they attend school, but that they are more likely to work at weekends. These findings, combined with the observation that children are active producers in this population (see Authors in press), suggest that children's work contributions may be important in offsetting some of the costs to their foster households.

There are few differences between the characteristics of households with and without foster children (see also (Lawson et al., 2017)). However, households fostering children are more likely to own land and have more older individuals (aged 60 and over) who may be less able to contribute to household work, which is consistent with a greater demand for children's work. Households fostering children are larger but not wealthier or more food secure, which suggests that children may move into households that are better able to absorb the extra costs, levelling differences between households. The circulation of children between households may reduce wealth differentials between households and even out the labour supply, patterns observed in other studies of fostering (Goody, 1982; Serra, 2009). In informal discussions during data collection, household members said fostering was most often done by grandparents, particularly grandmothers, who wanted company or help with household work, or children living with relatives in order to attend school, suggesting that purposive fostering, where households actively foster children in, is common in this context.

Previous work in this area has found that girls who are older within their household do more household work and are less likely to be enrolled (Authors, under review). Older girls are also more likely to be fostered by distant kin. We explored gender interactions with fostering in this study but found no clear evidence that fostered girls are more disadvantaged than fostered boys; however, this may reflect the relatively small number of children fostered by distant kin, hence giving us low power to detect differences.

Further work exploring gender and age patterns in the likelihood of being fostered, and the outcomes associated with being fostered, could help to draw out some of these nuances.

While time allocation to work activities on school days did not show significant differences between fostered and non-fostered children, children fostered with distant kin spent less time in educational activities. For these children, time spent in education appears to trade-off primarily with leisure rather than work activities, suggesting that distant kin may be less willing to pay school expenses, as opposed to requiring greater work inputs which then impacts school attendance. Increased leisure time may also indicate that distant kin do not provide as much supervision or monitoring as closer kin. Qualitative interviews with teachers, parents, and adolescents from the local area stated that parental supervision and interest is important in ensuring children attend school and stay motivated, and it may be this input that distant kin are particularly unwilling or unable to provide. However, we must also consider the possibility that children fostered by distant kin may be different from those fostered by close kin. During data collection and in the qualitative interviews, we heard a few cases of parent-child conflict over schooling, with some adolescents wishing to drop out of school, and so running away from home to avoid going. Some of those living with distant kin may therefore be fostered because they do not want to be enrolled in school, as opposed to being less likely to be enrolled because they are fostered.

Parental death has historically been a relatively uncommon reason for children being fostered in sub-Saharan Africa (Gaydosh, 2015), and in northern Tanzania specifically, accounts for a minority of cases where children live away from their parents (Lawson et al., 2017). We anticipated that orphans represent a situation of 'crisis fostering' and would therefore be particularly disadvantaged among fostered children. However, we

find little evidence of this. Double orphans are marginally less likely to be at the correct grade for their age, perhaps reflecting greater disruption to their schooling as the result of both parents having died. This presumably accounts for them spending less time in education on weekdays, as at a given age, they are at a lower grade and so spend less time in school. However, this does not seem to result in them spending more time working. Paternal orphans do not differ from other fostered children on educational measures or time allocation, although they do appear to be less likely to do farm work in the previous week. Maternal orphans, on the other hand, do appear to work slightly more on weekdays, and this marginally reduces their time spent in education and leisure.

These patterns fit with previous research which has consistently shown that paternal orphans tend to show fewer deficits to their well-being than maternal orphans (Coall & Hertwig, 2010; Daly & Perry, 2017; Sear & Mace, 2008). For infants and young children this is likely to be due the loss of important maternal care, but this does not account for similar patterns observed among older children, who require less direct care. Another popular explanation for the relative lack of disadvantage observed in paternal orphans is that they are more likely to be cared for by maternal kin, who are predicted to invest more in children than paternal kin because they have higher certainty over genetic relatedness, given 'mother's baby, father's maybe' (Euler & Weitzel, 1996). For example, a study in Canada found that maternal kin provided more stable foster care placements than paternal kin (Perry, Daly, & Macfarlan, 2014). However, paternity certainty is generally very high in human societies, so that additional explanations may be needed to help explain differences in the outcomes for maternal and paternal orphans (Larmuseau, Matthijs, & Wenseleers, 2016). For example, paternal orphans may continue to receive intensive investment from mothers, whereas fathers may benefit more from switching investment away from maternal orphans and towards a new

relationship and new children, as is perhaps suggested in this population by the higher likelihood of paternal orphans residing with their mothers than maternal orphans residing with their fathers.

Overall though, it is perhaps most interesting that orphans do not appear particularly disadvantaged. The portrayal of orphans in the media, policy, and research is often focused on their vulnerability and lack of resources (Abebe, 2012). In the wake of the HIV / AIDS epidemic and increased adult mortality, the incidence of 'crisis fostering' of orphans appears to be increasing in frequency, with some commentators concerned that this puts pressure on traditional fostering networks, reducing households' ability to foster non-orphans (Grant & Yeatman, 2012). During the 1990s, orphan prevalence increased significantly in Tanzania in response to the HIV epidemic (Bicego, Rutstein, & Johnson, 2003). However, in many contexts such as this one, with a strong tradition of fostering and care by close kin, orphans appear to be buffered from parental loss by high levels of investment from close kin, particularly by grandparents.

6.5.1. Limitations

In common with many studies of fostering, we lack data on the households in which children would otherwise be living, and on the reasons for children living away from their parents, and so cannot say whether fostering actively benefits children in our sample or not. Using longitudinal data would enable the investigation of how children's outcomes change as they move from one household to another, as well as how factors such as length of foster placement influence outcomes. Additionally, some children may retain closer links to their parents, and may continue to receive investment, for example school fees, while others may move more permanently and rely more heavily on their foster household for investment; collecting data on monetary assistance from people outside the household might highlight circumstances in which parents continue to invest

in non-resident children. In this study, we control for household factors but cannot explicitly compare foster children with biological children within the same household, due to the manner in which household member relationships were recorded. However, this would be an interesting avenue for future work. It should also be noted that the analysis presented here is part of a larger body of work conducted using the same dataset, and hence that additional hypotheses were tested in addition to those presented here. A limitation of this analysis is therefore that the rate of Type I errors may have been inflated above the assumed level of $\alpha = 0.05$. This should be considered when reading the results.

6.5.2. Conclusions

Fostering has been a puzzle in the anthropological literature, as it is a widespread phenomenon yet, due to relatively low relatedness between foster parent and child, is predicted to reduce children's well-being, and be costly to foster parents. Our findings suggest that children's work contributions may help explain this puzzle, allowing foster children to offset some of their costs and hence receive similar levels of investment to children living with their biological parents. While this appears to hold when there is a close genetic link between foster child and foster parents, distant kin appear less willing to invest as much in foster children's education. Our results also indicate that fostering networks are important in buffering orphans well from parental loss, even in a context such as this one where orphanhood has increased in the wake of the HIV epidemic. The focus in international policy and the media is often on fostered and orphaned children's vulnerability (Abebe, 2012; Akresh, 2004). However, in contexts such as this, with a strong tradition of fostering, kin reciprocity and altruism, and children's own productive contributions to their households, fostering may in fact be a beneficial part of socialisation, family relationships, and household livelihoods.

7. DISCUSSION

7.1. Summary of results

The aims of this project were to collect data on the time allocation of children in order to (1) describe the forms and levels of children's work and education, (2) investigate determinants of children's time allocation at the household and child level, and (3) explore local perceptions of the costs and benefits of school and work. Addressing aim 1, I show that children predominantly do unpaid household work, including chores and agricultural work, and that school enrolment and attendance are high in this area, with many children reporting doing additional studying outside of school hours (see Chapter 4: Figure 4.3; SM Table 4.1).

In addressing aim 2, I tested several hypotheses derived from the framework of human behavioural ecology (HBE) regarding the association between education and time allocation outcomes, and modernisation and gender, co-resident child characteristics, and fosterage. Support for these hypotheses was mixed (Table 7.1). Hypotheses receiving good support were the increase in education and decrease in work associated with modernisation, and the anticipated gendered division of work (hypotheses 1, 2, and 4). The hypothesised preference for investment in boys' education was not seen, and the trade-off between work and school also received mixed support (hypotheses 3 and 5). While school attendance is inversely correlated with time spent working, this trade-off varies according to children's age, gender, and residence in town or village. The opportunity costs of school attendance increase with age, and for boys are lower in the town than in the village. For girls however, trade-offs are similar in town and village at older ages, and girls sacrifice leisure time to a greater extent than boys.

Hypotheses regarding labour substitution within households received greater support among girls compared with boys, with younger girls doing less work, having more leisure

time, and being more likely to be in school (hypothesis 6). Additionally, out-of-school girls appear to substitute for the chores of in-school girls (hypothesis 7), and girls substitute for boys' household chores (hypothesis 8). For boys, relatively older boys within a household are more likely to be in school than younger boys, suggesting parental investment biases towards earlier-born sons.

Hypotheses predicting lower educational investment and a greater workload for fostered children also found mixed support, with fostered children doing more farm work, and those living with distant kin receiving less schooling. However for the majority of fostered children living with close kin there were few differences in education compared with non-fostered children (hypotheses 9 and 10).

Finally, addressing aim 3, I find that both school and work are important parts of children's everyday lives in this context, and are valued for contributing to household functioning, and giving children important skills in both the short and long-term. Parents and guardians describe work as part of children's responsibility to their family, but in some cases work conflicts with schooling, by making children miss school, or causing them to be late or tired. Education is highly valued as the means to a better life, but low-quality schooling seems to be a significant barrier to children's academic attainment. While the value of education is recognised, the sacrifices that must be made to attain a secondary education, including foregoing work and earnings, may be a risk that is not always considered to be worth the investment, for adolescents and parents alike.

Table 7.1 Summary of hypotheses tested in Chapters 4, 5, and 6

Chapter	Hypothesis		Notes
4	1	Modernisation associated with greater school enrolment	
	2	Modernisation associated with less work	
	3	Boys receive more education than girls	In village, opposite association; in town, no gender difference
	4	Boys specialise in farm work, girls specialise in household chores	
	5	Trade-off between work and school	Also trade-off with leisure
5	6	Older children within a household work more and receive less education	Girls
			Boys
	7	Out-of-school children substitute for school children's work	Some evidence for out-of-school girls
	8	Girls substitute for boys' household chores, boys substitute for girls' farm work	Girls
			Boys
6	9	Fostered children receive less educational investment	Close kin
			Distant kin
	10	Fostered children work harder	Farm work
			Daily work

Green = supported
Yellow = mixed support
Orange = weak or no support

7.2. Implications for research on childhood

This study builds on previous theoretical and empirical research within HBE regarding the production of embodied capital, children's contributions to their households, and parental investment, extending this to a transitioning context. It also contributes to a rapidly growing 'anthropology of childhood', and a growing body of research on children's work and education in sub-Saharan Africa which critiques the generalisations made about childhood in African countries (Abebe & Ofosu-Kusi, 2016; Imoh, 2016; Sobo, 2015). In this section I elaborate on some of the implications of my findings for evolutionary studies of childhood, and research on education and children's work, highlighting areas for future research.

I begin by emphasising the importance of looking more holistically at children's time allocation, particularly giving more attention to play and leisure time. I then elaborate more on gender differences in time allocation, emphasising that these may be quite nuanced, and connected to cultural norms surrounding gendered behaviour. I also consider the implications of widespread fostering and shared work within households for models of parental investment. Finally, taking a broader view on the value ascribed to education, I draw on some of the qualitative findings from this project in considering the increasingly high levels of education worldwide, and how this links to 'developmental idealism'.

7.2.1. Need for holistic approach to time allocation

The findings from chapters 4, 5 and 6 all indicate that evolutionary and economic models which seek to explain variation in children's education need to more explicitly consider all dimensions of time allocation, rather than just focusing on education by itself. As time is a limited resource, understanding variation in children's educational outcomes requires a consideration of what is 'traded-off' in order to facilitate spending

time in school or study. Without considering work, very different predictions may arise regarding differences by gender, age order, or fostering. In chapter 4, I predicted that boys would be more likely to be in school than girls. However, girls were actually more likely to be enrolled in the village, likely due to the high value and incompatibility of boys' work with school. Parental investment theory predicts that it is often most beneficial to invest preferentially in relatively older children, yet these are also the children who are most efficient at work tasks. The results in chapter 5 suggest that this efficient work allocation may help to explain variation in girls' schooling within households. Finally, in chapter 6 foster children are predicted to be disadvantaged, but results suggest that those living with close kin are no different to those living with their parents. Foster children's work contributions may therefore be a way for them to offset their costs and negotiate higher investment.

Western-centric notions of childhood have focused research primarily on education as an outcome, and work as a barrier or a 'problem' (Bourdillon et al., 2010). More explicit theorising regarding which children are anticipated to work, and what contextual factors may impact the value and compatibility of children's work with school, could help to more fully understand children's time allocation and outcomes in transitioning contexts (Nieuwenhuys, 1996). This study also demonstrates the importance of collecting data on all forms of work, rather than just paid or harmful work, in order to capture the real trade-off between work and school, and to better account for girls' work.

Compared with education or work, leisure time is much less frequently investigated as an outcome in its own right, potentially because it is less clearly functional. Particularly in transitioning settings with scarce resources, there may be a sense that children's play and leisure time is less important or interesting than other outcomes (Imoh, 2016). Results from this research indicate that formal education is reducing children's leisure

time, and that this disproportionately affects girls. In addition to allowing time for rest, relaxation, and enjoyment, leisure time is likely to be an important way for children to gain embodied capital, including learning social skills, building social networks, and developing problem-solving and creative skills that may not be taught in school (Pellegrini, Dupuis, & Smith, 2007). Ethnographic studies have demonstrated that children's play is an important part of the process of skill acquisition and learning social norms (Bock, 2002b; Bock & Johnson, 2004; Boyette, 2016; Lancy, 2015). Within evolutionary developmental psychology, researchers have suggested that play may enable children to explore and gain knowledge about their environment in a relatively low-cost way, facilitating adaptation to novel environments (Pellegrini et al., 2007), and one study has found the opportunities for 'free play' during childhood correlated with individual adaptivity and social success in adulthood (Greve, Thomsen, & Dehio, 2014). Play may therefore have played an important role in the evolution of the extended juvenile period in humans (Bock & Johnson, 2004).

More studies of children's time allocation to play and work in forager and subsistence populations, such as those done by Bock & Johnson (2004), and Boyette (2016), could help to further elaborate theory on the relative roles of learning versus growth in the evolution of childhood. Given the complexity of human social groups, as well as their reliance on complex foraging skills, the role of play in developing cognitive and social competency could also be investigated (Dunbar, 1998). In transitioning contexts, collecting more detailed data on children's play and leisure time would allow a better estimation of the potential consequences of changes in leisure time associated with education and modernisation. For example, studies could investigate how type of play, and amount of leisure time, map onto outcomes such as cognitive ability, social networks, and mental and physical health outcomes.

7.2.2. Gender differences

The differences in time allocation trade-offs between girls and boys also suggest a need for more nuanced considerations of the costs and benefits of education by gender. It is often assumed – by this research as well – that higher male wages and patriarchal norms favour investment in boys' education (United Nations, 2015a). However, there is growing evidence that gender norms surrounding work, both for children and for adults, may be influencing education and opportunities in different ways in contemporary transitioning settings. This research finds that while girls work more than boys, the relatively greater compatibility of girls' work with school attendance, and their sacrifice of leisure time means this does not appear to significantly reduce their schooling relative to boys. This implies that the value of girls' education may be greater than that of boys', or that girls are maybe less affected by the negative aspects of schooling. In this area, female obedience is highly valued and girls are expected to be submissive towards their elders, particularly men. Parents may therefore be better able to enforce girls' school attendance, and girls may be less likely to be punished by teachers, or may resent punishment less than boys.

Girls may also value their own education more than boys do, as it may provide a way for them to move beyond traditional gender norms, and to acquire wealth and status beyond that gained through marriage and having children. Across sub-Saharan Africa, female farmers are disadvantaged in land rights and access to productive land, but education increases women's opportunities for involvement in household enterprises or wage employment, which may mean girls have a greater incentive to continue in education than boys (Dieterich, Huang, & Thomas, 2016; Quisumbing & Pandolfelli, 2009). In Ethiopia, boys were found to be more sceptical than girls of the payoffs to school in terms of future employment, and to have better access to unskilled, paid work. Girls could not access these opportunities and so had greater incentive to succeed at

school (Boyden, Porter, Zharkevich, & Heissler, 2016). In transitioning settings more generally, adolescent girls have less freedom and fewer opportunities for socialising than boys (Blum & Boyden, 2018). From my own impressions in Kisesa, this also seemed to be the case; adolescent boys appeared more likely than girls to have their own entrepreneurial schemes with friends, for example burning CDs or being DJs. Differences in culturally appropriate work may also change parental investment. For example, in Fiji, where unskilled work was seen as inappropriate for girls but acceptable for boys, parents were found to invest preferentially in their daughters' education in order to help them get a skilled job (Neill, 2011).

Girls may also be more open to the opportunities provided by education; while patrilocality is often said to favour investment in sons, it also means that boys grow up with the assumption that they will stay close to their family, whereas girls are brought up to expect to move away for marriage. In the context of urbanisation and economic opportunities, this may also lead to girls being more willing to consider moving away for jobs or further education. This could be investigated further by collecting information on residence patterns in this area, and how these relate to migration patterns among young men and women.

Now that female education is so strongly encouraged and appears to be largely accepted in most areas of sub-Saharan Africa, investment may more reflect different cultural norms regarding gender-appropriate behaviour and work. While this appears to incentivise girls' educational attainment, it may also limit their freedom and ability to seek alternative opportunities, while norms may limit boys' academic aspirations or encourage them to engage in risky behaviours such as excessive alcohol consumption. Therefore, it may be important to move away from a focus on gender equality in access to education, to look more at the impact of gendered work on educational attainment,

and the implications of gender differences in socialising and employment opportunities for young men and women in transitioning contexts.

Longitudinal research linking education to subsequent livelihood and employment outcomes, and marital outcomes such as timing of marriage, bridewealth payments, and spousal education or income, would be very useful in investigating gender differences in the returns to education. For example, one study has demonstrated that education is linked to higher bridewealth payments, which may incentivise parental investment in daughters' education (Ashraf, Bau, Nunn, & Voena, 2016). It has been suggested that a similar effect is seen among Sukuma families; however, as bridewealth payments become less common, it is unclear to what extent this may impact parents' education decisions (Wijsen & Tanner, 2002: 53). Over the past few decades, changes in marriage practices among the Sukuma have been reported, including increased autonomy among young people in the timing of marriage and their choice of spouse, and a move away from traditional forms of marriage to more informal arrangements without the transfer of bridewealth. Older individuals perceive that young people get married earlier though in fact the median age at marriage has increased in recent years (Boerma et al., 2002; Schaffnit, S., personal communication). Understanding more about changing marriage processes and norms, and how these relate to education, would give more context to decision-making over schooling and time allocation, both by parents and by young people themselves, and could suggest potential conflicts of interest. Additionally, looking at longer-term outcomes beyond wages would give more insight into the social, as well as the economic, returns to education, and the trade-offs individuals may face between marrying earlier, or delaying marriage and childbearing in order to invest in education, a career, and a high-quality spouse, decisions which may be very influential in driving fertility decline. Qualitative research with young men and women could also

examine gender differences in aspirations and experiences at school, and investigate norms regarding appropriate employment.

7.2.3. Beyond parental investment

The lower-than-anticipated opportunity costs of education in this area (see Chapter 4) have implications for evolutionary models of fertility decline that emphasise the increasing costs of childrearing faced by parents. This emphasis on quantity-quality trade-offs has focused attention on the effects of sibling competition and family size on educational outcomes and workloads. Yet in this context, nuclear families are relatively uncommon; many children are fostered or live in multi-generational households, most have half- as well as full siblings, and there are many reciprocal links between households. Under these circumstances, investment from, and work obligations to, relatives other than parents may produce different patterns of education and work to those anticipated by models focused on parental investment. Fostering has been suggested to be a form of cooperative childcare, allowing individuals to offset the costs of large families (Scelza & Silk, 2014). Within households, children in Ethiopia have been shown to share work flexibly in order to facilitate school attendance, and this interdependence may be an important way to buffer poor households from resource scarcity (Heissler & Porter, 2010). Children's work and extended kin networks may therefore provide a way for families to reduce the costs of large families, disincentivising fertility limitation. This may particularly be the case in areas where social security in old age is still primarily provided by children and family, rather than by the state.

There are extensive changes in family life underway across sub-Saharan Africa, including increasing migration rates, and changing marriage norms encouraging greater choice over marital partners and a greater emphasis on the nuclear family, rather than the extended family (Clark, Kabiru, Mathur, & Johnson, 2010; Madhavan, Clark, Beguy,

Kabiru, & Gross, 2017). These changes may be important in driving fertility decline, as they reduce the ability of extended kin networks to buffer the costs of children, particularly when accompanied by persistent or increasing poverty (Eloundou-Enyegue & Shapiro, 2002; Gurmu & Mace, 2008). Given the importance of extended kin networks, and the interdependence between individuals within households in this context, another interesting area for future research would be the transmission of investment through social networks, for example in what contexts help from extended kin is leveraged and how it influences child outcomes, and under what circumstances might these reciprocal relationships break down. This would be useful in determining the potential consequences of family change for educational investment and fertility decline. Integrating evolutionary work on cooperative childcare and its consequences for fertility and child outcomes (Sear & Coall, 2011; Sear & Mace, 2008), with demographic work examining the effect of household structure and kin support on children's education (Madhavan, Myroniuk, et al., 2017), and work within cultural evolution on the transmission of fertility norms (Newson, Postmes, Lea, & Webley, 2005), could lead to a greater understanding of fertility decline in sub-Saharan Africa.

7.2.4. Developmental idealism and runaway parental investment

The worldwide expansion in formal education, and its inclusion as a fundamental goal of development programmes, is generally explained and justified in economic term; policy-makers highlight the need for skilled workers to drive economic growth, and the benefits of education both to the individual and to a society (World Bank, 2011: 3). Education is typically framed as a rational economic investment that maximises an individual's labour market potential in response to an increasing demand for skilled labour in modernising economies. This position has been reinforced by studies correlating education with increased adult earnings (e.g. Fink & Peet, 2014; Psacharopoulos & Patrinos, 2002), a fact that has been used to justify the financing of

education by private individuals rather than the state (Bathmaker, Ingram, & Waller, 2013). Around the world, these anticipated economic returns to education appear to incentivise increasingly high levels of investment in education, from families in Tanzania struggling to send their children to secondary school, to families in the UK striving to send their children to a Russell Group university. However, these economic returns may have been exaggerated through the hegemony of 'developmental idealism' (Thornton, 2001), meaning that investment in education has more to do with its social value, rather than any tangible economic payoff.

During this study, I was surprised by the high value placed on education. Given the very low academic achievement levels in Tanzania, and the lack of formal employment opportunities, I had thought that education might be spoken about less favourably. Yet my general impression was that the great majority of families wanted their children to attend and succeed at school, and that while people did complain about the practicalities of financing and supporting their children's schooling, achieving secondary education was the local ideal. Focus groups indicated that parents' motivation for schooling was linked to their desire for a better life for their children, and for their children to support them later in life through a good job. Several adolescents stated that their motivation to pursue education was to gain respect and help their community, as well as getting access to jobs other than farming.

This finding echoes the results from another study done in the Iringa region of Tanzania, which also found very positive perceptions of education despite widespread poverty, low-quality schooling, and few youth employment opportunities (Lindsjö, 2017: 103-104). In that study and in this one, people strongly linked education to wealth, development, and an easier way of life. Since Tanzanian independence, education has been seen as an integral part of achieving economic development and national unity

(Nyerere, 1967). Many government offices display portraits of Tanzania's first president, 'Mwalimu' (Teacher) Julius Nyerere, and many schools have mottos such as 'Education is the key to life', or 'Education for development'. Studies in other developing countries also show similarly positive attitudes towards education that link schooling with economic development. Evidence from the Young Lives project, which follows two cohorts of children in Peru, Ethiopia, Vietnam and India, shows that families have high aspirations for their children's educational achievement, and that education is highly valued as a means to escape poverty (Morrow & Boyden, 2018). A study in Ethiopia found that children went to school in order to be a 'good person', to help provide for their family and community, and to help develop and support their country (Marshall, 2016).

However, the promised returns of prosperity and employment have not been seen by the majority of individuals who have received education in developing countries (Imoh, 2016; Marshall, 2016). Very few developing countries have economies capable of providing all the young people they educate with skilled jobs, and many children spend several years in school without gaining even very basic literacy or numeracy skills (Pritchett, 2013). Studies linking schooling to adult wages may overestimate the returns to education by ignoring the 'clustering' of traits which cause children to stay longer in school, who may attend higher quality schools, have greater innate ability, or come from families which have the social or financial capital to enable them to access economic opportunities (Bourdillon et al., 2015). During focus groups in this study, participants commented that even those who attained a secondary education would need family contacts to secure a job, or financial capital to start a business. The recent expansion of tertiary education in the UK provides an analogous case. Education policy has emphasised the 'graduate dividend' and the potential for a university education to promote social mobility for young people from working-class backgrounds. However,

qualitative studies among UK undergraduates found that a 'degree is not enough'; converting a university degree into a graduate-level job is competitive, requiring access to CV-enhancing internships, extra-curricular activities, and networks of contacts, which are not available to those from working-class backgrounds (Bathmaker et al., 2013; Tomlinson, 2008).

Formal education is part of the package of what Thornton (2001) refers to as 'developmental idealism'. This is the predominating view that a 'modern' society (i.e. one with the characteristics of societies in the global North; urbanised, democratised, industrialised, with a high degree of individual freedom and equality) is the ideal, and that modern family structures are necessary in order to achieve it. Over time, this has established a causal link between small, nuclear families that prioritise the education of their children, and socioeconomic development, overlooking the fact that the causality may run both ways. Some aspects of 'modern' society are necessary in order for the economic promise of education to be realised, while in the absence of state-provided health and social care, large families may remain beneficial. Developmental idealism, while based on flawed evidence, has been incredibly powerful in driving development agendas, and in changing people's attitudes and behaviour in developing countries (Thornton, 2001). For example, Watkins (2000) describes changes in attitudes towards family planning and fertility in a community in Kenya since the 1960s, with the use of modern contraception and limiting family size previously perceived to be 'foreign', but now being assimilated into local models of reproduction. Across sub-Saharan Africa, education is now intrinsically linked with socioeconomic development, and is the key element in a normal, 'good' childhood (Marshall, 2016).

Evolutionary models assume that parents invest in their children in order to maximise their chances of adult reproductive success, in turn improving their long-term fitness.

Why then do parents invest in education in contexts where it may not translate into economic and social success? It has been argued that it is a 'runaway' response to the increasingly high levels of investment perceived to be necessary to make a child competitive (Mace, 2007). In runaway sexual selection, preferences for certain traits can become exaggerated as individuals compete to demonstrate their genetic quality through a costly signal, for example the peacock's tail. While the tail itself does not enhance health, survival, or reproduction, if tails act as an honest 'costly signal' of underlying genetic quality, it is beneficial for peahens to always choose the male with the best tail, driving runaway selection for increasingly large and flamboyant tails (Fisher, 1930). In some ways, education could be thought of as a 'costly signal', indicating a modern, prestigious, potentially prosperous individual with a caring family. Once primary education is the norm, parents are incentivised to invest in secondary education, to give their child a competitive edge; then higher education; then violin lessons, ballet classes, and chess club. Therefore, while education may not be directly necessary to survival or reproduction, its use as an indicator of underlying social capital, ability, and wealth can favour increasingly exaggerated levels of parental investment, which in turn incentivise fertility limitation (Mace, 2007). This supports perspectives on fertility decline that emphasise the interconnectedness of economic and social drivers, and the ways in which the social transmission of norms may reinforce perceptions of economic payoffs (Snopkowski & Kaplan, 2014).

Given the high expectations placed on education, and the fact that these expectations are often not met, there is potential for disillusionment with schooling and a disinclination to invest, particularly in more rural areas where 'runaway' investment has not yet begun. Pomponio & Lancy (1986) describe this process in Papua New Guinea, where initial enthusiasm over remittances from a few educated children gave way to apathy when it became clear that not everyone receiving education would be able to

benefit. In Tanzania, the decline in enrolment during the 1980s has been linked to disillusion as educated individuals struggled to find work during the economic downturn (Burke & Beegle, 2004). In Kenya, Wellings (1982) has argued that students' and parents' aspirations are 'unrealistic and inappropriate', and should be managed and reduced to better reflect reality. However, this approach could potentially increase inequalities. High aspirations can lead to high achievements, and so the focus should instead be on better converting the high aspirations of those living in poverty into academic attainment that truly allows children to succeed (Tafere, 2014).

7.3. Implications for interventions

Education and children's work are common targets of development interventions. In this area, harmful children's work (i.e. work in hazardous conditions or for long hours; see Box 1 in Chapter 2) appears to be uncommon. However, this is not to say that the work being done by children does not impact their educational attainment, or reduce their opportunities to engage in other activities. There appear to be two main areas in which interventions could make a positive impact; firstly, addressing some of the issues with local schools reported to affect attendance and enrolment, and secondly, focusing on reducing the burden of domestic chores.

Where children's work is not directly harmful, interventions should not necessarily aim to reduce children's work. However, they should aim to ensure that children who work can still access schooling, and that this schooling is locally relevant, beneficial, and provides a positive experience for children (Morrow & Boyden, 2018). Findings from interviews with teachers and parents suggest that better dialogue between families and schools, for example through Parent Teacher Associations or Parent Support Groups, could provide a better support network for students. Additionally, a more flexible approach allowing half-time schooling and re-enrolment following drop out could help

those families relying on children's work to balance these competing needs (Morrow & Boyden, 2018). School feeding programmes, which have been shown to improve enrolment and attendance, could help to address the problem of hunger at school affecting children's learning (Jomaa, Mcdonnell, & Probart, 2011). Harsh punishments were mentioned by many focus group participants as a factor affecting school attendance, and so reducing the use of corporal punishment and supporting teachers to use more constructive disciplinary strategies could also help. There is also a pressing need to improve primary school infrastructure to reduce class sizes, prevent teacher absenteeism, and provide enough desks and books for children. Several local people commented that the government should focus more on improving existing primary schools, rather than abolishing secondary school fees, a policy introduced by President Magufuli in 2016. Language barriers were also said to discourage progression to secondary school. Allowing teaching in children's mother tongue, at least in primary school, and teaching secondary school in Swahili, could be an important way to boost academic achievement in Tanzania, and avoid ostracising children from ethnic minorities (Brock-Utne, 2007).

Household chores, done predominantly by girls, are still vital to household functioning in this area, and the demand for girls' work does not appear to reduce as much with modernisation compared with the demand for agricultural work. In combining chores with school, girls sacrifice leisure time, and may also have less time for studying at home, or be more tired at school, negatively impacting their academic attainment. Addressing the structural factors that lead to high burdens of domestic chores, including providing better water and electricity access, could help to reduce girls' workload (Morrow & Boyden, 2018). More broadly, many development programmes have targeted improved school enrolment for girls. While this is important, and has been effective in equalising educational investment between girls and boys, it may now be

time to focus more broadly on challenging gender stereotypes and promoting equality in domestic work responsibilities as well as in education.

It may also be time for a more critical consideration of the current model of education. While development goals have focused primarily on achieving 'schooling', that is improving enrolment and attendance, there has been little focus on 'learning goals', in terms of what skills children actually gain through enrolling in and attending school. In many developing countries, the quality of learning outcomes appear to be very low, meaning that children may spend several years in school, yet emerge with very few actual skills (Pritchett, 2013). Additionally, the consequences of reduced leisure time have not really been examined. Formal education could potentially be linked to the epidemic of childhood obesity, anxiety, loss of self-esteem, and mental health issues faced by many countries in the global North because of its lack of physical activity, limited scope for developing creative or problem-solving skills, and emphasis on competition and qualifications. Additionally, the loss of important cultural heritage, language skills, and traditional crafts and skills has been increasingly recognised to be a problem associated with increasing globalisation, with damaging consequences for cultural and biodiversity (Reyes-García et al., 2010; UNESCO, 2001). While many previously oppressed native languages are now taught in schools in recognition of their role in cultural heritage and identity, for example Irish and Welsh in the UK, these retrospective approaches cannot reinstate these languages as mother-tongues (Romaine, 2007). Rather than merely exporting 'more of the same' to developing countries, it would surely be better to address some of these issues and consider which elements could be improved or adapted to provide the best possible opportunities for children, and avoid some of the problems now facing education systems in the North.

7.4. Reflections and limitations

7.4.1. Data limitations

A number of biases could have affected the selection of our final sample. In terms of households, the main reason that households could not be interviewed was because they had moved away (Table 2.1, p.54); additionally, our sampling frame would have excluded any households that had moved into the area since the last round of the DSS, approximately six months prior to the data collection for this study. Therefore, this means that the sample may underrepresent more mobile households, which may have different patterns of schooling and work for children. The small number of households who refused to participate may also have biased the sample, though there did not seem to be a particular type of household that refused.

The follow up rate for children was quite high, but the final sample does not include children who were away at boarding school, or who were travelling or living away from home (Table 2.1, p.54). Therefore, particularly among older children, this sample is skewed towards those who are either still attending a local government school, or still living at home. It therefore does not tell us about young people who are attending boarding school, who have migrated in search of work, or who have married and moved away. Additionally, we only asked about work on a previous weekday. When we visited households on Saturdays, children were often doing chores or helping with agricultural work. It is therefore likely that the overall contribution of children's work is underestimated here, as households may strategically wait for weekends or school holidays to make use of their help. The agricultural seasons could also have influenced our results, as children may face greater trade-offs during busy agricultural periods. However, it seems as though the main busy seasons correspond with school holidays, as the rice harvest falls during the summer holiday, and land preparation generally occurs

at the end of the year during the winter holiday. There is some indication that local schools adjust the timing of holidays during busy agricultural periods; when I carried out the pilot study, the local school had stopped for the holidays a week early because families were preparing their fields for planting. However, because one of the objectives of this study was to look at trade-offs between work and school, collecting data on weekday work appeared to be the best approach. Therefore, the final sample best reflects everyday time allocation for children and young adults still living at home, but cannot speak to outcomes for sub-groups living away from their household.

Relying on self-report data also introduces the potential for bias. Despite efforts to assure confidentiality, participants may still have been reluctant to disclose school absenteeism and non-enrolment. When debriefing with fieldworkers, they said they thought some households reported children as enrolled when children weren't attending school regularly. We also had a couple of instances of children telling us that they had attended school the previous day when we knew that they had not, and a few parents reported that children skipped school without them knowing. Equally there were also households in which guardians and children were open about not being enrolled. In terms of the work data, we asked only about half-hour increments of time, and so may have missed activities taking a smaller amount of time. We also did not probe for simultaneous activities, which is likely to underestimate the occurrence of passive childcare, as quite often crowds of young children would be present while older individuals were engaged in other activities. However, as this was not a key question of this study, I decided not to increase the interview time through enquiring more about this, particularly as it is difficult to determine at what point passive presence becomes 'care', and I felt it might be difficult to translate this concept. Finally, reporting bias may vary by age or gender; for example, older children may be more sensitive to social desirability bias, and hence be more likely to mis-report school attendance. Girls are

socialised more strongly into obedience than boys in this context; this could affect response bias in either direction, either making girls more likely to conform to social desirability bias (hence reporting greater time spent in education or chores, and less in leisure time), or making them more likely to report truthfully. Further research on how response bias varies according to age and gender would be interesting, ideally using an observational method such as focal follows, and also interviewing children about what they perceive to be the social norms around time allocation.

This study was carried out in the context of an existing demographic surveillance site (DSS). While this was enormously helpful in terms of having a sampling frame and trained fieldworkers already available, it also meant compromising on a few different measures in order to fit with existing definitions. The DSS household definition of people living under one roof and eating from the same pot was therefore used (Kishamawe et al., 2015). This is a common household definition used in demographic surveys, but has limitations, in part because the concept of the household is subject to different 'cultures of understanding' by those administering surveys and using the data (Randall et al., 2011). While my presence during data collection, and discussions with fieldworkers about the definitions of a household should hopefully have minimised these misunderstandings, issues still arise. Wealth, food security, and livelihood data were collected at a household level, but this assumes that individuals within a household have equal access to those resources. This model of a household also struggles to capture households with members who move away and return periodically, or members who contribute resources but live elsewhere, or members of multiple households, for example polygynous men who may live with one wife but support multiple households. This household flexibility may have important consequences for how households deal with shocks, and allocate labour and resources (Randall & Coast, 2014). I have assumed here that a household's resources are a good proxy for resources, both material and

social support, available to children, but this assumption may not hold if children receive investment from elsewhere, or if they have responsibilities to other family members in terms of contributing to farm work (Madhavan, Clark, et al., 2017). Using child-centric methods, for example asking about their relatedness to other household members, and asking who paid their school fees, could have been a more valid approach, though the increase in time and training required were not possible during this research project.

7.4.2. Theoretical considerations

While I believe in the value and necessity of interdisciplinary research, doing it is not without challenges and limitations. As part of an evolutionary demography research group, I have been challenged to apply theoretical frameworks from behavioural ecology to demographic and social behaviour, and to consider theory from other branches of the social sciences. In many cases, hypotheses derived from an evolutionary framework do not differ from those derived from other theories, for example economic theory. However, the benefits of an evolutionary approach to studying human behaviour include a clear definition of what individuals are hypothesised to maximise (namely fitness), the emphasis on the importance of context, and understanding how constraints alter the payoffs to different behaviours, as well as its potential to unify research across different contexts (Nettle et al., 2013). This research has demonstrated the value of an evolutionary framework in producing testable hypotheses regarding parental investment and children's time allocation. In an area with research from multiple disciplines, I believe that this study has effectively and originally combined considerations of gender, household livelihood, and local context and cultural norms. However, the high value of education discussed above suggests that both economic and evolutionary approaches must go further in their consideration of how changing cultural norms may influence behaviour. Recent work within HBE on the demographic transition has better integrated both economic and social models of behaviour, but this remains

an area where more research could be done (Shenk et al., 2013; Snopkowski & Kaplan, 2014). I propose that increased collaboration between HBE and the field of cultural evolution would provide a powerful opportunity to examine economic, demographic, and social influences on behaviour, leading to a deeper understanding of parental investment in education and children's time allocation, and how and why these are changing.

Despite the growing use of an evolutionary framework in research on human behaviour, it is far less common to use human research to inform evolutionary theory and to add to our understanding of biological fundamentals (Briga et al., 2017). This is partly due to practical problems such as the long generation times and strong ethical constraints on experimental studies, and more empirical concerns over the extent of human exceptionalism, including the role of cultural factors, and the extensively modified environment we inhabit (Brosnan & Postma, 2017). However, recently researchers have highlighted the past and potential contributions of human research to evolutionary biology through the abundance and availability of high-quality, historical data on demography, genes, physiology, and behaviour, and the unique opportunity to ask research subjects about their motivations and beliefs (Brosnan & Postma, 2017; Sterelny, 2017). My own project was not set up with the intention to provide insights to inform evolutionary biology due to its focus on the uniquely human phenomenon of formal education. However, Sterelny (2017) suggests that humans' exceptionalism in certain areas can be used to consider why we do not see these traits, or why these traits are not so pronounced, in other species. Thus, research on parental investment and juvenile skill acquisition, which are both seen at extreme levels in humans, could help to investigate whether, and if so under what circumstances, similar traits are seen in other species which also have social learning, tool use and complex social systems, for example chimpanzees and bonobos, cetaceans, and elephants.

Quantitative data and statistical analysis are now frequently used to evidence to test theory and inform policy within the social sciences. However, in attempting to quantify behaviour, and its associated costs and benefits, attention can be drawn away from the influence of social transmission, and individual personalities and motivations. It is impossible to reduce an individual, their life history, social and material environment, and hopes for the future, into a regression model. Additionally, the distribution of many variables used as predictors is 'lumpy', in that certain traits clump together and interact with one another, meaning that social behaviour is highly complex and interconnected. These facts violate many of the assumptions of regression models (Johnson-Hanks, Morgan, Bachrach, & Kohler, 2006). By including interviews and focus groups, learning (an albeit limited amount of) Swahili, and by being present during the process of data collection, I hoped to build a broader picture of this social complexity. However, the data from the qualitative and quantitative methods are presented separately, and were used to inform different research aims, rather than being integrated to provide triangulation. The analysis for Chapter 4 was conducted before the qualitative results had been transcribed and translated, and so the differences between village and town in terms of perceived benefits of education were not drawn out in as much detail. Additionally, issues of age order and fostering were not addressed during qualitative work, and so again there is little qualitative detail included in Chapters 5 and 6. This was my first experience of conducting qualitative work, and I learned important lessons from the interviews and focus groups that I will apply in future to better integrate quantitative and qualitative methods, and to use qualitative data in a more informative way. Thus while acknowledging that it is imperfect, I hope that this study can help in demonstrating the value of interdisciplinary research, and the ways in which evolutionary approaches can contribute to our understanding of social behaviour.

Another limitation of this analysis is that all three quantitative chapters draw on the same dataset, thus inflating the rate of Type I errors and increasing the possibility that some of the statistically significant results presented are in fact spurious. This limitation is not often mentioned but is pertinent to many anthropological and demographic studies that conduct multiple analyses on the same datasets, particularly those using publicly available datasets such as the Demographic and Health Surveys. Many of the main results – those relating to gender, town or village residence, girls' age order, and living with distant kin – have strong evidence against the null hypothesis, indicating that there is less concern that these results are spurious. Other results with more marginal or weaker evidence against the null hypothesis, and those with smaller sample sizes such as those relating to foster children, may need to be interpreted with more caution, though this is highlighted in the specific results sections. In the future this issue could be rectified through using corrections for multiple hypothesis testing where appropriate, for example by controlling the family-wise error rate or the false discovery rate.

7.4.3. Dissemination

The research presented in this dissertation has been presented at several conferences over the past three years, including the Institut National d'Études Démographiques (2016), the European Human Behaviour and Evolution Association (2017), the Human Behaviour and Evolution Society (2017 and 2018), and the International Union for the Scientific Study of Population (2017). Additionally, I gave research seminars at the National Institute of Medical Research in Mwanza, at the start of fieldwork to introduce the project, and on a return visit a year after the end of fieldwork in order to present initial findings. During this return visit I also had meetings with the village chairpeople in both Kisesa and Welamasonga in which I gave feedback on some of the key findings, and prepared a report for the District Education Officer, to communicate descriptive statistics regarding enrolment and children's work, and to highlight some of the

challenges associated with education locally that were described during qualitative interviews. Throughout fieldwork I also wrote an online blog about my experiences and project in order to make my research accessible to a wider audience (https://nobutyesbutequally.wordpress.com/).

7.4.4. Future research

In addition to some of the suggestions discussed above in section 7.2, a number of areas would have been interesting to expand on in this study had time or budget constraints not been a factor. I focused on children's time allocation, and on substitution between children within households. However, schooling and changing livelihoods are also likely to alter adults' time use, and there may be substitution of work between parents and their children. In the attitude questions, many people agreed that they have to work harder when children are attending school (Figure 3.1, p.84). Collecting time use data for both adult and child members of a household, to investigate how they influence each other, would provide a better picture of how households balance work requirements. Future research could also focus on collecting data on children's actual educational attainment, for example literacy and numeracy skills, and language comprehension. While studies frequently collect data on schooling outcomes in line with development goals, very few developing countries collect systematic data on learning outcomes (Pritchett, 2013). Linking these outcomes with investment would provide a more tangible indicator of embodied capital. Longitudinal data on children's time allocation would also be a useful way of expanding this research, in order to better establish causal links between work and education at younger ages, and academic, economic, and social outcomes later in life.

7.5. Conclusions

In transitioning contexts, individuals face complex decisions regarding the best ways to achieve success and well-being for themselves and their families in a rapidly changing environment. In this thesis I demonstrate the importance of children's work in shaping education decisions, and also the flexibility of families in responding to the increased costs of education. Gender continues to be a hugely important dimension shaping children's lives and opportunities, and a more nuanced consideration of its impact is necessary to move towards true equality. Improving the quality of education, particularly ensuring it gives children tangible skills relevant to the local context, and reducing the burden of chores for rural households, should be areas of prime concern for interventions.

In terms of fertility decline, education and children's work have occupied central roles in evolutionary and economic models involving quantity-quality trade-offs. However, simple causal links between education and fertility are unlikely, and these trade-offs can only tell a small part of the story. Education not only imparts skills and affects people's future livelihoods, it also has moral and status implications which augment its value beyond the purely economic, and muddy its association with other outcomes such as fertility and health. Many stereotypes, assumptions and morals surround the study of education and children's work, yet these have been largely unquestioned in the export of formal education worldwide. Research and policy should be more explicit about these assumptions, with a particular critical focus on the unintended consequences of the process of modernisation and demographic change.

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9. APPENDICES

9.1. Survey instruments

9.1.1. Household form

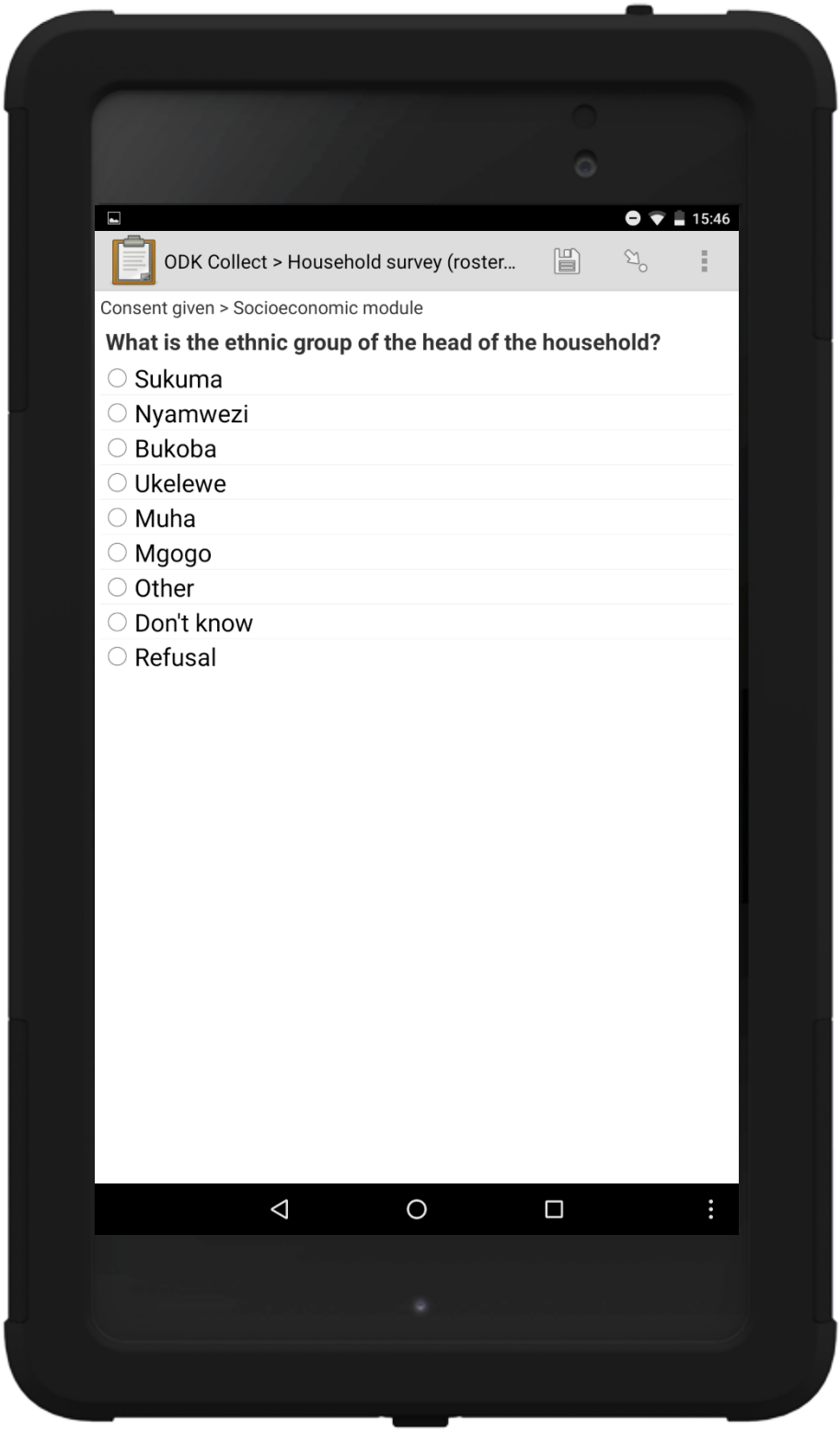
9.1.1.1. Example of household ID sheet and roster

Kaya:	40307216	**Tarehe:**	
Balozi:	40307 Yohana Kazungu	**Matokeo:**	

New line #	DSS line #	Jina	M/F	Umri	Mkuu?	Amehama
	1	Mtasi Cleofasi	M	41	X	
	2	Lucia Robert	F	34	0	
	3	Anastazia Mtasi	F	14	0	
	4	Mgisha Mtasi	M	11	0	
	5	Mjuni Mtasi	M	4	0	
	6	Rachael Mtasi	F	3	0	

Mtoto #	Fomu ya shughuli	Sababu	Notes

9.1.1.2. Screenshot of household survey in ODK Collect software



9.1.1.3. Household form

Household survey

start	Date
village	Village
village	1 ☐ Kisesa
village	2 ☐ Welamasonga
interviewer	Who is present for this interview?
interviewer	1 ☐ Sophie
interviewer	2 ☐ Holo
	3 ☐ Pascazia
interviewer	4 ☐ Vicky
interviewer	96 ☐ Other
hh_id	Enter the household ID number

Read consent statement

consent_statement

We are researchers working with Tazama, and we are here to learn about the lives of children and young people in this community. This research focuses on learning more about the activities children and young people do, like farmwork, helping at home, childcare, playing, and going to school. The information we collect will help us to better understand how children divide their time between school and other activities, and some of the problems children in this community face in attending school.

Your household was selected to be interviewed because you have resident children aged between 7 and 19. The questions usually take about an hour. After we have spoken to you, we would like to briefly interview the children in this household about their activities too. You can decide whether you are happy for us to do so after the first part of the interview. Your name will not be used in my report, so we can describe what you think without anyone knowing that it is you. This means that what you say will be shared with other members of the research team, but I am not going to tell your family, or anybody in the community, what you tell me.

Your participation in this study is entirely voluntary. By that we mean that you may refuse or agree to participate and your decision will not benefit or harm you in any way. You don't have to be in the study, but we hope you will agree to answer the questions since your views are important. If I ask you any questions you don't want to answer, just let me know and I will go on to the next question, or you can stop the interview at any time.

Do you have any questions?

consent	Would you like to take part in this study?
yes_no_dk	1 ☐ Yes
yes_no_dk	2 ☐ No
signature	Your signature

note9 *If no:* Sorry for disturbing you, thank you for your time. If you would like more information about this study, you can ring the number on this sheet.

start_questions *If yes:* May I begin the questions now? Remember that you can just let me know if you don't want to continue once we have started.

Household roster

note2 Now we will list all the people in this household, starting with the head of the household.

Fill in one sheet for each household member and then ask:

Is there anybody we have not yet listed, such as young children, or children who are not the biological child of the head of the household?

Is there anybody else who is part of this household, even if they are living, working or studying elsewhere?

Now I am going to ask some questions about this household's characteristics.

land **Land owned or rented by household**

land_own Does anyone in the household own any land?

yes_no_dk 1 ☐ Yes
yes_no_dk 2 ☐ No
yes_no_dk 98 ☐ Don't know
yes_no_dk 99 ☐ Refusal

If yes:

land_own_ha How many acres of land are owned? ☐

land_own_use Is this land used for agriculture?

yes_no_dk 1 ☐ Yes
yes_no_dk 2 ☐ No
yes_no_dk 98 ☐ Don't know
yes_no_dk 99 ☐ Refusal

land_rent Does anyone in the household rent or borrow any land?

yes_no_dk 1 ☐ Yes
yes_no_dk 2 ☐ No
yes_no_dk 98 ☐ Don't know
yes_no_dk 99 ☐ Refusal

If yes:

land_rent_ha How many acres of land are rented or borrowed? ☐

land_rent_use Is this land used for agriculture?

yes_no_dk 1 ☐ Yes
yes_no_dk 2 ☐ No
yes_no_dk 98 ☐ Don't know
yes_no_dk 99 ☐ Refusal

land_crops What crops are cultivated?

crops	1	☐	Maize
crops	2	☐	Cassava
crops	3	☐	Rice
crops	4	☐	Beans
crops	5	☐	Small beans
crops	6	☐	Pulses
crops	7	☐	Tomatoes
crops	8	☐	Onions
crops	9	☐	Potatoes
crops	10	☐	Peppers
crops	11	☐	Mangoes
crops	12	☐	Bananas
crops	13	☐	Coconuts
crops	14	☐	Papaya
crops	96	☐	Other
crops	98	☐	Don't know
crops	99	☐	Refusal

crops_sell Does anyone sell any of the crops?

yes_no_dk	1	☐	Yes
yes_no_dk	2	☐	No
yes_no_dk	98	☐	Don't know
yes_no_dk	99	☐	Refusal

animals_number **Animals**

animals Does this household own any livestock, herds, other farm animals, or poultry?

yes_no_dk	1	☐	Yes
yes_no_dk	2	☐	No
yes_no_dk	98	☐	Don't know
yes_no_dk	99	☐	Refusal

If yes:

note4 How many of the following animals does this household own?

cows	Cows / cattle	
horses	Horses or donkeys	
goats	Goats	
ducks	Ducks	
chickens	Chickens	

animals_sell Does anyone sell any animal products or animals at market?

yes_no_dk	1	☐	Yes
yes_no_dk	2	☐	No
yes_no_dk	98	☐	Don't know
yes_no_dk	99	☐	Refusal

occupation **Occupations of household members**

business Does anyone in this household have a business or shop?

yes_no_dk 1 ☐ Yes
yes_no_dk 2 ☐ No
yes_no_dk 98 ☐ Don't know
yes_no_dk 99 ☐ Refusal

If yes:

business_type What type of business or shop?

shop 1 ☐ Shop
shop 2 ☐ Food stall
shop 3 ☐ Fundi
shop 4 ☐ Barbers
shop 5 ☐ Phone charging
shop 6 ☐ Shoe shining
shop 7 ☐ Petty trading
shop 8 ☐ Pikipiki driver
shop 96 ☐ Other
shop 98 ☐ Don't know
shop 99 ☐ Refusal

business_other Specify other business ☐

house **Household buildings and facilities**

tinroof Does your house have a tin roof?

yes_no_dk 1 ☐ Yes
yes_no_dk 2 ☐ No
yes_no_dk 98 ☐ Don't know
yes_no_dk 99 ☐ Refusal

If no:

roof What kind of roof does your house have?

roof 1 ☐ No roof
roof 2 ☐ Cement
roof 3 ☐ Tiles
roof 4 ☐ Grass
roof 96 ☐ Other
roof 98 ☐ Don't know
roof 99 ☐ Refusal

cementfloor Does your house have a cement floor?

yes_no_dk 1 ☐ Yes
yes_no_dk 2 ☐ No
yes_no_dk 98 ☐ Don't know
yes_no_dk 99 ☐ Refusal

If no:

floor What kind of floor does your house have?

floor	*1*	Earth / sand
floor	*2*	Wood
floor	*3*	Tiles
floor	*96*	Other
floor	*98*	Don't know
floor	*99*	Refusal

electricity Does your household have access to electricity?

yes_no_dk	*1*	Yes
yes_no_dk	*2*	No
yes_no_dk	*98*	Don't know
yes_no_dk	*99*	Refusal

If yes:

elec_public Is this public electricity (Tanesco) or private electricity?

electricity	*1*	Public (Tanesco)
electricity	*2*	Private
electricity	*98*	Don't know
electricity	*99*	Refusal

If no electricity:

lighting How do you usually light your house?

lighting	*1*	Hurricane lamp
lighting	*2*	Tin candle
lighting	*3*	Solar lamp
lighting	*4*	Candle
lighting	*96*	Other
lighting	*97*	None
lighting	*98*	Don't know
lighting	*99*	Refusal

water Does your household have a water source in their own plot?

yes_no_dk	*1*	Yes
yes_no_dk	*2*	No
yes_no_dk	*98*	Don't know
yes_no_dk	*99*	Refusal

If no:

water_time How long does it take to fetch water?

toilet What kind of toilet facility do members of your household usually use?

toilet	*1*	Pit latrine
toilet	*2*	Flush toilet
toilet	*3*	Flush toilet with sink
toilet	*96*	Other
toilet	*98*	Don't know
toilet	*99*	Refusal

fuel	What type of fuel does your household mainly use for cooking?	
fuel	*1*	☐ Electricity
fuel	*2*	☐ Gas
fuel	*3*	☐ Kerosene
fuel	*4*	☐ Charcoal
fuel	*5*	☐ Fire wood
fuel	*6*	☐ Residue / saw dust
fuel	*7*	☐ Animal dung
fuel	*96*	☐ Other
fuel	*98*	☐ Don't know
fuel	*99*	☐ Refusal
fuel_other	Please specify other kind of fuel	
cooking	Do you cook outside, in the house, or in a separate building?	
cooking	*1*	☐ In the house
cooking	*2*	☐ In a separate building
cooking	*3*	☐ Outdoors
cooking	*96*	☐ Other
cooking	*98*	☐ Don't know
cooking	*99*	☐ Refusal
buildings	How many buildings does your household have?	
rooms	How many rooms does your house have?	
assets_hh	**Household assets**	
note5	Does any member of this household have any of the following?	
chair	*1*	☐ Chair
sofa	*1*	☐ Sofa
cupboard	*1*	☐ Cupboard
bed	*1*	☐ Bedstead
net	*1*	☐ Mosquito net
panga	*1*	☐ Panga
phone	*1*	☐ Mobile phone
clock	*1*	☐ Clock
radio	*1*	☐ Radio
cherahani	*1*	☐ Sewing machine
bike	*1*	☐ Bicycle
pikipiki	*1*	☐ Motorcycle
tv	*1*	☐ Television
fridge	*1*	☐ Fridge / freezer
benki	*1*	☐ Bank account

foodinsecurity

Food security

note6

The next questions are about your household's food and meals during the past four weeks. Please answer for everyone in the household who regularly eats together.

foodinsecurity1

In the past four weeks, did you worry that your household would not have enough food?

yes_no_dk
1 ☐ Yes

yes_no_dk
2 ☐ No

yes_no_dk
98 ☐ Don't know

yes_no_dk
99 ☐ Refusal

If yes:

foodinsecurity1a

How often did this happen?

frequency
1 ☐ Rarely (once or twice in the past four weeks)

frequency
2 ☐ Sometimes (three to ten times in the past four weeks)

frequency
3 ☐ Often (more than ten times in the past four weeks)

frequency
98 ☐ Don't know

frequency
99 ☐ Refusal

foodinsecurity2

In the past four weeks, were you or any household member not able to eat the kinds of foods you preferred because of a lack of resources?

yes_no_dk
1 ☐ Yes

yes_no_dk
2 ☐ No

yes_no_dk
98 ☐ Don't know

yes_no_dk
99 ☐ Refusal

If yes:

foodinsecurity2a

How often did this happen?

frequency
1 ☐ Rarely (once or twice in the past four weeks)

frequency
2 ☐ Sometimes (three to ten times in the past four weeks)

frequency
3 ☐ Often (more than ten times in the past four weeks)

frequency
98 ☐ Don't know

frequency
99 ☐ Refusal

foodinsecurity3

In the past four weeks, did you or any household member have to eat a limited variety of foods due to a lack of resources?

yes_no_dk
1 ☐ Yes

yes_no_dk
2 ☐ No

yes_no_dk
98 ☐ Don't know

yes_no_dk
99 ☐ Refusal

If yes:

foodinsecurity3a

How often did this happen?

frequency
1 ☐ Rarely (once or twice in the past four weeks)

frequency
2 ☐ Sometimes (three to ten times in the past four weeks)

frequency
3 ☐ Often (more than ten times in the past four weeks)

frequency
98 ☐ Don't know

frequency
99 ☐ Refusal

foodinsecurity4	In the past four weeks, did you or any household member have to eat some foods that you really did not want to eat because of a lack of resources to obtain other types of food?
yes_no_dk	*1* ☐ Yes
yes_no_dk	*2* ☐ No
yes_no_dk	*98* ☐ Don't know
yes_no_dk	*99* ☐ Refusal
	If yes:
foodinsecurity4a	How often did this happen?
frequency	*1* ☐ Rarely (once or twice in the past four weeks)
frequency	*2* ☐ Sometimes (three to ten times in the past four weeks)
frequency	*3* ☐ Often (more than ten times in the past four weeks)
frequency	*98* ☐ Don't know
frequency	*99* ☐ Refusal
foodinsecurity5	In the past four weeks, did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food?
yes_no_dk	*1* ☐ Yes
yes_no_dk	*2* ☐ No
yes_no_dk	*98* ☐ Don't know
yes_no_dk	*99* ☐ Refusal
	If yes:
foodinsecurity5a	How often did this happen?
frequency	*1* ☐ Rarely (once or twice in the past four weeks)
frequency	*2* ☐ Sometimes (three to ten times in the past four weeks)
frequency	*3* ☐ Often (more than ten times in the past four weeks)
frequency	*98* ☐ Don't know
frequency	*99* ☐ Refusal
foodinsecurity6	In the past four weeks, did you or any household member have to eat fewer meals in a day because of lack of resources to get food?
yes_no_dk	*1* ☐ Yes
yes_no_dk	*2* ☐ No
yes_no_dk	*98* ☐ Don't know
yes_no_dk	*99* ☐ Refusal
	If yes:
foodinsecurity6a	How often did this happen?
frequency	*1* ☐ Rarely (once or twice in the past four weeks)
frequency	*2* ☐ Sometimes (three to ten times in the past four weeks)
frequency	*3* ☐ Often (more than ten times in the past four weeks)
frequency	*98* ☐ Don't know
frequency	*99* ☐ Refusal
foodinsecurity7	In the past four weeks, was there ever no food of any kind in your household because of lack of resources to get food?
yes_no_dk	*1* ☐ Yes
yes_no_dk	*2* ☐ No
yes_no_dk	*98* ☐ Don't know
yes_no_dk	*99* ☐ Refusal

If yes:

foodinsecurity7a How often did this happen?

frequency 1 ☐ Rarely (once or twice in the past four weeks)
frequency 2 ☐ Sometimes (three to ten times in the past four weeks)
frequency 3 ☐ Often (more than ten times in the past four weeks)
frequency 98 ☐ Don't know
frequency 99 ☐ Refusal

foodinsecurity8 In the past four weeks, did you or any household member go to sleep at night hungry because there was not enough food?

yes_no_dk 1 ☐ Yes
yes_no_dk 2 ☐ No
yes_no_dk 98 ☐ Don't know
yes_no_dk 99 ☐ Refusal

If yes:

foodinsecurity8a How often did this happen?

frequency 1 ☐ Rarely (once or twice in the past four weeks)
frequency 2 ☐ Sometimes (three to ten times in the past four weeks)
frequency 3 ☐ Often (more than ten times in the past four weeks)
frequency 98 ☐ Don't know
frequency 99 ☐ Refusal

foodinsecurity9 In the past four weeks, did you or any household member go a whole day and night without eating anything because there was not enough food?

yes_no_dk 1 ☐ Yes
yes_no_dk 2 ☐ No
yes_no_dk 98 ☐ Don't know
yes_no_dk 99 ☐ Refusal

If yes:

foodinsecurity9a How often did this happen?

frequency 1 ☐ Rarely (once or twice in the past four weeks)
frequency 2 ☐ Sometimes (three to ten times in the past four weeks)
frequency 3 ☐ Often (more than ten times in the past four weeks)
frequency 98 ☐ Don't know
frequency 99 ☐ Refusal

Attitudes

note7 I am going to read some things that people sometimes say, think or feel. Please think about whether it sounds like something you might say, think or feel. If it sounds a lot like you, please say 'Strongly agree'. If it sounds a bit like you, please say 'Agree'. If it sounds very unlike, or the opposite, of you, please say 'Strongly disagree'. If it doesn't really sound like you, please say 'Disagree'.

attitude_1 The nearest primary school provides a good quality education for children

agree 1 ☐ Strongly agree
agree 2 ☐ Agree
agree 3 ☐ Disagree
agree 4 ☐ Strongly disagree

attitude_2	Children have a responsibility to help their families
agree	*1* ☐ Strongly agree
agree	*2* ☐ Agree
agree	*3* ☐ Disagree
agree	*4* ☐ Strongly disagree
attitude_3	Going to school ensures you will get a good job
agree	*1* ☐ Strongly agree
agree	*2* ☐ Agree
agree	*3* ☐ Disagree
agree	*4* ☐ Strongly disagree
attitude_4	Education is important in considering whether someone would make a good husband or wife
agree	*1* ☐ Strongly agree
agree	*2* ☐ Agree
agree	*3* ☐ Disagree
agree	*4* ☐ Strongly disagree
attitude_5	If a family needs help at home, it is ok for a child to miss school
agree	*1* ☐ Strongly agree
agree	*2* ☐ Agree
agree	*3* ☐ Disagree
agree	*4* ☐ Strongly disagree
attitude_6	I respect people in my community who have had a good education
agree	*1* ☐ Strongly agree
agree	*2* ☐ Agree
agree	*3* ☐ Disagree
agree	*4* ☐ Strongly disagree
attitude_7	Working at home or on the farm gives children important skills
agree	*1* ☐ Strongly agree
agree	*2* ☐ Agree
agree	*3* ☐ Disagree
agree	*4* ☐ Strongly disagree
attitude_8	School isn't very useful for the sort of work people do in this village
agree	*1* ☐ Strongly agree
agree	*2* ☐ Agree
agree	*3* ☐ Disagree
agree	*4* ☐ Strongly disagree
attitude_9	It is difficult for children to balance school work with their household chores
agree	*1* ☐ Strongly agree
agree	*2* ☐ Agree
agree	*3* ☐ Disagree
agree	*4* ☐ Strongly disagree

attitude_10	Going to school is very important in order to be successful in this community
agree	*1* ☐ Strongly agree
agree	*2* ☐ Agree
agree	*3* ☐ Disagree
agree	*4* ☐ Strongly disagree
attitude_11	Boys benefit more from education than girls
agree	*1* ☐ Strongly agree
agree	*2* ☐ Agree
agree	*3* ☐ Disagree
agree	*4* ☐ Strongly disagree
attitude_12	It is better for a child to start working than to progress to secondary school
agree	*1* ☐ Strongly agree
agree	*2* ☐ Agree
agree	*3* ☐ Disagree
agree	*4* ☐ Strongly disagree
attitude_13	When children are at school, other household members have to do more work
agree	*1* ☐ Strongly agree
agree	*2* ☐ Agree
agree	*3* ☐ Disagree
agree	*4* ☐ Strongly disagree
attitude_14	I expect my children to support me financially when they are grown up
agree	*1* ☐ Strongly agree
agree	*2* ☐ Agree
agree	*3* ☐ Disagree
agree	*4* ☐ Strongly disagree
note8	**Thank you for answering these questions about your household. Now I would like to ask some further questions about the children aged between 7 and 19 in this household.**
note10	Record any comments you have about the interview.

9.1.1.4. Household head form

Household head

hh_id	Enter household ID number	
id_1	Enter ID number	
name_1	Enter first name	
age_1	What is [name]'s age?	

gender_1 Is [name] male or female?

gender_1 1 ☐ Female

gender_1 2 ☐ Male

hhh_yn Is [name] the head of the household?

hhh_yn 1 ☐ Yes

hhh_yn 2 ☐ No

If head of household is female:

hhh_female What is the main reason that the household has a female head?

hhh_female 1 ☐ Divorced / widowed

hhh_female 2 ☐ Polygynous marriage and husband lives in another household

hhh_female 3 ☐ Husband absent for long period e.g. working away

hhh_female 4 ☐ Husband in household but ill or otherwise incapacitated

hhh_female 96 ☐ Other

hhh_female 98 ☐ Don't know

hhh_female 99 ☐ Refusal

marital What is [name]'s marital status?

marital 1 ☐ Married (monogamous)

marital 2 ☐ Married (polygynous)

marital 3 ☐ Engaged

marital 4 ☐ Divorced / separated

marital 5 ☐ Widowed

marital 97 ☐ Never married

marital 98 ☐ Don't know

marital 99 ☐ Refusal

ed_level What is [name]'s highest level of education?

ed_level 1 ☐ Primary school

ed_level 2 ☐ Secondary school

ed_level 3 ☐ Technical / vocational training

ed_level 4 ☐ Higher education

ed_level 97 ☐ None

ed_level 98 ☐ Don't know

ed_level 99 ☐ Refusal

work What is [name]'s occupation?

work 1 ☐ Farmer
work 2 ☐ Trader
work 3 ☐ Professional
work 4 ☐ Driver
work 5 ☐ Fundi (skilled manual work)
work 6 ☐ Unskilled labourer
work 7 ☐ Fishing
work 8 ☐ Studying
work 96 ☐ Other
work 97 ☐ None
work 98 ☐ Don't know
work 99 ☐ Refusal

religion What is [name]'s religion?

religion 1 ☐ Muslim
religion 2 ☐ Roman Catholic
religion 3 ☐ Other Established Christian
religion 4 ☐ Traditional
religion 5 ☐ No religion
religion 96 ☐ Other
religion 98 ☐ Don't know
religion 99 ☐ Refusal

ethnicity What is [name]'s ethnic group?

ethnicity 1 ☐ Sukuma
ethnicity 2 ☐ Nyamwezi
ethnicity 3 ☐ Bukoba
ethnicity 4 ☐ Ukelewe
ethnicity 5 ☐ Muha
ethnicity 6 ☐ Mgogo
ethnicity 96 ☐ Other
ethnicity 98 ☐ Don't know
ethnicity 99 ☐ Refusal

9.1.1.5. Household member (aged 20+) form

member **Household member**

hh_id Enter household ID number

id Enter ID number

name Enter first name

age What is [name]'s age?

gender Is [name] male or female?

1 ☐ Female
2 ☐ Male

rs What is [name]'s relationship to the head of the household?

1 ☐ Husband or wife
2 ☐ Son or daughter
3 ☐ Grandchild
4 ☐ Sibling (full sibling)
5 ☐ Sibling (half-sibing)
6 ☐ Niece or nephew
7 ☐ Other relative
8 ☐ Other non-relative
98 ☐ Don't know
99 ☐ Refusal

ed_level What is [name]'s highest level of education?

1 ☐ Primary school
2 ☐ Secondary school
3 ☐ Technical / vocational training
4 ☐ Higher education
97 ☐ None
98 ☐ Don't know
99 ☐ Refusal

work What is [name]'s occupation?

1 ☐ Farmer
2 ☐ Trader
3 ☐ Professional
4 ☐ Driver
5 ☐ Fundi (skilled manual work)
6 ☐ Unskilled labourer
7 ☐ Fishing
8 ☐ Studying
96 ☐ Other
97 ☐ None
98 ☐ Don't know
99 ☐ Refusal

9.1.2. Child family form

	Child family form
note1	We would like to ask you some questions about [name of child].
background	**Background details**
hh_id	Enter the household ID number
respondent	Who is the respondent for this interview?
respondent	*1* ☐ Mother
respondent	*2* ☐ Father
respondent	*3* ☐ Grandmother
respondent	*4* ☐ Grandfather
respondent	*5* ☐ Other relative
respondent	*6* ☐ Other non-relative
name	Enter child's first name as it appears on the household roster
id_child	Enter the child's ID number
birthdate	What is [name]'s birthdate?
already	Have you already completed a survey for a full sibling of [name]?
yes_no	*1* ☐ Yes
yes_no	*2* ☐ No
	If yes, enter ID number and go to 'Number of siblings'. If no, complete 'Information about child's parents'.
already_id	Enter the ID number of the full sibling
parents	**Information about child's parents**
mother	Is [name]'s natural mother alive?
yes_no_dk	*1* ☐ Yes
yes_no_dk	*2* ☐ No
yes_no_dk	*98* ☐ Don't know
yes_no_dk	*99* ☐ Refusal
mother_resident	Is [name]'s natural mother resident in household?
yes_no_dk	*1* ☐ Yes
yes_no_dk	*2* ☐ No
yes_no_dk	*98* ☐ Don't know
yes_no_dk	*99* ☐ Refusal
mother_age	What is [name]'s mother's age?

id_mum	Enter the mother's ID number	
mother_job	What is the main occupation of [name]'s mother?	
occupation	*1* ☐ Farmer	
occupation	*2* ☐ Trader	
occupation	*3* ☐ Professional	
occupation	*4* ☐ Driver	
occupation	*5* ☐ Skilled manual worker	
occupation	*6* ☐ Unskilled labourer	
occupation	*7* ☐ Fishing	
occupation	*8* ☐ Fundi	
occupation	*9* ☐ Studying	
occupation	*96* ☐ Other	
occupation	*97* ☐ None	
occupation	*98* ☐ Don't know	
occupation	*99* ☐ Refusal	
mother_job_other	Please specify other occupation	
mother_ed_level	What is the highest level of education [name]'s mother has attended?	
ed_level	*1* ☐ Primary school	
ed_level	*2* ☐ Secondary school	
ed_level	*3* ☐ Technical / vocational training	
ed_level	*4* ☐ Higher education	
ed_level	*97* ☐ None	
ed_level	*98* ☐ Don't know	
ed_level	*99* ☐ Refusal	
mother_ed_level_other	Please specify other level of education	
mother_ed_grade	What is the highest school grade [name]'s mother has completed?	
ed_grade	*-1* ☐ Pre-school / nursery	
ed_grade	*1* ☐ Standard 1	
ed_grade	*2* ☐ Standard 2	
ed_grade	*3* ☐ Standard 3	
ed_grade	*4* ☐ Standard 4	
ed_grade	*5* ☐ Standard 5	
ed_grade	*6* ☐ Standard 6	
ed_grade	*7* ☐ Standard 7	
ed_grade	*8* ☐ Form 1	
ed_grade	*9* ☐ Form 2	
ed_grade	*10* ☐ Form 3	
ed_grade	*11* ☐ Form 4	*97* ☐ None
ed_grade	*12* ☐ Form 5	*98* ☐ Don't know
ed_grade	*13* ☐ Form 6	*99* ☐ Refusal

mother_marital	What is [name]'s mother's current marital status?	
marital	*1*	Married (monogamous)
marital	*2*	Married (polygynous)
marital	*3*	Engaged
marital	*4*	Divorced / separated
marital	*5*	Widowed
marital	*97*	Never married
marital	*98*	Don't know
marital	*99*	Refusal
	If mother is married polygynously:	
wife	Is [name]'s mother a first wife or a junior wife?	
wife	*1*	First wife
wife	*2*	Junior wife
wife	*98*	Don't know
wife	*99*	Refusal
father	Is [name]'s natural father alive?	
yes_no_dk	*1*	Yes
yes_no_dk	*2*	No
yes_no_dk	*98*	Don't know
yes_no_dk	*99*	Refusal
father_resident	Is [name]'s natural father resident in household?	
yes_no_dk	*1*	Yes
yes_no_dk	*2*	No
yes_no_dk	*98*	Don't know
yes_no_dk	*99*	Refusal
father_age	What is [name]'s father's age?	
id_dad	Enter the father's ID number	
father_job	What is the main occupation of [name]'s father?	
occupation	*1*	Farmer
occupation	*2*	Trader
occupation	*3*	Professional
occupation	*4*	Driver
occupation	*5*	Skilled manual worker
occupation	*6*	Unskilled labourer
occupation	*7*	Fishing
occupation	*8*	Fundi
occupation	*9*	Studying
occupation	*96*	Other
occupation	*97*	None
occupation	*98*	Don't know
occupation	*99*	Refusal

father_job_other	Please specify other occupation	
father_ed_level	What is the highest level of education [name]'s father has attended?	
ed_level	*1*	Primary school
ed_level	*2*	Secondary school
ed_level	*3*	Technical / vocational training
ed_level	*4*	Higher education
ed_level	*97*	None
ed_level	*98*	Don't know
ed_level	*99*	Refusal
father_ed_level_other	Please specify other level of education	
father_ed_grade	What is the highest school grade [name]'s father has completed?	
ed_grade	*-1*	Pre-school / nursery
ed_grade	*1*	Standard 1
ed_grade	*2*	Standard 2
ed_grade	*3*	Standard 3
ed_grade	*4*	Standard 4
ed_grade	*5*	Standard 5
ed_grade	*6*	Standard 6
ed_grade	*7*	Standard 7
ed_grade	*8*	Form 1
ed_grade	*9*	Form 2
ed_grade	*10*	Form 3
ed_grade	*11*	Form 4
ed_grade	*12*	Form 5
ed_grade	*13*	Form 6
ed_grade	*97*	None
ed_grade	*98*	Don't know
ed_grade	*99*	Refusal
father_marital	What is [name]'s father's current marital status?	
marital	*1*	Married (monogamous)
marital	*2*	Married (polygynous)
marital	*3*	Engaged
marital	*4*	Divorced / separated
marital	*5*	Widowed
marital	*97*	Never married
marital	*98*	Don't know
marital	*99*	Refusal

sibs

Number of siblings

mother_siblings

Are there any children of [name]'s mother who do not have the same father as [name]?

yes_no_dk *1* ☐ Yes
yes_no_dk *2* ☐ No
yes_no_dk *98* ☐ Don't know
yes_no_dk *99* ☐ Refusal

mother_siblings_1 How many girls older than [name]? ☐

mother_siblings_2 How many boys older than [name]? ☐

mother_siblings_3 How many girls younger than [name]? ☐

mother_siblings_4 How many boys younger than [name]? ☐

father_siblings

Are there any children of [name]'s father who do not have the same mother as [name]?

yes_no_dk *1* ☐ Yes
yes_no_dk *2* ☐ No
yes_no_dk *98* ☐ Don't know
yes_no_dk *99* ☐ Refusal

father_siblings_1 How many girls older than [name]? ☐

father_siblings_2 How many boys older than [name]? ☐

father_siblings_3 How many girls younger than [name]? ☐

father_siblings_4 How many boys younger than [name]? ☐

siblings

Does [name] have any siblings with whom they share the same mother and father?

yes_no_dk *1* ☐ Yes
yes_no_dk *2* ☐ No
yes_no_dk *98* ☐ Don't know
yes_no_dk *99* ☐ Refusal

sisters_older How many older sisters does [name] have? ☐

brothers_older How many older brothers does [name] have? ☐

sisters_younger How many younger sisters does [name] have? ☐

brothers_younger How many younger brothers does [name] have? ☐

education	**Education**
ed_current	Is [name] enrolled in school during the current school year?
yes_no_dk	*1* ☐ Yes
yes_no_dk	*2* ☐ No
yes_no_dk	*98* ☐ Don't know
yes_no_dk	*99* ☐ Refusal
	If currently enrolled:
ed_grade	During this school year, what grade is [name] attending?
ed_grade	*-1* ☐ Pre-school / nursery
ed_grade	*1* ☐ Standard 1
ed_grade	*2* ☐ Standard 2
ed_grade	*3* ☐ Standard 3
ed_grade	*4* ☐ Standard 4
ed_grade	*5* ☐ Standard 5
ed_grade	*6* ☐ Standard 6
ed_grade	*7* ☐ Standard 7
ed_grade	*8* ☐ Form 1
ed_grade	*9* ☐ Form 2
ed_grade	*10* ☐ Form 3
ed_grade	*11* ☐ Form 4
ed_grade	*12* ☐ Form 5
ed_grade	*13* ☐ Form 6
ed_grade	*97* ☐ None
ed_grade	*98* ☐ Don't know
ed_grade	*99* ☐ Refusal
	If not currently enrolled:
school_ever	Has [name] ever attended school?
yes_no_dk	*1* ☐ Yes
yes_no_dk	*2* ☐ No
yes_no_dk	*98* ☐ Don't know
yes_no_dk	*99* ☐ Refusal
	If not currently enrolled, but has attended school:
ed_grade_completed	What is the highest school grade [name] has completed?
ed_grade	*-1* ☐ Pre-school / nursery
ed_grade	*1* ☐ Standard 1
ed_grade	*2* ☐ Standard 2
ed_grade	*3* ☐ Standard 3
ed_grade	*4* ☐ Standard 4
ed_grade	*5* ☐ Standard 5
ed_grade	*6* ☐ Standard 6
ed_grade	*7* ☐ Standard 7
ed_grade	*8* ☐ Form 1
ed_grade	*9* ☐ Form 2
ed_grade	*10* ☐ Form 3
ed_grade	*11* ☐ Form 4
	12 ☐ Form 5
	13 ☐ Form 6
	97 ☐ None
	98 ☐ Don't know
	99 ☐ Refusal

If currently enrolled:

school_yesterday Did [name] go to school yesterday?

yes_no_dk *1* ☐ Yes
yes_no_dk *2* ☐ No
yes_no_dk *98* ☐ Don't know
yes_no_dk *99* ☐ Refusal

childconsent Thank you for answering these questions about [name]. We would also like to ask [name] some questions about their activities. Would you be happy for us to speak to [name]?

yes_no_dk *1* ☐ Yes
yes_no_dk *2* ☐ No

childavailable Is [name] at home at the moment?

yes_no_dk *1* ☐ Yes
yes_no_dk *2* ☐ No
yes_no_dk *98* ☐ Don't know
yes_no_dk *99* ☐ Refusal

where Where is [name] at the moment?

where *1* ☐ School and returns each day
where *2* ☐ Working and returns each day
where *3* ☐ Boarding school
where *4* ☐ Working away
where *5* ☐ Visiting or staying in another place
where *96* ☐ Other
where *98* ☐ Don't know
where *99* ☐ Refusal

note2 Thank you for your time.

note3 Record any comments you have about the interview.

9.1.3. Child time allocation interview form

9.1.3.1. Interview form

	Child interview form
consent_statement	We are researchers working with Tazama, and we are here to learn about the lives of children in this community. We are especially interested in the different activities that children and young people do, such as working and going to school. The information we collect will help us to better understand how children divide their time between school and other activities, and some of the problems children in this community face in attending school. We will ask you some questions about school and work, and the time you have spent doing different activities. The questions take about 20 minutes. Your name will not be used in my report, so we can describe what you think without anyone knowing that it is you. This means that what you say will be shared with other members of the research team, but I am not going to tell your family or anybody in the community what you tell me. You don't have to be in the study, but we hope you will agree to answer the questions since your views are important. This is not a test, so there are no right or wrong answers! If I ask you any question you don't want to answer, just let me know and I will go on to the next question, or you can stop the interview at any time. Do you have any questions?
consent *yes_no* *yes_no*	Would you like to take part in this study? *1* ☐ Yes *2* ☐ No
start_questions	May I begin the questions now? Remember that you can just let me know if you don't want to continue once we have started.
background	**Background details**
hh_id	Enter the household ID number
id_child	Enter the child's ID number

work	**Child's work**
note1	These questions are about any work activities that you do, or help other people to do, maybe at the weekend or after school.
farm	Have you ever done farmwork?
yes_no_dk	*1* ☐ Yes
yes_no_dk	*2* ☐ No
yes_no_dk	*98* ☐ Don't know
yes_no_dk	*99* ☐ Refusal

	If yes:
farm_age	How old were you when you did farmwork for the first time? *If respondent does not know, enter 998*
farm_pay	Have you ever done farm work in exchange for money or goods?
yes_no_dk	*1* ☐ Yes
yes_no_dk	*2* ☐ No
yes_no_dk	*98* ☐ Don't know
yes_no_dk	*99* ☐ Refusal
farm_week	In the past week, how many hours have you spent doing farm work? *If respondent does not know, enter 998*
herd	Have you ever herded goats or cattle?
yes_no_dk	*1* ☐ Yes
yes_no_dk	*2* ☐ No
yes_no_dk	*98* ☐ Don't know
yes_no_dk	*99* ☐ Refusal
	If yes:
herd_age	How old were you when you herded for the first time? *If respondent does not know, enter 998*

herd_pay		Have you ever herded goats or cattle in exchange for money?
yes_no_dk	*1*	☐ Yes
yes_no_dk	*2*	☐ No
yes_no_dk	*98*	☐ Don't know
yes_no_dk	*99*	☐ Refusal
herd_week		In the past week, how many hours have you spent herding?
		If respondent does not know, enter 998
		☐
vibarua		Have you ever done vibarua?
yes_no_dk	*1*	☐ Yes
yes_no_dk	*2*	☐ No
yes_no_dk	*98*	☐ Don't know
yes_no_dk	*99*	☐ Refusal
		If yes:
vibarua_age		How old were you when you did vibarua for the first time?
		If respondent does not know, enter 998
		☐
vibarua_type		Have you ever done vibarua?
vibarua_type	*1*	☐ Selling items like peanuts, mangoes
vibarua_type	*2*	☐ Farming
vibarua_type	*3*	☐ Herding
vibarua_type	*4*	☐ Collecting sand or breaking stone
vibarua_type	*5*	☐ Working for a fundi
vibarua_type	*6*	☐ Phone charging
vibarua_type	*7*	☐ Shoe shining
vibarua_type	*8*	☐ Carrying bags
vibarua_type	*9*	☐ Selling items at the market
vibarua_type	*10*	☐ Shop
vibarua_type	*96*	☐ Other
vibarua_type	*98*	☐ Don't know
vibarua_type	*99*	☐ Refusal
		If other:
vibarua_other		What type of work?
		☐

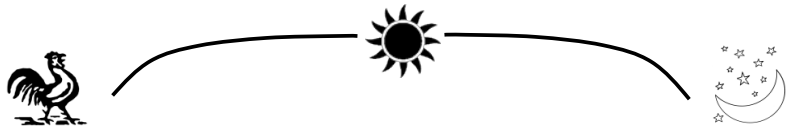
house_ever	Have you ever worked as a houseboy / housegirl?
yes_no_dk	*1* ☐ Yes
yes_no_dk	*2* ☐ No
yes_no_dk	*98* ☐ Don't know
yes_no_dk	*99* ☐ Refusal
	If yes:
house_age	How old were you when you worked as a houseboy / housegirl for the first time?
	If respondent does not know, enter 998
	☐

time_allocation	**Time allocation**
	I want to know what activities you did yesterday. This picture shows one day - waking up in the morning here, and going to bed at night here. Each box is an hour of the day, and each line is for a different activity. Please think about the activities you did yesterday, and how
time1	long you spent doing each activity. We will write the activity in this box, and we will colour in the boxes to show when you did that activity. Start from when you woke up, and continue all the way until you went to bed. What did you do first, after you woke up and got dressed?
	If today is a Monday, ask about the previous Friday, instead of yesterday.
time2	Now fill in the time allocation diagram with the child.

note2	Thank you for your time.
note3	Record any comments you have about the interview.
	☐

9.1.3.2. Time allocation diagram

Nambari ya kitambulisho cha mtoto



Shughuli	Asubuhi					Mchana					Jioni			Usiku			
	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4

9.2. Qualitative component question guides

9.2.1. Teacher interviews

General school questions (asked to headteachers)

- What subjects are taught at this school?
- Do you keep attendance records, and if so, what is the attendance rate? Are there certain times of year when attendance is low?
- If a child is not attending school, what happens? Do you make enquiries? Do parents have to pay fines?
- What school supplies and fees do parents have to pay for? Is there any support for parents who cannot afford to pay?

Teacher's professional background

- How long have been teaching (in general)?
- How long have you been teaching at this primary school?

Standard 1 teacher

- What is the expected age for children here to start school?
- When they do not start at this age, what are the reasons?
- Are there differences between girls and boys in starting school?

General questions

- What do you expect children to learn during Standard [x]?
- What are some of the reasons why children make good progress in school?
- Do you think any particular groups of children do better than others in primary school?
- Are any of your students not making good progress in school?

- How do you know they are not making good progress? (probe: non-attendance, drop-out, poor grades)
- What are some of the reasons why they aren't doing so well? What challenges do they face? What could help them to make better progress?
- What do you think are the main problems or worries for children here when they go to school? Do you think parents have any problems or worries when their children attend school?
- Are there particular groups of children who don't make good progress?
- What kind of knowledge or skills do children need to do well after school? Where do they learn them?
- What do you expect will happen to the children in your class in the next few years? Will they go to secondary school? What kind of work will they get?
- What do you think of the quality of education provided by this school? By other local schools? What are the main improvements you would like to see?
- What are the main challenges you face as a teacher?

Standard 7 teacher

- How many children do you expect will progress to secondary school?
- When they do not progress, what are the reasons?
- If they do not progress, what do they do?
- Are there differences between girls and boys in progressing to secondary school?
- What do children need in order to succeed at secondary school?

9.2.2. Focus group discussion guides

<u>Adolescents</u>

Three pathways:

1. Children who finish Standard 7, but don't continue with their studies
2. Young people who started secondary school, but dropped out before reaching Form 4
3. Young people who have finished Form 4

For each pathway ask:

- What reasons are there for a child to take this pathway?
- What are the most common reasons / which is the main reason?
- Do children and parents agree, or do they disagree?
- Work – why does a child do this work? For which children is it better to do work?
- What benefits do these children have?
    - Benefits now, at the time of finishing or stopping?
    - Benefits later, as an adult?
- What challenges do these children face?
    - Challenges now, at the time of finishing or stopping?
    - Challenges later, as an adult?

At the end:

- Which pathway is best? Why?
- When would pathway 1 be best? And pathway 2?

<u>Parents</u>

Three pathways:

1. Children who finish Standard 7, but don't continue with their studies

2. Young people who started secondary school, but dropped out before reaching Form 4
3. Young people who have finished Form 4

For each pathway ask:

- What reasons are there for a child to take this pathway?
- What are the most common reasons / which is the main reason?
- Do children and parents agree, or do they disagree?
- Work – why does a child do this work? For which children or family is it better that a child works?
- What benefits do these children and their families have?
    - Benefits now, at the time of finishing or stopping?
    - Benefits later, as an adult?
- What challenges do these children and their families face?
    - Challenges now, at the time of finishing or stopping?
    - Challenges later, as an adult?

At the end:

- Which pathway is best? Why?
- When would pathway 1 be best? And pathway 2?

Figure 9.1 Images used in focus group discussions to illustrate pathways through school