Three Essays on Intra-household Inequality and Child Welfare

by

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Abstract

This thesis consists of three essays that investigate inequality within the household with a particular focus on the effects of intra-household resource allocation and informal child fostering on the welfare of children. The first essay estimates individual resource shares within Ghanaian households using a modern household collective model. Individual poverty rates are also determined and compared to standard per-capita poverty indices. Our findings show that mothers, along with their children, tend to be more vulnerable to poverty than fathers because mothers tend to bear most of the cost of having children.

Applying the same model to a panel data set of households, the second chapter conducts a comparative study of children's resource shares between male-headed and female-headed households in Jamaica. The results indicate that children tend to be allocated a higher share of resources in female-headed households and hence may not be necessarily poorer in terms of resource shares than children in male-headed households.

The final essay investigates the effects of child fostering on two educational outcomes of children in Jamaica - school attendance and the number of years of schooling. We find that being a foster child in itself has a negative impact on the number of schooling years a child accumulates but has no significant effect on school attendance.Our findings also indicate that the impact of Jamaica's main social transfer programme on the education of children is dependent on the fostering status of the child.

Dedication

To my husband,

Kwadwo.

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Chapter 1

General Introduction

Research that focuses on assessing the impact of intra-household inequality on measures of poverty and policy making is still in its infant phase. In fact, standard headline measures of poverty and inequality usually neglect the existence of inequality within the household by using per-capita calculations which may be equivalised to account for the fact that different members of the household have different basic needs (for instance, the basic needs of a child are less than those of an adult). All the same, the underlying assumption for these calculations is that all members of the household are treated equally, such that, if one member of the household is categorized as poor then all other members are also deemed as poor. A major contributing factor for this is the fact that most of the households surveys on which these calculations are based collect consumption and expenditure data at the household level and not at the individual level.

Nevertheless, studies such as Sahn and Younger (2009) and Haddad and Kanbur (1990) have used anthropometric measures such as weight, height, and caloric intake to show that high levels of inequality could exist within households, especially in developing countries. Using body mass index (BMI) data, Sahn and Younger (2009) show that inequality within the household can account for more than half of total inequality in the 7 countries they examine. Haddad and Kanbur (1990) also use data on calorie adequacy in the Philippines to measure inequality within the household and find that neglecting intra-household inequality could cause overall estimates of inequality to be underestimated by about 30%. According to Kanbur

(2016), ignoring the possibility that certain members of the household may be particularly disadvantaged after resources are allocated could have other far-reaching consequences including the poor targeting of social protection programmes that aim to reduce poverty and inequality and the miscalculation of the effects of minimum wage policy on poverty.

The most recent approach to measuring individual well-being is to model the household decision-making process using a collective model. Pioneered by Chiappori (1988, 1992) and Apps and Rees (1988), the collective household model was developed following the rejection of the earliest model of the household - the unitary model. The unitary model assumes away the complex interactions that take place within a household treating households as individuals (Becker, 1964, 1965). Alderman et al. (1995) and Browning et al. (2014) provide excellent reviews of this model and the reasons behind its rejection within the literature. The collective model, on the other hand, allows each individual within the household to have separate preferences and hence makes room for the possibility that the preferences of one household member may conflict those of another. In fact, a subset of this category of household models use tools from game theory to model bargaining within the household (Manser and Brown, 1980; McElroy and Horney, 1981). More recent variants of the collective model such as Browning et al. (2013), Lewbel and Pendakur (2008), Bargain et al. (2010), Bargain and Donni (2012) and Bargain et al. (2014) estimate individual resource shares by imposing restrictions on the preferences of household members.

Focusing particularly on child welfare, this thesis employs and further develops one of such models to investigate intra-household inequality in two developing countries. This collective model, developed by Dunbar, Lewbel, and Pendakur (2013) (DLP hereafter), offers the most attractive framework for the present study because of its empirical tractability, its suitability to the developing-country context, and most importantly, its focus on estimating the resource shares of children. This thesis focuses on children for two main reasons. First, children are likely to be the most vulnerable members of the household because they are not given the opportunity to choose which household to belong to, they cannot leave at will, and are not likely to contribute significantly to household income. Second, the well-being of children has implications for the

intergenerational transmission of poverty, that is, poor children are generally more likely to become poor adults in the future (Chiappori and Meghir, 2014).

This thesis is composed mainly of three separate but related empirical essays which are written in a standard economic journal article format. The first empirical chapter investigates intra-household resource allocation in Ghana, a lower-middle income country located in sub-Saharan Africa. The DLP collective model is applied to the most recent round of the national household survey known as the Ghana Living Standards Survey (GLSS) to estimate the proportion of total household expenditure allocated to each member of the nuclear monogamous household, namely the father, the mother, and the children. Estimated resource shares are then used to compute individual poverty rates which are compared to standard per-capita rates. The results show that for the sample, standard poverty indices mostly underestimate rates of poverty by an error margin ranging from 2% to 12%. Our findings also indicate that while fathers have a significantly higher proportion of resources allocated to them, mothers tend to bear most of the cost of having children. Hence, mothers and children tend to be more vulnerable to poverty than fathers, especially in larger households. To demonstrate the usefulness of this kind of analysis for social transfer programmes, we discuss the implications of the results and make a few recommendations for the Livelihood Empowerment Against Poverty (LEAP) programme, a conditional cash transfer programme in Ghana aimed at reducing extreme poverty.

The second essay conducts a comparative study of the welfare of children in male-headed and female-headed households using a rotating panel data set of households from 21 rounds of the Jamaican Survey of Living Conditions (1990 to 2010). The motivation behind this study stems from the fact that compared to male-headed households, female-headed households are likely to be more vulnerable to shocks and disadvantaged in labour and credit markets (Boxill and Quarless, 2005; Zeller and Sharma, 1997). Moreover, the incidence of female headship is growing across the world; recent estimates put the proportion of female heads between 20% and 35% in the developing world (United Nations, 2017). Jamaica is an interesting test case for this kind of study because its matrifocal culture is characterized by a very high incidence of female-headed households (Safa, 2007). According to an executive summary of the 2012 Jamaican

Survey of Living Conditions, about 45% of the households in Jamaica are headed by women, a significant proportion of whom are single mothers (Planning Institute of Jamaica, 2012). This essay exploits the panel nature of the data set to improve the empirical identification of resource shares by accounting for unobserved heterogeneities within households that could cause other variables to be endogenous. To do this, we incorporate Mundlak's (1978) approach to panel data into DLP's non-linear model. In particular, we include time averages of all time-varying explanatory variables (also known as Mundlak terms) into the DLP model to account for unobserved household characteristics which do not vary over time. The results indicate that ignoring unobserved heterogeneities could result in biased estimates of resource shares. We also find that children in poorer female-headed households are not necessarily worse-off as women, relative to men, tend to spend more on child-specific goods like health and education.

Veering away from the collective household model, the final empirical study analyses inequality within the household by investigating the effects of the practice of child fostering on the educational outcomes (school attendance and the number of years of schooling) of children in Jamaica. Informal child fostering rates are known to be particularly high in sub-Saharan Africa and in the Caribbean (Zimmerman, 2003). A foster child, for our purposes, is defined as a child living apart from both biological parents. According to Hamilton (1964), an individual tends to more altruistic towards another individual, the more closely related he/she is to that individual. This implies that, the welfare of foster children is likely to be generally lower than that of biological children. While there are many empirical studies that analyse this practice in Africa (see for example, Akresh (2004), Akresh (2009), and Cichello (2003)), it is rare to find one that focuses on the Caribbean region. This is probably because of the absence of data sets suitable for this kind of work. This study attempts to address these issues in a number of ways. First and foremost, a rotating panel data set of children is constructed from the panel data set of households used in the second essay. Due to limitations in the data collected, we are able to use only six rounds of the Jamaican Survey of Living Conditions: 2004, 2006, 2007, 2008, 2009, and 2010. Similar to the second essay, the panel data set is exploited to account for unobserved child and household heterogeneities which are time invariant by applying child

and household fixed effects. Again, this ensures that endogeneity within the empirical model is dealt with (to a large degree, at least). The results after estimating two fixed effects regression models (one for each educational outcome) show that while being a foster child in itself does not affect a child's school attendance, it has a significant and negative effect on the number of years of schooling that the child accumulates. Our findings also indicate that the impact that Jamaica's Programme of Advancement through Health and Education (PATH) has on a child's education is dependent on the fostering status of that child.

The rest of the thesis is organized as follows. The first essay, "Intra-household Resource Allocation and Poverty: The Ghanaian Case" is presented in Chapter 2. The second essay, "Children's Resource Shares: Male versus Female-headed Households" is presented in Chapter 3. The third essay, "Child Fostering and the Educational Outcomes of Jamaican Children" is presented in Chapter 4. Finally, a brief conclusion is presented in Chapter 5.

Chapter 2

Intra-household Resource Allocation and Poverty: The Ghanaian Case

Abstract

Most standard poverty indices are determined using per-capita calculations and hence ignore intra-household inequality. Using the largest and most recent household survey data set available for Ghana, we investigate power dynamics in the household by estimating the share of total resources allocated to each member of the household using a collective model developed by Dunbar, Lewbel, and Pendakur (2013). These resource shares are used to compute individual poverty rates for household members. Our findings indicate that while fathers command a significantly larger share of household resources than mothers, mothers tend to bear a higher proportion of the cost of children, resulting in a higher incidence of poverty in Ghana for women and children. The results also indicate that poverty in Ghana is mostly underestimated when standard poverty measures are used, especially with respect to women and children. Finally, we discuss the implications of the results for the LEAP programme, a social cash transfer scheme aimed at reducing extreme poverty in Ghana.

2.1 Introduction

Although advances have been made in estimating resource shares within the household, most measures of poverty implicitly assume that resources are shared equally amongst household members. Using health measures such as weight, height, and calorie intake, studies such as Haddad and Kanbur (1990) have shown that with fewer resources to go round, intra-household inequality is likely to be particularly high in poor regions. Therefore, assessing the share of resources that each household member commands is indispensable in understanding the nature of poverty in these deprived areas. Moreover, this kind of study makes available crucial information that policy makers need in the planning and execution of effective redistributive policies. According to the World Bank (2016), over half of the extreme poor live in sub-Saharan Africa making this region the poorest in the world. Studies of intra-household inequality in sub-Saharan African countries are however, relatively, few.

This essay contributes to the literature on sub-Saharan Africa by investigating intra-household resource allocation in Ghana, a lower-middle income country located along the West African coast. With a per-capita GDP of US$3,940 (using 2011 purchasing power parity prices) in 2013, about a quarter of its population of roughly 26 million is estimated to be poor. The economy of Ghana is still quite dependent on agriculture with 52% of households owning farms and 45% of the economically active population working in the agricultural sector (Ghana Statistical Service, 2014b). Ghana is suitable for an analysis of this kind for two reasons. First, although poverty rates are declining in Ghana, poverty reduction is dampened significantly by increasing inequality in household consumption. According to Cooke et al. (2016), the Gini index for the country increased from 37.5 to 40.8 between 1992 and 2013. Identifying the household members that are disproportionately poor is therefore crucial if this trend is to be reversed. Second, we exploit the largest and most recent household survey data set for Ghana, the Ghana Living Standards Survey Round 6 (GLSS 6). This data set is suited to the kind of analysis we carry out in this essay because the household expenditure module is highly disaggregated and particularly rich.

By applying a collective household model originally developed by Dunbar, Lewbel, and

Pendakur (2013) (DLP hereafter) to a sample drawn from GLSS 6, we propose estimates of resource shares for individual household members and compute poverty rates that are adjusted for unequal resource allocation within the household. To the best of my knowledge, this study is the first to estimate resource shares for Ghanaian households and one of the rare applications of collective models to developing countries in sub-Saharan Africa. Other applications of collective models in sub-Saharan Africa include DLP and Bargain, Donni, and Kwenda (2014) (BDK hereafter), which estimate resource shares for nuclear households in rural Malawi and Côte d'Ivoire, respectively. Although these papers use slightly different identifying assumptions, both papers are very similar in their conclusions for poverty, in that, they find that standard poverty indices underestimate child poverty and overestimate poverty among adults. The findings of this study indicate that the results of DLP and BDK may not be completely generalizable to other sub-Saharan African countries.

Our results show that fathers have the highest bargaining power in the household as they command the largest share of household expenditures. Although mothers command a smaller share of household resources, they tend to bear a higher proportion of the cost of children, especially very young children. This result is in line with the findings of Duflo (2003) and Duflo and Udry (2004), who show that an increase in a woman's income leads to increased expenditure on goods which favour children, such as education and health care, in South Africa and Côte d'Ivoire, respectively. Compared to DLP and BDK, children in Ghana command a relatively large share of total household resources, beginning at 29% for one-child households and reaching 43% for households with four children. Additionally, this study shows that, on average, the resource share of mothers is approximately 10 percentage points lower than those of fathers and children. This is also in contrast to DLP and BDK, who find that children receive the lowest share of household resources on average.

With regard to poverty, there are a lot more households with poor women and children than there are with poor men. Assuming equal resource shares within households understates the incidence of poverty in Ghana, except for men who have two or more children. The results also show that the incidence of child poverty rises as the number of children in the household

increases. On average, per-capita calculations yield a poverty rate of 18% for the entire sample while unequal resource shares yield poverty rates of 15% for fathers, 34% for mothers and 31% for children. Unlike DLP and BDK, women and not children tend to have the highest poverty rates in Ghana. Lastly, we illustrate the importance of this kind of study for development policies by discussing the implications of the results for the Livelihood Empowerment Against Poverty (LEAP) programme in Ghana, a social cash transfer scheme that is aimed at alleviating extreme poverty in Ghana.

The rest of the chapter is organized as follows. Section 2.2 presents a survey of the literature on collective models and gives a brief overview of the DLP model. Section 2.3 describes the data set by providing summary statistics, and discusses the specification of the model we estimate. Section 2.4 presents the main results of the study. Section 2.5 discusses the implications of the main findings for LEAP and Section 2.6 concludes.

2.2 Theoretical Framework

This section presents the theoretical framework on which the empirical analysis is based. The first part of the section provides a brief survey of the literature on collective household models and the second part gives a more detailed overview of the DLP framework we apply in this chapter and the next.

2.2.1 The Collective Household Model

The collective household model is currently the most popular framework for modelling household decision making. It was first developed by Chiappori (1988, 1992) and Apps and Rees (1988) following the rejection of many of the predictions of the unitary model.[1] Chiappori (1988) generalized the work of Manser and Brown (1980) and McElroy and Horney (1981) who modelled household decision-making processes using tools from cooperative game theory. Collective household models recognize that the household is made up of different individuals,

[1]See Alderman et al. (1995) and Doss (1996) for a detailed discussion on the rejection of the predictions of the unitary model.

each characterized by his or her own preferences. They also assume that these individuals collectively take Pareto-efficient decisions. A number of studies such as Bourguignon et al. (1993), Browning and Chiappori (1998), Chiappori and Ekeland (2006) and Bourguignon et al. (2009) have since further elaborated the model.

In earlier applications of the collective model, a series of papers show how changes in distribution factors help to identify changes in resource shares but not the actual levels of resource shares (see Chiappori and Ekeland, 2009 for a formal proof of this). Browning et al. (1994), Chiappori et al. (2002) and Vermeulen (2002) are examples of such papers. Distribution factors are observed socio-demographic factors that affect the sharing rule within the household but not the preferences of household members or the household's budget constraint. Although they are still used in the literature, it can be difficult to test the validity of some commonly used distribution factors such as relative wage and relative age.

Fortunately, recent variants of the collective model not only identify the levels of resource shares, but also do not require distribution factors in the identification process. For instance, Cherchye et al. (2011) and Cherchye et al. (2015) identify resource shares by applying revealed preference theory. The more popular approach, pioneered by Browning, Chiappori, and Lewbel (2013) (BCL hereafter), identifies resource shares by imposing additional restrictions on the individual preferences of household members and also allows for general forms of scale economies to consumption. In particular, BCL imposes the identifying assumption that childless couples generally have the same preferences for goods as their single counterparts. This allows for the identification of resource shares since the demand functions of single men and women can be observed directly from households consisting of only one individual. However, the BCL model is very complex and difficult to estimate because it does not assume any structure for its parameters. Lewbel and Pendakur (2008) simplify the BCL model by imposing an additional restriction that provides some structure on some parts of the model. This allows for the identification of resource shares from Engel curves (demand curves keeping prices constant) rather than the complex non-linear system that BCL use. Bargain et al. (2010), Bargain and Donni (2012) and BDK further extend the BCL model to identify the resource shares of children.

The DLP model is also an extension of BCL. This model currently offers the most attractive model for the study of intra-household resource distribution because, compared to other BCL-type models, it imposes relatively milder assumptions on individual preferences, has lower data requirements and is easier to implement empirically. DLP identifies resource shares by making two identifying assumptions. First, resource shares are assumed to be independent of household expenditure. Second, the DLP model imposes at least one of two semi-parametric restrictions on the shape of Engel curves. The SAP (Similar Across People) restriction assumes that in certain limited ways, the preferences of individuals within households with a particular number of children are similar. This would imply that individuals in one-child households for instance, have similar tastes. The SAT (Similar Across Types) restriction, on the other hand, assumes that the preferences of individuals are similar across household types so that fathers for example, have similar preferences irrespective of the number of children they have. Hence, unlike the other BCL-type models, the DLP model does not impose that fathers and mothers have the same tastes as single men, single women, and childless couples, and therefore does not require data on these household types. Also, the DLP model imposes these restrictions only on the Engel curves of a set of private assignable goods. This is also in contrast to the other BCL-type models which impose their identifying restrictions on all goods.

2.2.2 The DLP Framework

As already indicated, the DLP model allows for parents' bargaining and the joint consumption of goods that gives rise to economies of scale. Let the subscripts t and s represent individual and household types, respectively. In this application of the DLP model, four household types are investigated. Household types are determined by the size of the household; $s = 1, 2, 3, 4$ indexes couples with one, two, three, and four children, respectively. Each household consists of three individual types: an adult male or father denoted by $t = m$, an adult female or mother denoted by $t = f$ and children denoted by $t = c$. Good types are denoted by the superscript $k = 1, ..., K$. A household of type s purchases the vector of quantities of goods $z_s = (z_s^1, ..., z_s^K)$ at market prices $p = (p^1, ..., p^K)$, while each household

member consumes $x_t = (x_t^1, ..., x_t^K)$, the vector of private good equivalents of z_s. Let y denote total household expenditure. Demographic variables such as age and education are suppressed in this section to simplify notation. They are defined explicitly in the following section where they are allowed to affect preference parameters and resource shares.

DLP assume economies of scale of a linear technology type where $x_m + x_f + x_c = x = A_s^{-1} z_s$. A_s is a K by K matrix which converts z_s into x, a vector of private good equivalents where $\sum x_t$ is strictly larger than z_s when goods are shared (Gorman, 1976). In this model, the existence of private assignable goods for each individual type is crucial to the identification of resource shares. A private assignable good is a good which is consumed only by a particular household member that is known to the researcher from the data. In other words, these goods do not have any scale economies in consumption. It is important to emphasise that even though the DLP model and other BCL-type models are based on a particular private assignable good, the model estimates overall individual shares of total household expenditure for all goods.

In this study, men's, women's, and children's clothing and footwear are used as the private assignable goods because expenditures on these goods are observed separately in GLSS 6. Even though expenditure on clothing and footwear make up only about 6% of total household expenditure, Bargain et al. (2018) show that clothing and footwear perform best when compared to other available private assignable goods in estimating actual individual resource shares. This is because these particular goods (clothing and footwear) validate the individual preference restrictions that BCL-type models impose, especially SAT. They exploit a unique data set from Bangladesh that provides data on clothing and footwear, nutrition, health, education, and other personal effects at the individual level.

Each individual possesses a utility function denoted by $U_t(x_t)$ that is monotonically increasing, strictly quasi-concave, continuous, and twice differentiable. In principle, an individual's utility function may depend on the utilities of other members of the household. However, to simplify the model, we will assume that each individual's total utility is weakly separable over the sub-utility functions for goods. Also, due to data limitations, children are characterized by a single utility function. The identification of resource shares for each child is

possible only if each child can be assigned a different private assignable good. Unfortunately, this is not possible from the GLSS 6.

Pareto efficiency implies the following maximization problem for the household:

$$\max_{x_m,x_f,x_c,z_s} \tilde{U}_s[U_m(x_m), U_f(x_f), U_c(x_c), p/y] \quad \text{such that}$$

$$z_s = A_s[x_m + x_f + x_c], \quad y = z_s'p \tag{2.1}$$

where $\tilde{U}_s$ represents a monotonically increasing social welfare function. According to BCL, Equation (2.1) can also be interpreted as a two-stage process. In the first stage, total expenditure is allocated to household members according to resource shares. Each individual then maximizes his/her utility subject to his/her shadow budget constraint in the second stage. A shadow budget constraint in this context is an individual budget constraint that has been adjusted for both the individual's resource share and economies of scale. Economies of scale are characterized by the household shadow prices $A'p$, which differ from market prices for goods which are shared. Heating and furniture are common examples of such goods. Unlike resource shares, the same shadow prices are faced by all household members. Solving Equation (2.1) above yields the resource shares or Pareto weights for each member of the family.[2] Let η_{ts} denote the resource share of individual t in household type s.

The household demand functions for private assignable goods derived from solving Equation (2.1) have the following simple forms:

$$\begin{aligned} W_{ms}(y,p) &= \eta_{ms}(y,p)\; w_m(\eta_{ms}(y,p)y, A_s'p) \\ W_{fs}(y,p) &= \eta_{fs}(y,p)\; w_f(\eta_{fs}(y,p)y, A_s'p) \\ W_{cs}(y,p) &= s\eta_{cs}(y,p)\; w_c(\eta_{cs}(y,p)y, A_s'p) \end{aligned} \tag{2.2}$$

where W_{ts} represents the household budget share of individual t's private assignable good and w_t represents individual t's budget share of his private assignable good from his own maximization process (in the second stage). Equation (2.2) defines the household budget share of individual

[2] Browning et al. (2013) provide a detailed discussion on the relationship between resource shares and Pareto weights.

t's private assignable good as the product of his individual budget share and his resource share. However, η_{ts} cannot be identified from Equation (2.2) because even though W_{ts} is observed, w_t is not; and unlike BCL, DLP does not identify w_t from single households.

As mentioned previously, DLP circumvents this problem by making two identifying restrictions. First, resource shares η_{ts} are assumed to be independent of household expenditures y. Although this can be a strong assumption, studies such as Menon et al. (2012) and Cherchye et al. (2012) find that this assumption holds in Italian and Dutch data, respectively. Moreover, resource shares are allowed to depend on variables that are closely related to household expenditures such as income or wealth. This restriction allows us to rewrite the model so far in an Engel-curve framework where prices are taken to be constant (Lewbel and Pendakur, 2008). Equation (2.2) can be rewritten in Engel-curve form as

$$\begin{aligned} W_{ms}(y) &= \eta_{ms}\, w_{ms}(\eta_{ms} y) \\ W_{fs}(y) &= \eta_{fs}\, w_{fs}(\eta_{fs} y) \\ W_{cs}(y) &= s\eta_{cs}\, w_{cs}(\eta_{cs} y). \end{aligned} \tag{2.3}$$

The next step is to invoke either the SAP restriction or SAT restriction on the individual Engel curves for private assignable goods. These semi-parametric restrictions allow for the identification of resource shares across household types (SAT) or across people within a household (SAP). It is also possible to invoke both restrictions simultaneously. Assuming PIGLOG preferences (Muellbauer, 1976) for household members, the model takes the following form:

$$\begin{aligned} W_{ms}(y) &= \eta_{ms}(\delta_{ms} + \beta_{ms} \ln \eta_{ms}) + \eta_{ms}\, \beta_{ms} \ln y \\ W_{fs}(y) &= \eta_{fs}(\delta_{fs} + \beta_{fs} \ln \eta_{fs}) + \eta_{fs}\, \beta_{fs} \ln y \\ W_{cs}(y) &= s\eta_{cs}(\delta_{cs} + \beta_{cs} \ln \eta_{cs}) + s\eta_{cs}\, \beta_{cs} \ln y \end{aligned} \tag{2.4}$$

for $t = m, f, c$ and $s = 1, 2, 3, 4$.[3] While δ_{ts} represents the intercept preference parameters, β_{ts}

[3]Utility functions of the Price Independent Generalized Linearity (PIGL) form assume that expenditure is independent of prices but dependent on the distribution of expenditure. The logarithmic form of PIGL preferences, known as PIGLOG preferences, allow Engel curves to be linear in $\ln(y)$ as in Equation (2.4). The Almost Ideal Demand System (AIDS) is an example of a demand system model that is developed using PIGLOG preferences (Deaton and Muellbauer, 1980).

represents the latent slope preference parameters. β_{ts} is specified according to which restriction is applied to the shapes of the Engel curves. If SAP is imposed, $\beta_{ts} = \beta_s$ for all t. If SAT is imposed, $\beta_{ts} = \beta_t$ for all s. If both SAP and SAT are imposed, $\beta_{ts} = \beta$ for all t and s. After imposing these restrictions, resource shares (η_{ts}) of household members can be identified by observing how household expenditures on each member's private assignable good (W_{ts}) vary with total household expenditure (y).[4]

In appendix 2.A, we carry out tests to confirm that the assumptions necessary for the identification of resource shares discussed in this section, hold in our data set. In spite of data restrictions, the results show that these assumptions largely hold in our data set.

2.3 Empirical Implementation

The first part of this section briefly describes the data set and presents sample summary statistics. The second part discusses the empirical specification of the model and the method of estimation.

2.3.1 Data and Sample Selection

The Ghana Living Standards Survey Round 6 (GLSS 6) is the most recent round of the largest nationally representative household survey for the country. It was undertaken by the Ghana Statistical Service with support from the United Kingdom's Department for International Development (DFID), United Nations International Children's Emergency Fund (UNICEF), United Nations Development Programme (UNDP), International Labour Organization (ILO), and the World Bank. This survey covers a period of 12 months, from 18th October 2012 to 17th October 2013. The general aim of the survey is to generate data on the living conditions of Ghanaians. Using questionnaires, well-trained personnel interviewed households on their general demographic characteristics, education, health, employment, time use, housing conditions, migration, agriculture, household expenditure, income, and assets.

[4]See the online appendix of DLP for a more detailed discussion on the identification of resource shares using this model at http://dx.doi.org/10.1257/aer.103.1.438.

To ensure that a nationally representative sample was chosen, a two-stage stratified sampling process was used. In the first stage, 1,200 enumeration areas were selected to form primary sampling units. The second stage consisted of systematically selecting 15 households in each primary sampling unit. Out of the 18,000 households selected, 16,772 were successfully enumerated.

Considering the private assignable goods available from the data set, the sample in this study is restricted to monogamous, nuclear households. We exclude households consisting of children older than 14 and/or retired adults to ensure that only one adult of each gender lives in the household. We exclude households with economically inactive male heads as well. Female-headed households and single-parent households are also excluded from the sample as this study investigates gender asymmetry in consumption within the household. Finally, other obvious outlying observations such as households with zero food expenditure are also excluded. The final sample is made up of 2,782 households (11,806 individuals) consisting of couples with 1 to 4 children all under the age of 15. Hence, our results hold for this sample of nuclear monogamous households and may not hold entirely for the other household types that are excluded from the sample.

Table 2.1 presents the summary statistics of the sample by household size. Generally, the summary statistics conform to what one would expect from a developing country like Ghana. Also, the variables have very little variation as the standard deviations are generally small. First, the men in the sample are generally older than the women. Indeed, a document on marriage patterns by the United Nations (2000) shows that men in sub-Saharan Africa generally marry younger women. We also observe that men are more likely than women to have some education. In addition, the probability of being an uneducated adult increases the more children the adult has. Most women in the sample are economically active and the percentage of working women increases as the household size gets larger. 11% of the children in the sample work. This is disturbing because the average age of a child in this sample is 5. It seems that children from larger families are more likely to work than children from smaller families. Also, almost 60% of the sample live in rural areas. We notice that larger households are more likely to be

Table 2.1: Summary Statistics for Sample by Household Size

	Couples with				All
	1 child	2 children	3 children	4 children	
	General Characteristics				
Men's age	33.3	35.5	37.6	39.1	35.9
	(0.29)	(0.25)	(0.27)	(0.33)	(0.15)
Women's age	27.5	29.6	31.4	32.6	29.9
	(0.26)	(0.22)	(0.22)	(0.27)	(0.13)
Men's schooling dummy	0.82	0.79	0.77	0.68	0.78
	(0.01)	(0.01)	(0.02)	(0.02)	(0.01)
Women's schooling dummy	0.72	0.70	0.66	0.58	0.68
	(0.02)	(0.02)	(0.02)	(0.03)	(0.01)
Working women dummy	0.84	0.88	0.91	0.94	0.88
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Working children dummy	0.03	0.06	0.12	0.18	0.11
	(0.01)	(0.01)	(0.01)	(0.01)	(0.003)
Proportion of male children	0.52	0.51	0.52	0.51	0.51
	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)
Average age of children	3.1	4.6	5.8	6.4	5.2
	(0.12)	(0.09)	(0.08)	(0.10)	(0.05)
Rural household dummy	0.54	0.59	0.61	0.70	0.59
	(0.02)	(0.02)	(0.02)	(0.02)	(0.01)
Per-capita expenditure per day in USD*	2.51	1.98	1.72	1.48	2.04
	Budget Shares				
Food	0.523	0.530	0.539	0.552	0.533
	(0.005)	(0.005)	(0.006)	(0.008)	(0.003)
Housing	0.071	0.065	0.062	0.051	0.064
	(0.003)	(0.003)	(0.003)	(0.004)	(0.002)
Transportation	0.064	0.059	0.057	0.049	0.059
	(0.003)	(0.003)	(0.003)	(0.004)	(0.001)
Men's clothing and footwear	0.031	0.028	0.025	0.023	0.027
	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)
Women's clothing and footwear	0.022	0.019	0.016	0.015	0.018
	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)
Children's clothing and footwear	0.013	0.017	0.020	0.021	0.017
	(0.000)	(0.000)	(0.001)	(0.001)	(0.000)
Sample size	786	900	728	368	2,782

Standard deviations are in parentheses.

*The exchange rate used is \$1= 2.895 GHS (Source: Central Intelligence Agency's World Factbook)

poor; expenditure per capita per day falls as the household becomes larger.

With regard to budget shares, most households spend more than half of total expenditure on food. Apart from food, the highest proportions of household expenditure are spent on

housing and transportation. It is important to note that for a typical private good such as food, budget shares rise as the household size increases. On the other hand, with items such as housing and transportation which are considered public, budget shares fall as the household size becomes larger. This indicates that economies of scale to consumption are likely to exist in the sample and may differ for each good. The budget shares of the private assignable goods are most important for our purposes. As expected, Table 2.1 shows that the budget shares of both men's and women's clothing and footwear reduce as the number of children increases as children are known to impose economic costs on parents (Bargain et al., 2010; Bargain and Donni, 2012). Interestingly, the budget share on children's clothing and footwear increases as the household becomes larger but at a decreasing rate. Again, this could indicate the presence of scale economies in consumption among children. Unfortunately, our model is unable to account for this because of data restrictions.

2.3.2 Model Specification and Estimation Method

Like DLP, we estimate the log-linear Engel curves for private assignable goods in Equation (2.4) using non-linear seemingly unrelated regression (SUR) to allow for the correlation of errors across equations. The estimators are iterated and the regressors are taken to be exogenous.

The data set allows for the construction of 18 socio-demographic factors. These demographic variables are allowed to affect both resource shares and tastes of household members and hence cannot be classified as distribution factors. As previously indicated, the DLP model does not require distribution factors for the identification of resource shares. These demographic variables include the ecological region of residence (coastal, forest, savannah, and the Greater Accra Metropolitan Area as the reference variable), dummies indicating an older than average father and mother, the education levels of father and mother, the average age of children in the household minus five, the number of children in the household less than three years old, the proportion of children who are boys, a dummy indicating whether the household owns land, a dummy indicating whether the mother works, a dummy indicating whether at least one child works, a dummy indicating whether the household lives in a rural area, and dummy variables

indicating the religion of the father (Christian or Muslim, with other religions as the reference variable).

Let $d = (d1, d2, ..., d18)$ be a vector of these demographic variables and let $b = (b1, ..., b4)$ be a vector of four dummy variables, each indicating a household type s. The vector b generally plays the role of the constant for each household type in η_{ts}, δ_{ts}, and β_{ts}. η_{ts} and δ_{ts} are specified as linear in b and d for a total of 22 coefficients each. As already mentioned, β_{ts} is specified according to the semi-parametric restriction imposed on the Engel curves. For SAP, β_{ts} is specified as linear in b and d for a total of 22 coefficients. For SAT, β_{ts} is specified as linear in a constant and d for each of the 3 individual types for a total of 57 coefficients. When both SAP and SAT are imposed, β_{ts} is specified as linear in a constant and d for a total of 19 coefficients.

2.4 Empirical Results

In this section, the key findings of the study are presented. The section is divided into 3 parts. The first part presents estimated resource shares for reference households. We check for possible endogeneity in the second part and carry out a poverty analysis based on estimated resource shares in the third part.

2.4.1 Resource Share Estimates

Table 2.2 presents the estimates of resource shares using each of the three identifying assumptions: SAP, SAT, and the combination of the two. This table lists resource shares for mothers, fathers, children and each child in a reference household and the marginal effects of a number of demographic variables on these estimates (see Table 2.B.1 in the appendix for the marginal effects of all demographic variables on resource shares). A reference household is one where all demographic variables take the value of zero. For this essay, a reference household is an urban household living in the Greater Accra Metropolitan Area. Both parents have the modal level of education, which is high school education, and all children are girls and have an average age of 5. The reference household does not own land and neither the mother nor

children work.

Table 2.2: Resource Share Estimates for Ghanaian Households

		SAP		SAT		SAP and SAT	
Household characteristic	Individual type	Estimate	StdErr	Estimate	StdErr	Estimate	StdErr
One child	man	0.366***	0.059	0.339***	0.073	0.351***	0.057
	woman	0.292***	0.041	0.324***	0.082	0.294***	0.041
	children	0.342***	0.048	0.337***	0.058	0.355***	0.048
	each child	0.342***	0.048	0.337***	0.058	0.355***	0.048
Two children	man	0.424***	0.064	0.394***	0.076	0.409***	0.061
	woman	0.191***	0.040	0.243***	0.070	0.198***	0.041
	children	0.385***	0.051	0.363***	0.060	0.393***	0.051
	each child	0.193***	0.026	0.182***	0.030	0.196***	0.025
Three children	man	0.370***	0.064	0.349***	0.075	0.345***	0.062
	woman	0.201***	0.040	0.229***	0.066	0.204***	0.041
	children	0.428***	0.053	0.423***	0.062	0.451***	0.052
	each child	0.143***	0.018	0.141***	0.021	0.151***	0.017
Four children	man	0.344***	0.070	0.315***	0.078	0.334***	0.068
	woman	0.191***	0.045	0.220***	0.064	0.201***	0.045
	children	0.465***	0.061	0.466***	0.066	0.465***	0.059
	each child	0.116***	0.015	0.116***	0.017	0.116***	0.015
Rural household	man	0.023	0.022	0.037	0.024	0.022	0.022
	woman	0.041**	0.016	0.010	0.014	0.040**	0.017
	children	-0.064***	0.022	-0.047*	0.026	-0.061***	0.022
Working children	man	0.075**	0.031	0.034	0.033	0.077**	0.031
	woman	-0.005	0.021	0.025	0.023	-0.005	0.021
	children	-0.070***	0.026	-0.059	0.036	-0.072***	0.026
Number of children<3yrs	man	0.035	0.023	0.013	0.024	0.033	0.023
	woman	-0.046***	0.015	-0.035**	0.016	-0.047***	0.015
	children	0.010	0.020	0.022	0.022	0.014	0.020
Man's education	man	-0.002	0.007	0.001	0.007	-0.003	0.007
	woman	0.012**	0.005	0.005	0.005	0.012**	0.006
	children	-0.010	0.006	-0.006	0.008	-0.009	0.006
Woman's education	man	-0.019**	0.007	-0.025***	0.009	-0.019**	0.008
	woman	0.001	0.005	0.000	0.005	0.000	0.005
	children	0.018***	0.007	0.025***	0.009	0.018***	0.007
Proportion of male children	man	0.095***	0.025	0.082***	0.024	0.098***	0.025
	woman	-0.043**	0.020	-0.048**	0.019	-0.045**	0.020
	children	-0.052***	0.021	-0.033	0.029	-0.053***	0.022

Standard errors robust to all forms of heteroskedasticity. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

We will focus on the rightmost columns of the table which present the estimates when both SAP and SAT are imposed. For the most part, these estimates are the most precise

because more identifying assumptions are invoked than with either SAP or SAT alone. Actually, the estimates and standard errors for the SAP restriction only and the combination of both restrictions are quite similar. This may be an indication that the SAT assumption is weak and hence, does not cause significant changes to SAP estimates and standard errors when both restrictions are imposed. DLP acknowledge the fragility of the SAT restriction and admit that one may need a large sample to obtain precise estimates when imposing this restriction only. Nonetheless, the results are reasonably consistent across all three identifying assumptions.

The first four rows of Table 2.2 present the constant terms in the η_{ts} functions which correspond to the resource shares in reference households. We notice that although fathers command a significantly larger share of household resources than mothers, mothers bear a higher proportion of the cost of children. For example, a mother's share falls by about 9 percentage points while that of a father rises by about 6 percentage points when they have a second child. In fact, at 5% significance level, the hypothesis that the father's share is invariant to the number of children in the household cannot be rejected. Children command 35.5% of household resources in one-child households. This is relatively large in comparison to DLP who find that children in one-child households command 23% of household resources. The results of BDK also show that an only child in Côte d'Ivoire commands just 19% of household resources in their baseline model. We additionally notice the per-capita resource share of each child reducing as the number of children increase. Each child in a household with four children is estimated to command 11.6% of the resources available. This appears to be a substantial amount if children jointly consume goods like toys and books.

Let us now turn to the marginal effects of demographic variables on resource shares. We will focus on six covariates that stand out. First, children's resource shares reduce by 6 percentage points in rural areas. Although children's resource shares may still be considered high even when reduced by 6 percentage points, this result suggests that child poverty in Ghana is more of a rural phenomenon than an urban one. Still on the subject of children, the coefficients corresponding to the working children dummy reveal that resource shares of children in these households are reduced by 7.2 percentage points. The resource shares of mothers with working

children also reduce marginally while fathers gain the extra resources. This shows that, in terms of consumption, child labour may not benefit the children themselves but benefits parents (especially fathers) instead. It may also indicate that households that put a lower weight on children's welfare are more likely to require them to work.

Mothers also tend to command less resources if their children are younger than three years. To be precise, a mother commands 4.7 percentage points less resources, while fathers and children gain. Because infants under three years are not likely to have started school yet, mothers who work in the informal sector or as family labourers may be forced to stay home temporarily to take care of the children. In doing this, they lose a major source of their income and livelihood, leading to a reduction in their bargaining power in the household. This is in line with the findings of Lewbel and Pendakur (2008) and Couprie (2007) for Canada and the United Kingdom, respectively, showing that a woman's income share or relative wage is directly related to the share of household resources she commands.

The next two covariates of interest relate to the education levels of parents in the household. The more educated a father is, the higher the resource share of his spouse. The resource shares of women with more educated husbands are 1.2 percentage points higher. However, these extra resources seem to be mostly diverted from the children and not from the father. On the other hand, a more educated mother diverts resources from her husband to her children. Her own share increases only by negligible amounts. Children with more educated mothers have their resource shares increasing roughly by 2 percentage points. In sum, although a more educated father seems beneficial to a woman in terms of resource shares, the children are negatively affected. On the contrary, a more educated mother is advantageous mainly to the children of the household. Again, this conforms to the idea that mothers are more willing than fathers to sacrifice for their children in terms of their expenditure patterns.

Finally, similar to DLP and Rose (1999), this study finds compelling evidence of gender bias in Ghanaian households, but, unlike these other papers, we find gender bias in favour of girls and not boys. Furthermore, this result is robust to changes in the specification of the non-linear SUR model we estimate. In particular, we find that resources are diverted from

children as the proportion of boys in the household increases; children's resource shares are about 5 percentage points lower if all the children in the household are boys. A possible reason for this is the matrilineal system practised by the Akan ethnic group. The Akan ethnic group is the largest in the country; according to the main report for GLSS 6, 50% of household heads in the country are Akan (Ghana Statistical Service, 2014a). Akans practise a matrilineal system of descent, succession and inheritance. Hence, the girl child is preferred to the boy child because women are traditionally viewed as the maintainers of the lineage or clan (Adei, 2003). This contrasts with the tradition in Eastern and Southern Asia for instance, where the boy child is preferred because of a patrilineal system of inheritance (Das Gupta et al., 2003). In a matrilineal system, the external family takes precedence over the nuclear family and conjugal ties are usually weak since husband and wife belong to two different families. Additionally, children in Akan households do not belong to their father's family but to their mother's family. Therefore, matrilineal uncles may exert a greater authority than fathers on the children since male children inherit the wealth of their matrilineal uncles. In the same way, fathers are likely to spend more on their sisters' children than on their own children especially if all his children are male. Nevertheless, an Akan father is still expected to set his children up for life by giving them an education or by teaching them a trade (Takyi and Gyimah, 2007; La Ferrara and Milazzo, 2014). It is important to note that BDK also find some evidence of gender bias in favour of girls in Côte d'Ivoire, although insignificant in their case. This is interesting because Côte d'Ivoire is located next to Ghana and 30% of its population is also Akan.[5]

We investigate this bias further by applying the same non-linear SUR model to two groups of sub-samples. The first group compares results from a sub-sample of Akan households to that of non-Akan households while the second group compares results from the four ecological zones. Table 2.3 presents the coefficients of the proportion of boys variable for each sub-sample and for each of the three identifying assumptions. Again, we will focus on the results obtained when both SAP and SAT are invoked (the last two columns). The first row presents the coefficients for the total sample, which is the same as row 8 of Table 2.2. The next two rows

[5]For a detailed discussion on the matrilineal system of the Akan ethnic group, see Warren (1986); Rattray (1923, 1927); Nkansa-Kyerematen (1996); Fortes (1960).

Table 2.3: Gender Bias Estimates in Ghanaian Households

		SAP		SAT		SAP and SAT	
Ecological zone	Individual type	Estimate	StdErr	Estimate	StdErr	Estimate	StdErr
All households	man	0.095***	0.025	0.082***	0.024	0.098***	0.025
(2,874 hhs)	woman	-0.043**	0.020	-0.048**	0.019	-0.045**	0.020
	children	-0.052***	0.021	-0.033	0.029	-0.053***	0.022
Akan	man	-0.115***	0.024	-0.075	0.064	-0.118***	0.031
(944 hhs)	woman	0.163***	0.032	0.074	0.064	0.052**	0.024
	children	-0.048*	0.028	0.001	0.003	0.066*	0.036
Non-Akan	man	0.152***	0.028	0.000	0.000	0.146***	0.030
(1,838 hhs)	woman	-0.080***	0.021	0.010	0.034	-0.077***	0.021
	children	-0.072***	0.023	-0.010	0.034	-0.069***	0.024
Forest	man	0.076**	0.031	0.079	-	-0.013	0.025
(1,196 hhs)	woman	-0.076**	0.031	0.000	-	0.073**	0.034
	children	0.000	0.000	-0.078	-	-0.060	0.037
Coastal	man	0.000	0.000	0.000	0.000	0.000	0.000
(327 hhs)	woman	0.000	0.000	0.000	0.000	0.000	0.000
	children	0.000	0.000	0.000	0.000	0.000	0.000
Savannah	man	-0.155***	0.037	-0.081*	0.046	-0.160***	0.037
(974 hhs)	woman	0.210***	0.031	0.000	0.000	0.208***	0.031
	children	-0.056*	0.030	0.081*	0.046	-0.047	0.031
GAMA	man	0.003	0.006	0.021	0.017	-	-
(285 hhs)	woman	0.000	0.000	-0.061***	0.022	-	-
	children	-0.003	0.006	0.040	0.028	-	-

Standard errors robust to all forms of heteroskedasticity. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

present the estimates for Akan households versus non-Akan households. We define an Akan household as one where both adults in the household identify first as belonging to the Akan ethnic group. They could also belong to a second ethnic group if either of their parents is not Akan. Surprisingly, we find the resource share of children increasing by 6.6 percentage points in Akan households and reducing by almost 7 percentage points in non-Akan households if all children are boys. This clearly contradicts what one would expect if Akans truly practise a matrilineal system of inheritance. However, due to modernisation and the rising number of inter-ethnic marriages in Ghana, it is possible (especially in urban areas) that, the traditional matrilineal system is not fully adhered to in these households that identify as Akan (Awusabo-Asare, 1990).

Another plausible way to capture matriliny in Ghana is through the four ecological zones

of the country namely: forest, coastal, savannah and the Greater Accra Metropolitan Area (GAMA hereafter). Akans are known to have settled in the forest ecological zone comprising mainly of the Western, Central, Ashanti, Eastern and Brong-Ahafo regions (Awusabo-Asare, 1990). According to Ghana Statistical Service (2014a), about 70% of the households in these regions have Akan household heads. We estimate the model separately for each of the ecological zones. The coefficients for the proportion of boys variable are presented in the fourth to seventh rows of Table 2.3. As expected, we observe that the bias in favour of girls is greatest in the forest ecological zone, with the resource shares of children reducing by 6 percentage points, if all children are male. It is important to note that the coefficient for children for the forest area is greater in absolute value than the coefficient for the entire sample, as this suggests that the forest coefficient may be driving the result for the entire sample. The coefficient for children for the savannah zone also indicates girl-child preference, although this coefficient is not as large as that of the forest zone or the entire sample. Meanwhile, gender bias appears to be non-existent in the coastal ecological zone. Due to data restrictions, we are unable to obtain estimates for GAMA when both SAP and SAT are invoked. However, results from imposing either SAP or SAT alone does not indicate significant girl-child preference in this area. In sum, we do find some evidence indicating that the matrilineal system practised in regions that are traditionally Akan, and not necessarily by parents who identify as Akan, could be one of the main reasons for girl-child preference in Ghana. Nonetheless, our results in Table 2.3 are generally less precise than those presented in 2.2 due to the relatively smaller sample sizes. For instance, we are unable to obtain standard errors for the forest ecological zone when the SAT restriction alone is invoked.

2.4.2 Handling Endogeneity

The basic DLP model can be adapted to deal with endogeneity through instrumental variables. In this setting, the two variables that are likely to be endogenous are total expenditure and the number of children in the household (that is, the household size).

Total expenditure may be endogenous because of measurement error between total

expenditure and actual consumption. Secondly, endogeneity may also occur because of recall errors, as households are asked to recall consumption from the past. Following DLP, we use wealth measures including farm wealth and household wealth as instruments for total expenditure. Farm wealth is a sum of the value of livestock and farm equipment, and household wealth is a sum of the value of durable items in a household and the household's savings. These variables are less likely to be subject to recall errors as most of these items can be directly observed and counted by interviewers. Farm wealth is more suited to rural households while household wealth is more suited to urban households.

The number of children in the household could also be an endogenous variable because unobserved heterogeneity in the error term of clothing equations may affect fertility decisions. Following DLP, we are able to construct three instruments relating to health and education from the data set that are likely to correlate with fertility decisions but not clothing decisions. First, we use the number of minutes it takes for children to get to school. Since, basic education is free in Ghana, parents with more children have more of an incentive to live closer to a basic school. The second instrument is a dummy indicating whether at least one of the adults in the household is disabled. The third instrument is a dummy indicating whether the couple uses condoms as a means of contraception. This variable is chosen because most adults in Ghana have access to condoms as they are provided free of charge or at very low costs by the government.

Altogether, these instruments are strongly correlated to total expenditure and yield an F-statistic of 102.10 on the excluded instruments in the first stage. On the other hand, the instruments are not strong in predicting the number of children in the household; they yield an F-statistic of only 2.44. Following DLP, we estimate the model with endogenous variables using Hansen's (1982) generalized method of moments (GMM). Unfortunately, the model we estimate does not converge.[6] Nevertheless, we are able to retrieve the estimates of the last iteration of the GMM estimation and find that the results have the same pattern as the non-linear SUR results (see Table 2.C.1 in appendix C). This suggests that endogeneity is not likely to be a

[6]This is not a rare occurrence as most studies are unable to construct strong instruments from available data. Tommasi and Wolf (2016), for example, deal with a similar case of non-convergence in an attempt to control for endogeneity.

significant issue for our model.

2.4.3 Poverty Analysis

Estimating the level of resource shares alone does not tell us whether the needs of an individual are met. In order to gain an understanding into the level of welfare of individual household members, we calculate individual poverty rates based on estimated resource shares and compare these to standard poverty measures.

To begin, columns 3 to 6 of Table 2.4 present the mean, standard deviation, and the maximum and the minimum values of resource shares for individuals across different household types. These calculations are based on the estimates obtained when both SAP and SAT identifying assumptions are imposed (the rightmost columns of Table 2.2) and average over all the values of demographic factors. These descriptive statistics (especially the mean values) present a more general picture of how resource shares change across household types. Generally, mean values of resource shares follow the expected pattern. The average resource shares of fathers are higher than that of mothers for all household types. Indeed, in the penultimate row of the table, which shows average resource shares when all household types are combined, we notice that women's average resource shares are at least 10 percentage points lower than the average resource shares for fathers and children. We also observe that standard deviations are consistently lower for women than men and children across all household types. According to DLP, this may suggest that for mothers, the various demographic variables are not as important as the household size in determining the level of resource shares. In other words, women who live in a particular household type tend to have similar socio-demographic characteristics. Also, it is reassuring to see that all minimum and maximum values of resource shares lie between 0 and 1.

The last two columns of Table 2.4 present estimated poverty rates across household types for our sample. Column 7 presents individual poverty rates based on the resource shares estimated in this study and column 8, standard poverty rates which assume equal resource shares. We use the poverty threshold calculated by the Ghana Statistical Service using data

Table 2.4: Average Resource Shares and Poverty Rates

		Resource Shares				Poverty Rates	
Household type	Individual type	Mean	Standard deviation	Minimum	Maximum	Using unequal shares	Using equal shares
One child	man	0.369	0.096	0.075	0.630	0.181	0.090
	woman	0.341	0.055	0.154	0.507	0.205	
	children	0.290	0.081	0.067	0.567	0.146	
	each child	0.290	0.081	0.067	0.567		
Two children	man	0.415	0.093	0.167	0.666	0.116	0.166
	woman	0.233	0.052	0.073	0.383	0.413	
	children	0.352	0.078	0.135	0.580	0.320	
	each child	0.176	0.039	0.068	0.290		
Three children	man	0.347	0.096	0.088	0.623	0.148	0.223
	woman	0.236	0.057	0.066	0.383	0.350	
	children	0.416	0.078	0.149	0.641	0.359	
	each child	0.139	0.026	0.050	0.214		
Four children	man	0.342	0.091	0.106	0.652	0.171	0.326
	woman	0.224	0.054	0.079	0.377	0.397	
	children	0.434	0.073	0.255	0.607	0.500	
	each child	0.108	0.018	0.064	0.152		
All households	man	0.375	0.099	0.075	0.666	0.150	0.180
	woman	0.263	0.073	0.066	0.507	0.336	
	children	0.362	0.095	0.067	0.641	0.305	
	each child	0.189	0.084	0.050	0.567		
All persons	all	0.236	0.117	0.050	0.666	0.302	0.198

from GLSS 6.[7] According to Ghana Statistical Service (2014b), an adult needs GHS1,314.00 a year to purchase essential food and non-food commodities. Since children have lower needs than adults, we follow the Organisation for Economic Co-operation and Development (OECD) and estimate that children's needs are 60% of that of an adult. Hence, we compare expenditure on children to GHS788.40 in assessing the incidence of child poverty.

With regard to poverty estimates, there are a number of patterns to take note of. First, it is clear from column 7 that the poverty incidence is much higher for women and children than for men. While women have the highest incidence of poverty in households with one to two children, children have the highest poverty rates in households with four children. In households with three children, poverty rates are roughly the same for mothers and children.

[7]We also estimate individual poverty rates using the World Bank threshold of $3.10 per person a day (at 2011 purchasing power parity prices) and arrive at the same conclusions.

In addition to this, the incidence of poverty for children rises consistently with household size. As BDK argues, one reason for this may be the fact that we are unable to account for the large economies of scale to consumption that may exist amongst the children of a household. The figures in the penultimate row of column 7 present the estimates of individual poverty rates for all households in the sample. These figures suggest that mothers particularly and children are the most vulnerable groups to poverty in Ghana. Mothers and children have poverty rates of 33.6% and 30.5%, respectively, while fathers have a poverty rate of 15%. From our results in Table 2.2 and our discussions in Subsection 2.4.1, we can conclude that one of the main reasons women tend to be the poorest is that they tend to bear most of the cost of having young children. In other words, poverty among mothers in Ghana seems to be directly related to the welfare of their children, especially the young ones. DLP and BDK do not find this relationship in their studies. Also, these other studies find that per-capita calculations overestimate poverty levels for mothers and fathers, but underestimate poverty levels for children. Our results, on the other hand, indicate that the only instances where per-capita calculations overestimate poverty levels are for men who have two or more children. For the most part, the incidence of poverty in Ghana is generally underestimated when equal resource shares are assumed.

In sum, our findings show that the nature of poverty may vary from country to country in the sub-Saharan African region. More importantly, they show that the study of intra-household resource allocation can be a useful tool for understanding these differences. Knowledge gained from this kind of study has several applications in the targeting and implementation of poverty alleviation policies. In Section 2.5, we discuss the importance of our results for one of such policies in Ghana.

2.5 Implications for LEAP

The Livelihood Empowerment Against Poverty (LEAP) programme was first implemented in 2008 as the flagship programme of the National Social Protection Strategy and as part of the country's efforts to achieve the UN Millennium Development Goals (MDGs).[8] The

[8]For more general information on the LEAP programme, see www.leap.gov.gh.

programme is funded by the government of Ghana and supported by the World Bank and the DFID. The objective of the programme is to alleviate extreme poverty in Ghana by increasing basic household consumption and nutrition, increasing access to health care services, and increasing school enrolment and attendance among the extremely poor and vulnerable. This is done primarily through social cash transfers and the provision of health insurance for eligible households. Currently, LEAP has 213,028 beneficiaries in all 216 districts and all 10 regions of the country. The scheme targets specific social groups including orphans and vulnerable children, severely disabled individuals, the elderly who have no support and, recently, pregnant and lactating women. For the purposes of this section, we will focus on orphans, vulnerable children, pregnant women, and mothers with infants since our sample does not explicitly include the other social groups.

In 2015, the LEAP programme was extended to include pregnant women and mothers with infants under 15 months old. This sub-component of LEAP called LEAP 1000 currently covers only the Northern and Upper East regions of the country and specifically aims at reducing stunting in Ghana. According to UNICEF (2013), stunting can have negative long-term effects on children such as general poor health and diminished cognitive and productive capabilities. Since most stunting is known to occur before a child turns 2 years old (Walker et al., 2007), LEAP 1000 hopes to reduce stunting by supporting children for the first 1000 days of their lives. Based on our results, we know that child poverty is most prevalent in large rural households making it more likely for children in such households to be stunted. LEAP 1000 is likely to be an effective means of reducing stunting and child poverty in Ghana because it effectively targets these households. According to MoGCSP (2016), LEAP 1000 households have 6 members on average compared to the average of 4.5 in rural Ghana. MoGCSP (2016) also finds that LEAP 1000 households have a poverty rate of 91% and a poverty gap of 54%. These poverty measures are also much higher than average rates in rural areas in Ghana. Also, as our results have indicated, the mothers of these poor and vulnerable children are likely to be even poorer and more vulnerable themselves. Our findings show that mothers with younger children (less than 3 years old) have reduced bargaining power in the household; resource shares for these women can

be 5 percentage points lower than for other women. This is especially important for LEAP 1000 households as women in these households are either pregnant or have children that are less than 15 months. The Baseline Evaluation Report for the programme released in May 2016 states that over 80% of the women in LEAP 1000 households did not complete primary education and live with spouses that exhibit controlling behaviour. In addition, 20% of these women were married before the age of 18 (MoGCSP, 2016). These factors explain why the women eligible for this programme are likely to be extremely vulnerable and poor. This means that although LEAP 1000 is primarily aimed at reducing stunting in children, the programme is likely to create the positive externality of improving the welfare of some of the most vulnerable women in the country also. This makes LEAP 1000 a potentially effective poverty alleviation scheme for the Ghanaian context. Hence, policy makers need to consider expanding this sub-component of the LEAP programme to cover all the rural regions of the country.

Women can also play an important role in the administration of mainstream LEAP to improve the overall efficiency of the programme. Currently, any member of a LEAP household can be nominated to receive payments on behalf of that household. These individuals are known as caregivers. In the spirit of Duflo (2003), our findings indicate that women are more likely to spend the cash they receive on the needs of children than men. This is especially important in Ghana since half of the households in Ghana are matrilineal. This gives mothers an even greater incentive to spend on the needs of their children. Therefore, encouraging female adults to be caregivers in households where child beneficiaries are present is likely to greatly improve the effectiveness of mainstream LEAP.

In order to ensure that the objectives of the programme are achieved, households with eligible children receive payments only if certain conditions are met with regard to children's health and education. In this sense, the scheme is conditional for child beneficiaries. One of the conditions that must be met is that children in LEAP households cannot be involved in child trafficking or in the worst forms of child labour. Our results on working children confirm the importance of this condition. However, our findings indicate that children who are involved in any kind of work at all can have their resource shares reduced by 7 percentage points. Therefore,

making this condition a little more stringent than it already is could be a legitimate course of action.

2.6 Conclusion

Researchers are now able to use collective household models to estimate the proportion of total expenditure that each member of the household commands in spite of data restrictions and joint consumption. Estimating resource shares of individuals is particularly important for developing countries because intra-household inequality is likely to be very high in such countries.

In the present essay, we apply the Dunbar, Lewbel, and Pendakur (2013) framework to a Ghanaian data set to estimate resource shares and calculate individual poverty rates. The results show that fathers command a larger share of resources than mothers and children. One of the reasons for this appears to be the fact that mothers bear a significantly larger proportion of the cost of having children, especially when the children are less than three years old. The resource shares of children are quite large compared to similar papers on sub-Saharan Africa although per-capita resource shares of children falls with the number of children. We also find significant gender bias in favour of girls. A likely reason for this is the practice of the matrilineal system of descent and inheritance within the forest ecological region by the largest ethnic group in the country. Furthermore, unlike educated fathers, educated mothers tend to divert resources from their spouses to favour their children. Finally, children who are involved in any form of work appear to command significantly lower levels of resources in the household. With regard to poverty, the estimates of individual poverty generally show that women and children are the most vulnerable groups of people to poverty in Ghana. Standard poverty indices generally underestimate poverty rates in Ghana except for men who have two or more children.

Finally, to illustrate the applicability of our results to development policies, we discuss the implications of our findings for the Livelihood Empowerment Against Poverty (LEAP) programme, a social cash transfer programme that is aimed at alleviating extreme poverty in Ghana. Based on the results, we argue that LEAP 1000 is likely to be very effective at

reducing poverty among women and children. We also recognize that allowing for only female caregivers is likely to improve the outcomes of mainstream LEAP. Lastly, we suggest that the condition that children are not involved in child trafficking or in the worst forms of child labour is strengthened.

Appendix 2.A Testing DLP Model Assumptions

Appendix 2.A discusses the tests carried out to confirm that the four assumptions necessary for the identification of resource shares in the DLP model hold in our data set. The online appendix of DLP provides a detailed discussion on the derivations of these tests. In carrying out some of these tests, additional samples on single individuals and childless couples from GLSS 6 are used. In spite of data restrictions, the results show that the assumptions of the DLP model largely hold in our data set.

Do households make Pareto-efficient decisions? DLP, like BCL, assumes that households make decisions in a Pareto-efficient manner and allow for joint consumption among members of the household. Given PIGLOG preferences and the other assumptions of the DLP model, Pareto-efficiency has different implications for each of the semi-parametric restrictions on Engel curves of single households and childless couples. For SAP, Pareto efficiency implies that the slopes of the Engel curves for men's clothing and women's clothing have the same sign. We test this on 462 childless couples using linear SUR regressions and find that on average, the sign of the slope coefficient is the same for both men (-0.005) and women (-0.006). From an observation by observation stance, 75% of the childless couples have the slope coefficients of the man and woman having the same sign.

For SAT, Pareto-efficiency implies that the slopes of Engel curves for men's and women's clothing among childless couples must be proportional to that of single persons with the sum of the proportions equalling 1. Again, we test this using linear SUR regressions on 1,643 single households and 462 childless couples. Out of the 13 slope coefficients, the sum of the proportions for men and women is not statistically different from 1 for 10 of those coefficients. Taken together, the results for both SAP and SAT suggest that households in our data set make Pareto-efficient decisions.

Are resource shares affected by household expenditure? As previously indicated, all BCL-type models impose resource-share invariance to expenditure in order to identify resource shares. Other studies have shown empirically that this restriction may be valid in some data sets (see Menon et al., 2012 or Cherchye et al., 2012). To test the validity of this assumption in

our data set, we re-run the non-linear SUR estimation given both SAP and SAT conditions in the last columns of Table 2.2 including a new dummy variable in η_{ts}, δ_{ts} and β that indicates higher expenditure. This dummy takes the value of 1 when household expenditure is above the median value for the sample. If resource-share invariance holds, we expect this new variable to be statistically insignificant in η_{ts}. A Wald test indicates that the coefficient on this variable is not statistically different from zero with p-values 0.4573 for men's resource shares and 0.9997 for women's resource shares. Therefore, our results show that within our sample, resource shares are unaffected by household expenditure.

Are SAP and/or SAT valid restrictions on individual preferences? Due to data restrictions, we are unable to test these assumptions directly on our sample. However, we are able to test whether SAP holds among single households by comparing the slopes of Engel curves of single men and single women. Assuming PIGLOG preferences for both men and women, SAP implies that the slope coefficients for single men and single women are statistically equal. We estimate separate linear SUR regressions using a sample of 1,161 single men and 482 single women and carry out a Wald test on the slope parameters. With a p-value of 0.5433, we cannot reject the null hypothesis that the slope coefficients for single men and single women are statistically equal. The fact that SAP holds for single households is reassuring, and shows that SAP is likely to hold within our sample as well.

We are unable to test the validity of SAT in single households because such a test would require data from 2 waves of the GLSS. Unfortunately, we do not have access to previous rounds of the GLSS. Moreover, as previously mentioned, SAT requires relatively large samples to produce precise results. Compared to GLSS 6, previous rounds of GLSS cover very few households and hence we are likely to end up with a relatively small sample.

Are clothing and footwear private assignable goods? This restriction can be violated in two ways: through direct sharing among family members and through consumption externalities. To test for direct sharing, we re-estimate the non-linear SUR estimation given both SAP and SAT conditions in the last columns of Table 2.2 treating clothing and footwear as two separate private assignable goods. This yields a number of overidentifying restrictions.

Similar to DLP, we argue that footwear is more difficult to share than clothing. Hence, if clothing is not shared within the household, the estimates of resource shares obtained from using clothing as the private assignable good should be statistically equal to the estimates obtained from using footwear. Unexpectedly, the results show some evidence of direct sharing. However, it is important to note that footwear budget shares are very small (with a mean of less than 1%). This leads to badly estimated Engel curves for footwear. Indeed, the estimates obtained from clothing are very similar to those obtained when the sum of clothing and footwear are used (last columns of Table 2.2). This is not the case with footwear. Hence, clothing and footwear may not be comparable in this case. Moreover, we can be quite certain that children do not share clothing and footwear with their parents as our sample excludes households with older children. The mean age of children in our sample is 5. In view of these considerations, we do not consider these results to provide overwhelming evidence of direct sharing in the household. As DLP argues, the previous tests of the other three model assumptions are really joint tests of those assumptions and the privateness and assignability of clothing and footwear. If this assumption were not valid in our data set, all the other tests should have failed. Hence, we can conclude that for our purposes, using clothing and footwear as private assignable goods does not adversely affect the results.

Externalities in clothing consumption occur if one household member derives utility from clothing worn by other members of the household. DLP tests for this by comparing estimates of resource shares for two-parent households and single-mother households. In doing this, they test the dependence of an adult's utility on the consumption of clothing by his or her spouse. Unfortunately, we are unable to carry out this test because of data restrictions.

Appendix 2.B Estimated Resource Shares - Complete

Table 2.B.1: Resource Share Estimates for Ghanaian Households - Complete

		SAP		SAT		SAP and SAT	
Household characteristic	Individual type	Estimate	StdErr	Estimate	StdErr	Estimate	StdErr
One child	man	0.366***	0.059	0.339***	0.073	0.351***	0.057
	woman	0.292***	0.041	0.324***	0.082	0.294***	0.041
	children	0.342***	0.048	0.337***	0.058	0.355***	0.048
	each child	0.342***	0.048	0.337***	0.058	0.355***	0.048
Two children	man	0.424***	0.064	0.394***	0.076	0.409***	0.061
	woman	0.191***	0.040	0.243***	0.070	0.198***	0.041
	children	0.385***	0.051	0.363***	0.060	0.393***	0.051
	each child	0.193***	0.026	0.182***	0.030	0.196***	0.025
Three children	man	0.370***	0.064	0.349***	0.075	0.345***	0.062
	woman	0.201***	0.040	0.229***	0.066	0.204***	0.041
	children	0.428***	0.053	0.423***	0.062	0.451***	0.052
	each child	0.143***	0.018	0.141***	0.021	0.151***	0.017
Four children	man	0.344***	0.070	0.315***	0.078	0.334***	0.068
	woman	0.191***	0.045	0.220***	0.064	0.201***	0.045
	children	0.465***	0.061	0.466***	0.066	0.465***	0.059
	each child	0.116***	0.015	0.116***	0.017	0.116***	0.015
Coastal	man	0.098**	0.040	0.064	0.039	0.109***	0.039
	woman	-0.048*	0.028	-0.015	0.025	-0.051*	0.029
	children	-0.050	0.037	-0.049	0.045	-0.058	0.038
Forest	man	0.000	0.032	0.013	0.031	0.014	0.031
	woman	0.040	0.025	0.050*	0.026	0.040	0.026
	children	-0.040	0.030	-0.063*	0.037	-0.053*	0.031
Savannah	man	0.021	0.037	0.030	0.038	0.032	0.037
	woman	0.044	0.027	-0.007	0.026	0.044	0.028
	children	-0.065*	0.034	-0.023	0.043	-0.076**	0.035
Rural household	man	0.023	0.022	0.037	0.024	0.022	0.022
	woman	0.041**	0.016	0.010	0.014	0.040**	0.017
	children	-0.064***	0.022	-0.047*	0.026	-0.061***	0.022
Average age	man	-0.008**	0.004	-0.009*	0.005	-0.007	0.004

of children	woman	-0.008**	0.004	-0.001	0.003	-0.008**	0.004
	children	0.014***	0.004	0.010**	0.005	0.015***	0.004
Proportion of	man	0.095***	0.025	0.082***	0.024	0.098***	0.025
male children	woman	-0.043**	0.020	-0.048**	0.019	-0.045**	0.020
	children	-0.052***	0.021	-0.033	0.029	-0.053***	0.022
Owns land	man	-0.020	0.021	-0.062**	0.026	-0.018	0.021
	woman	-0.062***	0.016	-0.071***	0.023	-0.064***	0.016
	children	0.082***	0.022	0.133***	0.028	0.082***	0.022
Working	man	-0.041	0.032	0.001	0.030	-0.035	0.032
mother	woman	0.025	0.023	0.006	0.022	0.024	0.023
	children	0.016	0.024	-0.008	0.031	0.011	0.024
Working	man	0.075**	0.031	0.034	0.033	0.077*	0.031
children	woman	-0.005	0.021	0.025	0.023	-0.005	0.021
	children	-0.070***	0.026	-0.059	0.036	-0.072***	0.026
Number of	man	0.035	0.023	0.013	0.024	0.033	0.023
children<3yrs	woman	-0.046***	0.015	-0.035**	0.016	-0.047***	0.015
	children	0.010	0.020	0.022	0.022	0.014	0.020
Father's age	man	-0.002	0.019	0.014	0.023	-0.006	0.022
above average	woman	0.005	0.016	0.002	0.014	0.007	0.016
	children	-0.002	0.020	-0.016	0.023	-0.001	0.019
Mother's age	man	-0.072***	0.026	-0.084***	0.030	-0.072***	0.025
above average	woman	0.040**	0.017	-0.013	0.016	0.042**	0.017
	children	0.032	0.022	0.097***	0.030	0.030	0.022
Man's	man	-0.002	0.007	0.001	0.007	-0.003	0.007
education	woman	0.012**	0.005	0.005	0.005	0.012**	0.006
	children	-0.010	0.006	-0.006	0.008	-0.009	0.006
Woman's	man	-0.019**	0.007	-0.025***	0.009	-0.019**	0.008
education	woman	0.001	0.005	0.000	0.005	0.001	0.005
	children	0.018***	0.007	0.025***	0.009	0.018***	0.007
Christian	man	-0.074**	0.037	-0.076**	0.034	-0.077**	0.037
father	woman	0.032*	0.019	-0.012	0.017	0.032*	0.019
	children	0.042	0.031	0.088**	0.036	0.045	0.031
Muslim	man	-0.084**	0.038	-0.079**	0.035	-0.084**	0.038
father	woman	0.039*	0.021	0.007	0.018	0.034	0.021
	children	0.045	0.032	0.072**	0.038	0.050	0.032

Standard errors robust to all forms of heteroskedasticity. *p<0.10, **p<0.05, ***p<0.01

Appendix 2.C GMM Estimation

Table 2.C.1: GMM Estimates

		SUR[3]		GMM[4]
Household characteristic	Individual type	Estimate	StdErr[1]	Estimate
One child	man	0.339***	0.054	0.337
	woman	0.301***	0.044	0.301
	children	0.360***	0.049	0.362
Extra child[2]	man	-0.017*	0.010	-0.018
	woman	-0.024***	0.008	0.023
	children	0.041***	0.010	0.041
Rural household	man	0.011	0.022	0.011
	woman	0.027	0.017	0.027
	children	-0.039**	0.021	-0.039
Working children	man	0.096***	0.030	0.097
	woman	-0.007	0.019	0.008
	children	-0.089***	0.026	-0.089
Number of children<3yrs	man	0.018	0.022	0.017
	woman	-0.038**	0.015	-0.038
	children	0.020	0.020	0.021
Proportion of male children	man	0.116***	0.026	0.116
	woman	-0.034*	0.020	-0.034
	children	-0.082***	0.023	-0.082
Man's education	man	-0.001	0.007	-0.004
	woman	0.009	0.006	0.009
	children	-0.007	0.007	-0.007
Woman's education	man	-0.019**	0.007	-0.019
	woman	0.001	0.005	0.002
	children	0.018***	0.007	0.017

[1] Standard errors robust to all forms of heteroskedasticity. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

[2] Household dummies are replaced by a scalar valued number of children variable called the 'extra child' variable.

[3] Columns 3 and 4 present non-linear SUR results which are analogous to estimates presented in the rightmost columns of Table 2.2. The change from household dummies to the extra child variable does not change the qualitative implications of our results.

[4] Column 5 presents the GMM estimates. The endogenous regressors are extra child and total expenditure. We notice that the GMM estimates are very similar to the non-linear SUR estimates. We also estimate a model where only the extra child variable is treated as endogenous and arrive at the same conclusions. Based on these, we conclude that even if some endogeneity is present in our model, it is not significant enough to affect the qualitative results of our model. The standard errors of the GMM estimators are unknown since the model did not converge.

Chapter 3

Children's Resource Shares: Male versus Female-headed Households

Abstract

This study conducts a comparative study of children's resource shares in male-headed and female-headed households. To this end, we extend a modern collective model developed by Dunbar, Lewbel, and Pendakur (2013) by incorporating Mundlak (1978) terms. The extended model is then applied to a rotating panel of households from the Jamaican Survey of Living Conditions over a period of 21 years (1990 - 2010). The panel nature of our data allows us to control for unobserved household heterogeneities which are shown to play an important role in the results. We find that the gender of the household head plays an important role in determining individual resource shares within the household. Our results also indicate that children receive substantially larger resource shares in female-headed households than in male-headed ones and hence children who live in relatively poor female-headed households are not necessarily worse off. The marginal effects of household characteristics on the resource shares of children are shown to vary considerably based on the gender of the household head.

3.1 Introduction

The growing incidence of female headship of households across the world has motivated considerable policy research because of its link to poverty, gender inequality, and child welfare. A recent study by the United Nations (2017) estimates the proportion of female-headed households (FHHs) to be 34% in Latin America and the Caribbean, 27% in Africa , and 19% in Asia. Importantly, it has been argued widely that, compared to male-headed households (MHHs), FHHs are likely to be poorer and more vulnerable as women tend to have less access to productive resources such as land and capital (Buvinic and Gupta, 1997), credit (Zeller and Sharma, 1997), and receive lower wages compared to men for similar jobs (Boxill and Quarless, 2005). For instance, the United Nations Development Programme (2005, p. 299-308) estimates that women in Latin America and the Caribbean earn only 40% of men's incomes. This implies that FHHs are more likely to raise children with lower health and educational outcomes, leading to lower labour market outcomes in the long run (Handa, 1994). On the other hand, the general consensus in the literature is that the preferences of women tend to favour children, where studies such as Duflo (2003), Duflo and Udry (2004), and Caiumi and Perali (2015) have shown that women spend more on child-related goods such as food, health and education, while men spend more on adult-specific goods, such as tobacco and alcohol. Hence, in FHHs, and in single-mother households in particular, the well-being of children may increase as a result of higher expenditure on child-friendly goods. Since both arguments are equally plausible, the actual impact of female headship on child welfare in specific contexts can only be determined empirically.

This study addresses this issue by investigating the relationship between the gender of the household head and the nature of intra-household resource allocation using a modern collective household model. To the best of our knowledge this study is the first to compare FHHs to MHHs within this framework. Arguably such an analysis is essential to understanding inequality and poverty as it enables policy makers to not only identify the poorest households, but also to determine which individual household members are likely to be the most vulnerable. While recent literature on intra-household inequality have found that women and children tend to

be poorer than men living in the same households (Dunbar et al., 2013; Bargain et al., 2014; Mangiavacchi et al., 2014), these papers have focused on traditional MHHs which consist of couples and their children.

In this study, we estimate the levels of resource shares allocated to adults and children within MHHs and FHHs in Jamaica, an island country situated in the Caribbean. Jamaica is an interesting test case for the analysis at hand since it has one of the highest incidences of FHHs in the world. According to an executive summary of the 2012 Jamaican Survey of Living Conditions, 45.6% of all households in Jamaica are female-headed, with 26% of these households containing a male-adult resident (Planning Institute of Jamaica, 2012). Partnered FHHs usually result when a man is unable to provide financially for his family, is away seeking job opportunities (Massiah, 1982) or when the household lives in a property owned by the woman (Handa, 1996a). The report also indicates that FHHs in Jamaica usually bear a greater dependency burden compared to MHHs since they contain a higher proportion of children.

According to Safa (2007), a high percentage of FHHs usually indicates a matrifocal society. In fact, various sociological and anthropological studies have established the central role women and mothers play in Jamaica and the Caribbean society at large (Massiah, 1983; Sargent and Harris, 1992; Stuart, 1996). The Caribbean is known for its weak conjugal bonds, strong consanguineal ties and unconventional mating and residential patterns. According to Massiah (1983) and Safa (1998), weak conjugal unions originated during the slave trade as married slaves were usually sold separately. Mothers and children were, however, sold together creating strong consanguineal ties between mothers and children. Also, most young adults in Jamaica tend to engage in visiting relationships and have children before they enter a residential union such as a common law relationship[1] or marriage (Handa, 1996a; Eggleston et al., 1999). More often than not, these mating patterns usually force young women to become the sole breadwinner for the household in the absence of a male adult. In contrast to this, a minority of these women also willingly choose to be household heads as an adaptive response to local economic conditions, including high rates of male unemployment, increasing female participation rates (Handa, 1996a; Safa, 1998) and a high rate of emigration of male adults (Massiah, 1982). They

[1] A common law relationship exists when a couple share a residence but is not legally married.

thus take advantage of male absenteeism to secure their own welfare and that of their children, and to maintain their independence and the custody of their children.

Jamaica has been the subject of a number of previous studies on FHHs, such as Louat et al. (1993), Handa (1994), Handa (1996a), Handa (1996b), Handa (1996c), and Handa (1998). While Handa (1996a) attempts to identify the economic factors that lead to the formation of FHHs in Jamaica using a bargaining model of headship choice, Louat et al. (1993) and Handa (1994) evaluate the relationship between gender, headship and child welfare using reduced form regressions. Their findings indicate that children raised in FHHs are not necessarily disadvantaged when compared to children in MHHs with similar characteristics. The results of Handa (1996b) support this notion as well. Using standard Engel curves, Handa (1996b) finds that FHHs in Jamaica tend to spend more on food, education and children's clothing, and less on alcohol and tobacco. However, it is important to note that none of these papers estimates the share of resources that is allocated to the different members of the household.[2]

Within Jamaica's unique sociocultural context, we estimate and conduct a comparative analysis of children's resource shares in MHHs and FHHs using the modern household collective model developed by Dunbar, Lewbel, and Pendakur (2013) (DLP hereafter). We apply this model to a rotating panel constructed from the Jamaican Survey of Living Conditions (JSLC hereafter) for the period from 1990 to 2010. In terms of methodology, our study is also original since, to the best of our knowledge, this kind of collective model has not yet been used with panel data. Using such data allows us to control (at least partially) for possible endogeneity in our model by accounting for time-invariant unobserved heterogeneities within households. We do this by incorporating Mundlak's (1978) approach to panel data into the DLP model. In particular, we include time averages of all time-varying covariates (also known as Mundlak terms) in our regression model to control for household time invariant effects. Similar to Roberts and Taylor (2017) who also account for individual fixed effects in the context of intra-household commuting choices, we implement our model using a seemingly unrelated regression (SUR) model.

[2]More recent literature such as Gaiha and Kulkarni (2005), Klasen et al. (2015) and Liu et al. (2017) analyse FHHs in Asia and Latin America. Again, these studies do not estimate actual resource shares of individual household members.

Our results indicate that not taking these time invariant unobserved household heterogeneities into account leads to both upward and downward biases in our estimates. With respect to children's resource shares, our findings suggest that children who live in and around the capital city (that is, in the Kingston Metropolitan Area) are worse off, irrespective of whether they live in a MHH or a FHH. Our results also indicate that, in contrast to MHHs, remittances and other forms of support from family and friends significantly increase the resource shares of children in single-mother households. A likely reason for this is the tradition of child fostering in Jamaica. We also find evidence that suggests that female heads prefer male children to female children. A possible explanation for this is that male children are more likely to contribute to household income at an earlier age than female children. In addition, more educated female heads are found to spend more on housing and private primary and secondary education, and less on children's clothing and footwear, arguably in an attempt to provide a safer and more nurturing environment for their children. Also, expenditure on primary education is usually treated as an investment in human capital for possible future contributions to the household, especially for boys. In sum, our findings show that children in more vulnerable FHHs may be compensated by higher resource shares and hence may not be worse off in terms of welfare outcomes.

The rest of the chapter is organized as follows. Section 3.2 provides the theoretical framework of this essay by discussing both the DLP model and the Mundlak framework and how these two models are merged. Section 3.3 describes the data set, presents summary statistics and discusses the empirical implementation of the model. Section 3.4 presents our main empirical findings, while Section 3.5 concludes.

3.2 Theoretical and Empirical Framework

This section presents the theoretical framework of the study. The first part provides a brief description of the DLP model for the present context, while the second part discusses the Mundlak (1978) approach to panel data, how it relates to obtaining fixed effects estimates, and how we incorporate its framework into the DLP model.

3.2.1 The DLP Framework

As previously discussed Section 2.2 of Chapter 2, the DLP model is a collective household model that estimates resource shares of individual household members with a particular focus on the shares of children. In some previous versions of the collective model, children are not treated as individuals who have preferences of their own; they are either treated as public goods for parents or as a household characteristic (see Blundell et al., 2005 for example). As DLP argues, children are unique members of the household because in most cases they are unable to make a choice as to which household to belong to, may find it difficult to leave in strenuous circumstances, and do not contribute to household income substantially. Hence, they are likely to be the most vulnerable individuals within a household. Other collective household models that estimate the share of resources allocated to children include Bargain et al. (2010), Bargain and Donni (2012) and Bargain et al. (2014). Compared to these models, the DLP model offers the most flexible framework for our study because of its empirical tractability, milder assumptions with respect to individual preferences and lower data requirements.[3]

In this essay, the model in Section 2.2.2 is slightly modified to suit the present data set. Assuming PIGLOG preferences (Muellbauer, 1976) for household members, the model takes the following form:

$$W_{aj}(y) = \eta_{aj}(\delta_{aj} + \beta_{aj} \ln \eta_{aj}) + \eta_{aj}\, \beta_{aj} \ln y$$

$$W_{cj}(y) = j\eta_{cj}(\delta_{cj} + \beta_{cj} \ln \eta_{cj}) + j\eta_{cj}\, \beta_{cj} \ln y \tag{3.1}$$

for $i = a, c$ and $j = 1, 2, 3, 4$. The subscripts i and j represent individual and household types respectively. Similar to the previous application in Chapter 2, household types are determined by the size of the household; $j = 1, 2, 3, 4$ indexes households with one, two, three, and four children, respectively. Each household consists of two individual types: adults denoted by $i = a$, and children denoted by $i = c$. In the original DLP model and the previous essay, each household consists of three individual types: a male adult, a female adult, and children. With the present application of the model, we are unable to distinguish between the spending

[3] All these models (including DLP) build on the pioneering work of Browning et al. (2013) and Lewbel and Pendakur (2008).

patterns of men and women living in the same household because of data restrictions. It is important to note that time subscripts[4] and demographic variables such as age and education are suppressed in this section to simplify notation.

W_{ij} represents the household budget share of individual i's private assignable good. As previously mentioned, the identification of resource shares in this model is heavily dependent on the existence of private assignable goods for each individual type. In this essay, adult's and children's clothing and footwear are used as the private assignable goods because expenditures on these goods are observed separately in the JSLC. Similar to the previous chapter, clothing and footwear make up only a small proportion of total household expenditure. A study by Bargain et al. (2018) shows that this is not likely to be an issue because of the suitability of these particular goods (clothing and footwear) to the individual preference restrictions that BCL-type models impose, especially SAT. Using a unique data set from Bangladesh, the study finds that clothing and footwear perform best when compared to other available private assignable goods (such as food, health, education, and other personal effects) when estimating actual individual resource shares.

It is important to note that unlike DLP and Bargain et al. (2014), we are unable to estimate the share of men and women separately as we do not have separate private assignable goods for men and women in our data set. This is, however, not a huge loss in this context since the main focus of this study is to compare children's resource shares in MHHs to children's resource shares in FHHs. Also, although the DLP model and other BCL-type models are based on a particular private assignable good, it is worth emphasising that the model estimates overall individual shares of total household expenditure for all goods.

y denotes total household expenditure, η_{ij} denotes the resource share of individual i in household type j, while δ_{ij} and β_{ij} represent the intercept preference parameters and the latent slope preference parameters respectively. Again, β_{ij} is specified according to which restriction is applied to the shapes of the Engel curves. If SAP is imposed, $\beta_{ij} = \beta_j$ for all i. If SAT is imposed, $\beta_{ij} = \beta_i$ for all j. If both SAP and SAT are imposed, $\beta_{ij} = \beta$ for all i and j.

[4]Strictly speaking, time subscripts should be included in the model as we are dealing with a panel data set. They are defined explicitly in the following subsection where we focus on modelling household fixed effects.

3.2.2 The Mundlak Framework and Household Fixed Effects

In an attempt to adjust the original DLP model to fit a panel data set, we incorporate Mundlak's (1978) approach as this enables us to control for unobserved heterogeneities at the household level which do not vary with time. As already mentioned, using a panel data set and accounting for these household fixed effects could control (at least partially) for possible endogeneity that may exist in the original DLP model. DLP address these endogeneity issues in their paper by using instrumental variables. In cases, such as ours, where viable instrumental variables cannot be obtained from the available data set, controlling for household heterogeneities in a panel-data setting is an alternative route researchers can take to control for possible endogeneity in the DLP model. Consider the Mundlak (1978) framework using the simple unobserved effects model below:

$$y_{st} = x_{st}\psi + v_s + u_{st} \tag{3.2}$$

where $s = (1, 2, ..., S)$ denotes the cross-sectional unit (which is the household in our case), and $t = (1, 2, ..., T)$ denotes the time period. x_{st} is a matrix of observable explanatory variables which may change across both s and t, or across s but not t, or across t but not s. ψ represents the matrix of coefficients, v_s denotes the unobserved heterogeneities which are time-invariant and u_{st} represents idiosyncratic disturbances which vary across s and t.

The key concern with v_s in this kind of set-up is whether or not it is correlated with x_{st}. If the two terms are correlated, a fixed effects estimation approach is appropriate. However, fixed effects estimation can be difficult to carry out in non-linear models such as the DLP model because of the incidental parameters problem for instance. Under such circumstances, a correlated random effects (CRE) framework such as the Mundlak (1978) approach can provide a useful alternative. One should note that the difference between this framework and the pure fixed effects approach is that with CRE, the relationship between v_s and x_{st} is modelled in a very specific way (Wooldridge, 2010, p. 286). More specifically, Mundlak (1978) allows v_s to depend on time averages or panel-level averages of the observed covariates (x_{st}) that vary over

time so that:

$$v_s = \bar{x}_s \pi + w_s \tag{3.3}$$

where $\bar{x}_s$ denotes the time averages of time-varying covariates in x_{st}, π is the matrix of coefficients, and w_s is the error term which is independently and identically distributed. These time averages or panel-level averages are usually referred to as Mundlak terms. Substituting Equation (3.3) into Equation (3.2) gives the following expanded model:

$$y_{st} = x_{st}\psi + \bar{x}_s \pi + w_s + u_{st}. \tag{3.4}$$

It is important to note that the error term in Equation (3.4) is a sum of w_s and u_{st}. A generalized least squares (GLS) estimation of Equation (3.4) is efficient and produces an estimator of ψ that equals the fixed effects estimator (Cameron and Trivedi, 2005, p. 719).

We incorporate this framework into the DLP model by including Mundlak terms in the intercept preference parameters (δ_{ij}), the slope preference parameters (β_{ij}), and the resource share functions (η_{ij}) of Equation (3.1). Then we estimate Equation (3.1) using an iterated feasible generalized non-linear least squares estimation method within a non-linear seemingly unrelated model framework. This produces the fixed effects estimator for the explanatory variables that vary across s and t. Due to the complicated nature of the error term in this model, we obtain fully robust inferences by using an unrestricted variance-covariance matrix.[5]

In spite of the fact that Mundlak (1978) makes certain strong assumptions about the relationship that exists between v_s and x_{st}, his approach has two main advantages over a pure fixed effects approach. First, unlike the pure fixed effects approach, we are able to include time-invariant variables in our estimation. Second, the Mundlak approach is also an indirect way of testing the correlation between v_s and x_{st}. If v_s and x_{st} are correlated, that is, if fixed effects assumptions hold, the Mundlak terms ($\bar{x}_s$) must be jointly significant within the expanded model.

[5] We implement this in Stata using the "cluster" option instead of the "robust" option.

3.3 Empirical Implementation

We describe our data set and present some summary statistics for each family type in the first part of this section. The second part discusses the specification of our model and the estimation method we use in implementing it.

3.3.1 Data Set

The Jamaican Survey of Living Conditions (JSLC) is a nation-wide survey that was introduced in 1988 to monitor the economic welfare of households within the country. Since 1990 the survey has been carried out on an annual basis (except for 2011 when the survey was not conducted). Its core modules include health, education, consumption, nutrition, and housing. For most years an additional module is included that focuses on specific subjects such as remittances, coping strategies, ageing and employment.

The JSLC is tagged to the national Labour Force Survey (LFS hereafter) which is carried out using a one-half panel design. This means that half of the households from a previous round of the LFS, and by extension, the JSLC, are included in the current sample as long as the master frame is not changed. This one-half panel design enables us to construct a rotating panel of households for the following years: 1990-1992, 1993-1994, 1995-1996, 1997-1998, 1998-2000, 2002-2003, 2004-2006, and 2007-2010. We follow Handa's (2008) procedure in matching households across different rounds of the JSLC. First, we construct a unique household identifier that is used to match households across years. Before households are matched, we verify that the gender of the household head has not changed, that his/her age did not change by more than 2 years, and that the household size did not change by more than 2 people. Using this criteria, and similar to Handa (2008), we are able to match about 70% of the households across years. Our match rates are slightly higher in later years of the sample period. We use monthly Consumer Price Indices from the Bank of Jamaica to deflate all monetary values with December 2006 as the base value.

We restrict our sample to monogamous nuclear households for three reasons. First, the private assignable goods that are available from our data set allow individual resource shares

to be easily identified in these kinds of households. Taking this a step further, we also exclude households with children older than 13 to ensure that clothing and footwear cannot be shared between adults and children within the same household since these goods are crucial for the identification of resource shares.[6] Second, restricting our sample to nuclear monogamous households ensures that the structure of MHHs and FHHs are as similar as possible and hence makes them more comparable. This also means that conclusions drawn from the comparative analysis are likely to be more robust and reliable. Third and most importantly, it significantly reduces the bias that may be present in the identification of household heads. These biases are usually greater in extended family households where the oldest male adult assumes the position of the household head even if he is not the individual responsible for the upkeep and maintenance of the family (Handa, 1994). Finally, one should note that we also include partnered FHHs in our sample because they enable us to determine whether the presence of a male adult in a FHH adversely affects the resource shares children receive when compared to single-mother households.

Our final sample consists of 479 MHHs consisting of a couple with one to four children, 304 FHHs consisting of a single mother with one to four children, and 159 FHHs consisting of a couple with one to four children. According to Rosenhouse (1989), MHHs usually indicate an intact couple whereas FHHs usually represent a single female or a female in some sort of consensual union. In our sample, we find that all partnered households (whether MHH or FHH) indicate an intact couple in that the couple is either married or have a common law relationship. About 58% of the couples in the MHHs are in a common law relationship, while 42% are married. Similarly, 79% of the couples in partnered FHHs are in a common law relationship while 21% are married. The higher percentage of common law relationships among partnered FHHs is not surprising as one of the social requirements for marriage for a man in Jamaican culture is to own a house (Handa, 1996a). It is therefore plausible that in these partnered FHHs the women tend to own the houses in which they live. It could also be an indication that the man in the household is unable to bear the economic burden of maintaining

[6]This is common practice within the literature (see DLP, Bargain and Donni, 2012 and Bargain et al., 2014 for example). In addition to this, the JSLC treats children older than 13 as adults. Therefore, they are able to enter the labour market freely.

the household and hence has very little bargaining power in the household (Handa, 1996a). The single-mother FHHs in our sample suit the definition of FHHs found in Rosenhouse (1989) to a large extent; only 9% of them are married or engaged in a common law relationship. 87% of them are either single or engaged in a visiting relationship, while 4% of them report to be in no sort of union. In total, our sample is made up of 942 households and 2,043 observations (on average, each household is followed for 2 two years).

We present summary statistics according to the different household categories in Table 3.1. The men in our sample are generally older than the women for all partnered households. On average, women are more likely than men to attend tertiary education. According to Reddock (2009), the female share of tertiary education in Jamaica is about 70%. This is because in Jamaica the pecuniary returns associated with additional education is much larger for women than for men (Handa, 1996c; Boxill and Quarless, 2005). Men, on the other hand are more likely to pursue vocational training after their secondary school education (STATIN and PIOJ, 2014). Similar to Handa (1996c), we find that FHHs are more likely to live in urban households. It is also clear from weekly expenditure values that on average MHHs are wealthier than FHHs.

Let us now turn to the budget shares of goods which represent the weights which each household gives to each of these goods. Generally, all households spend most of their income on food, housing, and transportation and communication. With regard to the private assignable goods, the share of adult clothing and footwear is roughly equal across all household categories. In other words, equal weights are given to adult clothing and footwear in each household category. On the other hand, FHHs (especially single-mother households) tend to put a higher weight on children's clothing and footwear than MHHs although MHHs may spend more in absolute terms on children's clothing and footwear due to higher overall expenditure levels. Single-mother households also tend to have highest budget shares for other child-related goods such as health and education, and the lowest budget shares for vices (alcohol and tobacco), which are more adult-specific. The share of vices doubles in all partnered households and is highest in partnered FHHs where the male adult is more likely to be idle and not involved in any economic activity. This could be seen as preliminary evidence in support of Duflo (2003),

Table 3.1: Summary Statistics for Sample by Family Type

	MHHs	FHHs		All
	Couples with children	Couples with children	Single mothers with children	
General Characteristics				
Men's age	36.2	34.9	-	35.9
	(8.51)	(7.62)		(8.34)
Women's age	31.3	30.5	32.3	31.5
	(8.28)	(6.78)	(7.86)	(7.96)
Men's tertiary education dummy	0.09	0.02	-	0.08
	(0.29)	(0.15)		(0.27)
Women's tertiary education dummy	0.10	0.06	0.08	0.09
	(0.29)	(0.24)	(0.28)	(0.28)
Proportion of male children	0.51	0.51	0.52	0.51
	(0.40)	(0.39)	(0.41)	(0.40)
Average age of children	5.6	6.1	7.0	6.1
	(3.06)	(2.86)	(2.88)	(3.04)
Rural household dummy	0.55	0.48	0.40	0.49
	(0.50)	(0.50)	(0.49)	(0.50)
Weekly expenditure in J$	8,569.30	6,868.08	6,042.24	7,519.14
	(6852.48)	(3686.95)	(5218.34)	(6088.26)
Budget Shares				
Adult's clothing and footwear	0.056	0.057	0.055	0.056
	(0.041)	(0.037)	(0.046)	(0.042)
Children's clothing and footwear	0.041	0.046	0.057	0.047
	(0.030)	(0.031)	(0.038)	(0.034)
Food	0.491	0.543	0.516	0.507
	(0.194)	(0.162)	(0.187)	(0.188)
Housing	0.111	0.093	0.124	0.113
	(0.110)	(0.112)	(0.123)	(0.115)
Transportation and communication	0.114	0.103	0.085	0.103
	(0.107)	(0.094)	(0.077)	(0.097)
Health	0.020	0.017	0.022	0.020
	(0.024)	(0.025)	(0.027)	(0.025)
Education	0.040	0.037	0.051	0.043
	(0.071)	(0.043)	(0.059)	(0.064)
Vices	0.012	0.013	0.006	0.010
	(0.033)	(0.032)	(0.026)	(0.031)
Sample size (households)	479	159	304	942

Standard deviations are in parentheses.

Duflo and Udry (2004), and Caiumi and Perali (2015), who show that women's preferences tend to be more child-friendly. On average, we also find that single mothers tend to spend more on housing compared to other households. This may be because a larger proportion of

single-mother households live in urban areas where housing is more expensive.

We present detailed summary statistics for each household type in Appendix 3.A. There are a few things worth noting from these tables. First, for all household categories, as the number of children in the household increases, the household expenditure share on adult's clothing and footwear tends to roughly decline while the share on children's clothing and footwear tends to rise. This supports the notion in the literature that children impose economic costs on parents (Browning, 1992; Bargain et al., 2010; Bargain and Donni, 2012; Bargain et al., 2014). Second, the share for typical public goods such as housing, transportation and communication, and even health tend to decrease as the number of individuals in the household increase. Since these goods are not luxuries, a plausible explanation for this is the presence of substantial scale economies within the household. On the other hand, the share of typical private goods such as food and education increase with the size of the household. Again, this is true for all household categories.

3.3.2 Model Specification and Estimation Method

Based on our data set, we include the following demographic variables in our model: the region of residence (rural area, other urban area, and the Kingston Metropolitan Area as the reference category), the age of the man, the age of the woman, the minimum age of the children in the household, the number of children aged less than three, the proportion of male children, dummies indicating whether the man and the woman have completed tertiary education, a dummy indicating whether the household receives remittances or other support from family and friends elsewhere in Jamaica, a dummy indicating whether the household receives any form of public assistance or poor relief, and a dummy indicating whether a male-adult is resident in a FHH. Similar to the previous essay, these demographic variables are included in both the resource share functions (η_{ij}) and the preference functions (δ_{ij} and β_{ij}) of Equation (3.1) and hence cannot be described as distribution factors.

Following DLP, we estimate our log-linear Engel curves (Equation (3.1)) using an iterated non-linear seemingly unrelated regression model. We allow the errors to be correlated across

the two equations. We estimate two models: one with no Mundlak terms and another where Mundlak terms are included to account for the unobserved heterogeneities within the household. We refer to the model without Mundlak terms as our baseline model because it is used as a benchmark against which to compare the model with includes Mundlak terms. To construct these Mundlak terms, we calculate time averages or panel-level averages of all demographic variables that change across time. Apart from variables indicating the region of residence, all other demographic variables vary across time. Hence, we construct Mundlak terms for 10 out of 12 demographic covariates.

Let $d = (d1, d2, ..., d12)$ be a vector of all the demographic variables, let $g = (g1, g2, ..., g10)$ be a vector of the Mundlak terms and $b = (b1, ..., b4)$ be a vector of four dummy variables, each indicating a household type j. The vector b plays the role of the constant for each household type in η_{ij}, δ_{ij}, and β_{ij}. For the baseline model, η_{ij} and δ_{ij} are specified as linear in b and d for a maximum of 16 coefficients each. As already mentioned, β_{ij} is specified according to the semi-parametric restriction imposed on the Engel curves. For SAP, β_{ij} is specified as linear in b and d for a maximum of 16 coefficients. For SAT, β_{ij} is specified as linear in a constant and d for each of the 2 individual types for a maximum of 26 coefficients. When both SAP and SAT are imposed, β_{ts} is specified as linear in a constant and d for a maximum of 13 coefficients.

For the model with Mundlak terms, η_{ij} and δ_{ij} are specified as linear in b, d, and g for a maximum of 26 coefficients each. For SAP, β_{ij} is specified as linear in b, d, and g for a maximum of 26 coefficients. For SAT, β_{ij} is specified as linear in a constant, d, and g for each of the 2 individual types for a maximum of 46 coefficients. When both SAP and SAT are imposed, β_{ts} is specified as linear in a constant, d, and g for a maximum of 23 coefficients.[7]

3.4 Empirical Results

In this section, we present the main empirical findings of this study. Both the baseline model and the model with Mundlak terms are carried out for all MHHs, all FHHs, and also

[7]We are unable to add year dummies as our models do not converge due to relatively small sample sizes. We attempt to include period dummies and find that our results do not change significantly for the models that do converge. This is probably due to the fact that, we follow households for just 2 years on average.

for single-mother households only. For each of these household categories, we impose the SAP restriction alone, the SAT restriction alone, and both SAP and SAT restrictions. Similar to the application on Ghanaian data, we find the SAT restriction to be the weakest identifying assumption for all household categories. As explained by DLP, one may need a very large sample size to produce precise estimates when the SAT restriction alone is imposed. In this section, we focus on estimates from imposing both restrictions, because for the most part these estimates are the most precise. Also, upon testing the validity of the SAT restriction given the SAP restriction, we conclude that the SAT restriction holds in our data set once the SAP restriction has already been imposed.[8]

Our results from the baseline model and the model with Mundlak terms (see Table 3.B.1 in Appendix 3.B) show that for all household categories, estimates differ appreciably in terms of statistical significance and magnitude once Mundlak terms are included in the model. For instance, with respect to the household size dummies, we observe that while the value of adult resource shares are underestimated in the baseline model for MHHs, they are overestimated in single-mother households. In addition to this, for FHHs in particular, we notice that the sign of some coefficients also change. According to Wooldridge (2013), when estimates differ substantially and in a statistically significant way, a fixed effects framework such as the one we use, is usually appropriate. Most importantly, for each household type, the Mundlak terms are jointly significant. As previously indicated, the joint significance of Mundlak terms means that fixed effects assumptions are satisfied and hence the model including the Mundlak terms is appropriate.

Resource Share Estimates with Household Fixed Effects

Table 3.2 presents the estimates of the resource share functions (η_{ij}) when both SAP and SAT are imposed as identifying restrictions, and when unobserved household heterogeneities are

[8]Following DLP, we do this by first estimating our model imposing only the SAP restriction. We then test the null hypothesis that the coefficients on the household size dummies inside β_{ij} are statistically equal using a Wald test as this is equivalent to imposing the SAT restriction. For all three household categories, we find that this null hypothesis cannot be rejected with p-values of 0.2715, 0.3729, and 0.3017 for MHHs, FHHs, and single-mother households respectively. Therefore, we conclude that the SAT restriction is valid once the SAP restriction has already been imposed.

accounted for using Mundlak terms. The results for three household categories are presented: all MHHs, all FHHs (including single-mother households), and only single-mother households. Following DLP, the household size dummies outline the resource shares for adults, children, and each child in a reference household. A reference household is a household that has a value of zero for all demographic variables included in the model. In our case, this household lives in the Kingston Metropolitan Area, does not receive any support from friends and family within or outside the country, and does not receive any public assistance or poor relief. All adults in this household have not completed tertiary education and all children within the household are girls. The table also lists the marginal effects of a number of demographic variables on these estimates (see Table 3.C.1 in Appendix 3.C for the marginal effects of all demographic variables on resource shares).

First, let us discuss the resource share of adults and children in the reference household found in the first four rows of Table 3.2. Generally, a relatively smaller share of resources is allocated to children in MHHs. In MHHS, children's resource shares range from 31% to 8% per child as the number of children in the household increases, while they range from 52% to 19% per child in all FHHs and from 56% to 21% per child in single-mother households. This can be attributed to a number of reasons. First, while all MHHs in our sample consist of 2 adults, close to 70% of the FHHs are composed of a single adult. Although couples seem to enjoy large scale economies (when one compares the estimates for MHHs and single-mother households for instance), children appear to benefit with regards to resource shares from having just one adult present in the household. Second, this could indicate that the preferences of women in Jamaica are more child-related and hence, as household heads, they are able to allocate a larger share of resources to the children. We also notice that, unlike MHHs, the total share of resources for adults consistently declines with the number of children in FHHs and single-mother households. For all three categories of households, the per-capita share for children decreases substantially as the number of children in the household increases. Again, this could be an indication that large scale economies to consumption exist among the children as well.

Let us now turn to the demographic variables. With regard to the region of residence,

Table 3.2: Resource Share Estimates for Jamaican Households

		Male-headed Households		Female-headed Households		Single-mother Households	
Household characteristic	Individual type	Estimate	StdErr	Estimate	StdErr	Estimate	StdErr
One child	adults	0.688***	0.083	0.479***	0.069	0.441***	0.068
	children	0.312***	0.083	0.521***	0.069	0.559***	0.068
	each child	0.312***	0.083	0.521***	0.069	0.559***	0.068
Two children	adults	0.636***	0.086	0.416***	0.073	0.412***	0.076
	children	0.364***	0.086	0.584***	0.073	0.588***	0.076
	each child	0.182***	0.043	0.292***	0.035	0.294***	0.038
Three children	adults	0.594***	0.085	0.416***	0.090	0.410***	0.088
	children	0.406***	0.085	0.584***	0.090	0.590***	0.088
	each child	0.135***	0.028	0.195***	0.030	0.197***	0.029
Four children	adults	0.684***	0.105	0.261***	0.098	0.150	0.105
	children	0.316***	0.105	0.739***	0.098	0.850***	0.105
	each child	0.079***	0.026	0.185***	0.025	0.213***	0.026
Other urban areas	adults	-0.081**	0.038	-0.109***	0.039	-0.147***	0.049
	children	0.081**	0.038	0.109***	0.039	0.147***	0.049
Rural areas	adults	-0.144***	0.032	-0.082**	0.041	-0.117**	0.048
	children	0.144***	0.032	0.082**	0.041	0.117**	0.048
Number of children < 3years old	adults	0.119**	0.054	0.188***	0.068	0.229***	0.067
	children	-0.119**	0.054	-0.188***	0.068	-0.229***	0.067
Proportion of male children	adults	0.103	0.110	-0.152*	0.086	-0.194**	0.089
	children	-0.103	0.110	0.152*	0.086	0.194**	0.089
Head completed tertiary education	adults	-0.113*	0.063	0.249***	0.055	0.211***	0.065
	children	0.113*	0.063	-0.249***	0.055	-0.211***	0.065
Support from others (incl remittances)	adults	-0.003	0.035	-0.062	0.038	-0.094**	0.043
	children	0.003	0.035	0.062	0.038	0.094**	0.043
Public assistance	adults	-0.167*	0.091	0.001	0.087	0.005	0.085
	children	0.167*	0.091	-0.001	0.087	-0.005	0.085
Partner present in FHH	adults	-	-	0.170***	0.063	-	-
	children	-	-	-0.170***	0.063	-	-

Standard errors robust to all forms of heteroskedasticity. *p<0.10, **p<0.05, ***p<0.01

children are generally worse off in terms of resource shares if they live in the Kingston Metropolitan Area. Up to 15% of resource shares are diverted from children to adults who live in this area. This holds irrespective of the gender of the household head. However, the shares of children are highest in rural areas for MHHs and are highest in other urban areas for FHHs. Since the cost of living is likely to be higher in urban areas (especially the capital city) than in rural areas (Kurre, 2003), parents in the Kingston Metropolitan Area tend to

spend more on other goods such as housing and utilities. For instance, within our sample, households living in the Kingston Metropolitan Area allocate about 15% of total expenditure to housing and utility bills on average, whereas rural households allocate only 8% of their total expenditure to housing and utility bills. We find a similar trend for non-consumption goods such as insurance and the repayment of loans.

Another similarity that exists between MHHs and FHHs is that children's resource shares decrease substantially (by 12% to 23%) as the number of children less than three years old increases within the household. Since 95% of all children in Jamaica are enrolled in school by their third birthday (National Academy of Sciences, 2015), this result may indicate that parents tend to spend a lot more on their children once they are enrolled in school. These school-related expenses include the cost of transportation to school, extra lessons, books, and tuition. Also the magnitude of this effect is higher in FHHs than in MHHs. This is not surprising because FHHs and single mothers in particular, tend to invest more in the education of their children than MHHs. This may be due to the fact that in Jamaica the responsibility of child care falls predominantly on women. Hence, children are more likely to take care of their elderly mothers than their elderly fathers (Handa, 1996a; Wyss, 1999; Handa, 1996c).

The next covariate of interest relates to gender bias within the household. Our results show that single-mother households have a strong preference for male children; about 19% of household resources are diverted from adults to children as the proportion of boys to girls rises. While this is true to a smaller extent in partnered FHHs, there appears to be no such bias in MHHs. Studies such as DLP and Rose (1999) have also found some forms of gender inequality in favour of the boy child within the household. In patriarchal cultures like those of Eastern and Southern Asia, this is the common practice (Das Gupta et al., 2003). However, some anthropological and ethnographic studies, such as Sargent and Harris (1992), find that girls are generally preferred to boys in Jamaica, although they observe that often a special bond exists between mothers and sons. They base their arguments on evidence from the patterns of child abandonment, health, and adoption practices.

In spite of the fact that our results seem to conflict with studies from these other disciplines,

Table 3.3: Average Expenditure Shares for FHHs

	KMA[1]		Other urban		Rural		All	
	Head TE[2]	Head no TE	Head TE	Head no TE	Head TE	Head no TE	Head TE	Head no TE
Children's clothing and footwear	0.036	0.058	0.033	0.050	0.040	0.055	0.036	0.055
Housing	0.213	0.139	0.147	0.112	0.126	0.083	0.174	0.109
Education	0.053	0.049	0.086	0.044	0.040	0.042	0.056	0.045

[1] KMA stands for Kingston Metropolitan Area.
[2] TE stands for tertiary education

we argue that by analysing gender bias in Jamaica from an economic perspective, our findings enrich the pool of knowledge that is already available on the subject. According to Handa (1996a), single mothers recognize that their older children can become assets to the household, in that they are able to contribute to household income. This then allows a single mother to be less dependent on her partner(s) and to maintain her independence. Hence, single mothers may prefer boys to girls because they are more likely to bring in income at an earlier age since they tend to enter the labour market earlier than girls do (Handa, 1998). According to Boxill and Quarless (2005), the rate of absenteeism from school for boys is about three times that of girls because culturally boys are allowed to participate in the labour market at a very early age. Girls, on the other hand, usually stay in school and spend the rest of their time engaged in domestic activities (STATIN and PIOJ, 2014).

The level of education that the household head attains is also an important factor in the household decision-making process. In MHHs, a man who has completed tertiary education tends to divert about 11.3% of resources from adults to children. First, this could mean that more educated men tend to spend more on their children. Second, since previous evidence shows that women tend to be more concerned about the welfare of children, this finding could also indicate that a more educated man is likely to be more willing to accommodate the preferences of his partner. Hence, similar to what Handa (1994) finds, children may also benefit from the presence of a female decision maker in the household who is not necessarily the head of the household.

In contrast to MHHs, a female head who has completed tertiary education tends to divert over 20% of household resources from children to adults. This is very surprising given that women are known to be more sensitive to the needs of their children. However, upon further investigation, we find that compared to their counterparts who have no tertiary education, female heads who have completed tertiary education tend to spend significantly more on housing and education and significantly less on children's clothing and footwear. This is evident in Table 3.3 which presents the average expenditure shares of these goods for female heads who have completed tertiary education and those who have not. These average values are also presented separately for each region of residence. From this table, it is clear that these findings are true particularly in the Kingston Metropolitan Area. Although housing is not seen as a typical child-related good, it may very well be in the Jamaican context. According to the World Bank (2004, p. 45-46), urban poverty in Jamaica is associated with vices such as crime and violence. Hence, especially in the KMA, high-income-earning female heads who have completed tertiary education (Boxill and Quarless, 2005) tend to move into more decent, respectable, and often gated communities where housing tends to be very expensive in order to provide a safer and more nurturing environment for their children. These women also tend to send their children to private primary schools which are very costly (Heyneman and Stern, 2014). We can therefore conclude that, even though female heads care about their children's needs, their spending patterns may differ depending on their level of education (a variable which is highly correlated to her level of income) and their region of residence. Accordingly, it may be profitable in certain scenarios to analyse expenditure shares of other goods that are not traditionally known to be child-related. It is worth noting that these findings feature prominently in FHHs and not in MHHs because females in Jamaica are more likely to complete tertiary education and are also more likely to live in urban areas (STATIN and PIOJ, 2014; Handa, 1996c).

Next, we discuss the support that the household receives from external sources in monetary form or in the form of goods and services. This support usually comes in two forms: support received from family and friends living elsewhere in Jamaica or in another country and public assistance or poor relief from the government (including food stamps, school feeding programme,

and PATH[9]). From Table 3.2, our results show that public assistance increases the resource shares of children in MHHs by almost 17%, whereas support received from family and friends (including remittances) leads to a rise in children's resource shares by 9.4% in single-mother households. For single-mother households, the most likely reason for this is the common practice of child fostering in Jamaica, where children are sent to live with a member of the extended family or a friend. According to Wyss (1995), in 1989, more than half of Jamaican children did not live with their biological fathers, about a quarter did not live with their biological mothers, and about one-fifth lived apart from both parents. These biological parents usually send money and/or goods to help with the upkeep of their children. In addition to this, remittances are becoming more and more important in Jamaica because of the increase in emigration of adults (especially the male adult) to other countries to look for better employment (Massiah, 1982). As stated by Stephenson and Wilsker (2016), in 2009, Jamaica was the 14th most reliant country on remittances in the world, with remittances comprising close to 15% of the country's GDP. This reliance of single-mother households on remittances and other forms of support from family and friends may cause them to be more vulnerable to economic and social shocks since these sources of income are relatively less stable (Benfield, 2010).

Last but not least, we find that the presence of a male adult in a FHH reduces the share of children by 17%. As already indicated, this means that children who live with single mothers tend to have higher resource shares than children who live in partnered FHHs. Although it is natural for the resource shares of children to reduce as a result of the presence of an additional adult, this could also indicate that an unpartnered female head is able to fully implement her preferences without having to bargain with a man. It is however important to note that, children may benefit both socially and emotionally from the guidance, discipline, and support that a male adult in the household provides (Handa, 1994). Unfortunately, our study is unable to take intangible benefits such as these into account.

Based on the estimates in Table 3.2, we calculate the resource shares in each household in our sample and find that resource shares follow the expected pattern. On average, resource

[9]PATH is an acronym for the Programme for Advancement through Health and Education. This programme is a conditional cash transfer programme that was created in 2001 and is aimed at increasing the welfare of children in poor households through human capital development.

shares per child are highest in single-mother households. Again, it is important to remember that this is partly due to the the fact that single- mother households consist of only one adult. We present means and standard deviations of resource shares according to household categories in Table 3.D.1 in Appendix 3.D.

3.5 Conclusion

With the increase in the incidence of FHHs in the developing world, investigating the nature of resource share allocation in these households has become crucial for the development and effective targeting of redistribution programmes. So far, most studies on household decision-making have focused on the traditional MHHs consisting of a couple with children. This study contributes to the literature by carrying out a comparative study of children's resource shares in MHHs and FHHs (including single-mother households) using a collective household model developed by Dunbar, Lewbel, and Pendakur (2013). We extend this model by incorporating Mundlak's (1978) approach. The extended model is then applied to a rotating panel of Jamaican households covering the period between 1990 and 2010. Using a panel data set allows us to account for unobserved household heterogeneities that are constant over time, thereby providing an alternative route to dealing with possible endogeneity that may be present in the DLP model.

Our results indicate that controlling for household fixed effects in this way is appropriate and improves upon the precision of our estimates. With respect to the distribution of household resources, we find that in Jamaica the gender of the household head is an important determinant of the final outcome. In particular, our findings show that the resource shares of children are substantially higher in FHHs (especially in single-mother households) than in MHHs, where children in single-mother households receive 56% to 85% of household resources, while children in MHHs receive only 31% to 41%. In fact, children may be better off in single-mother households than in partnered FHHs as a male-adult tends to divert about 17% of household resources from children to adults in partnered FHHs. Hence, children in relatively poor single-mother households may be compensated by the higher resource shares they receive and thus may not necessarily be worse off when compared to children in MHHs or partnered FHHs. We

also find a strong preference for the boy child in FHHs. This may result from the fact that boys are more likely to contribute significantly to future household income as they tend to enter the labour market at an earlier age compared to girls (STATIN and PIOJ, 2014). We also show that the spending patterns of female heads differ depending on their level of education and their region of residence. More specifically, even though empirical evidence suggests that women tend to care more about their children's needs, their preferences may be expressed by spending on different kinds of goods depending on whether they have completed tertiary education and whether they live in an urban or rural area. Our findings also indicate that remittances and other support from family and friends affect the resource shares that children receive in single-mother households to a greater extent than public assistance. This may be due to the culture of child fostering in Jamaica. More generally, our study demonstrates that an increased cultural awareness of the region in question is a crucial component in understanding the nature of intra-household resource distribution in FHHs.

Finally, it must be noted that our analysis suffers from some drawbacks. First, we are unable to distinguish between men's resource shares and women's resource shares because of the unavailability of a separate private assignable good for men and women in the JSLC. Second, it is also impossible to check whether a child lives with his/her biological parents for a considerable number of years in the JSLC (from 1992 to 1999). These pieces of information would have greatly increased the depth of our analysis and understanding of intra-household resource allocation in FHHs vis-à-vis MHHs.

Appendix 3.A Detailed Summary Statistics

Table 3.A.1: Summary Statistics for Single-Mother Households (FHHs)

	Single Mother with				All
	1 child	2 children	3 children	4 children	
General Characteristics					
Women's age	33.3	32.3	30.4	29.2	32.3
	(9.68)	(6.63)	(4.31)	(3.21)	(7.86)
Women's tertiary education dummy	0.11	0.07	0.04	0.06	0.08
	(0.31)	(0.25)	(0.20)	(0.25)	(0.28)
Proportion of male children	0.58	0.45	0.49	0.60	0.52
	(0.49)	(0.37)	(0.25)	(0.26)	(0.41)
Average age of children	7.3	6.8	6.7	6.4	7.0
	(3.47)	(2.53)	(1.89)	(1.51)	(2.88)
Rural household dummy	0.31	0.47	0.51	0.32	0.40
	(0.46)	(0.50)	(0.50)	(0.48)	(0.49)
Weekly expenditure (J$)	6,626.62	5,543.40	5,465.42	6,210.63	6,042.24
	(7032.70)	(2894.76)	(2963.12)	(4193.87)	(5218.34)
Budget Shares					
Adult's clothing and footwear	0.061	0.050	0.049	0.054	0.055
	(0.046)	(0.041)	(0.060)	(0.039)	(0.046)
Children's clothing and footwear	0.049	0.059	0.067	0.086	0.057
	(0.034)	(0.037)	(0.037)	(0.055)	(0.038)
Food	0.460	0.543	0.586	0.605	0.516
	(0.190)	(0.170)	(0.181)	(0.145)	(0.187)
Housing	0.156	0.116	0.067	0.070	0.124
	(0.128)	(0.122)	(0.085)	(0.084)	(0.123)
Transportation and communication	0.094	0.081	0.077	0.051	0.085
	(0.084)	(0.075)	(0.063)	(0.045)	(0.077)
Health	0.024	0.021	0.021	0.011	0.022
	(0.029)	(0.026)	(0.023)	(0.010)	(0.027)
Education	0.046	0.052	0.062	0.043	0.051
	(0.054)	(0.061)	(0.068)	(0.038)	(0.059)
Vices	0.006	0.005	0.005	0.005	0.006
	(0.029)	(0.025)	(0.021)	(0.016)	(0.026)
Sample size	139	126	58	22	304

Standard deviations are in parentheses.

Table 3.A.2: Summary Statistics for Male-Headed Households

	MHHs Couples with				All
	1 child	2 children	3 children	4 children	
General Characteristics					
Men's age	36.5	35.3	37.0	37.0	36.2
	(10.17)	(6.84)	(7.96)	(6.66)	(8.51)
Women's age	31.7	30.6	31.3	32.2	31.3
	(10.00)	(6.79)	(7.59)	(5.62)	(8.28)
Men's tertiary education dummy	0.12	0.09	0.06	0.03	0.09
	(0.32)	(0.29)	(0.24)	(0.18)	(0.29)
Women's tertiary education dummy	0.12	0.10	0.04	0.06	0.10
	(0.32)	(0.31)	(0.19)	(0.24)	(0.29)
Proportion of male children	0.48	0.52	0.54	0.54	0.51
	(0.50)	(0.35)	(0.28)	(0.25)	(0.40)
Average age of children	5.4	5.4	6.1	6.2	5.6
	(3.58)	(2.87)	(2.46)	(1.84)	(3.06)
Rural household dummy	0.49	0.55	0.62	0.63	0.55
	(0.50)	(0.50)	(0.49)	(0.49)	(0.50)
Weekly expenditure (J$)	8,593.76	9,056.25	8,295.42	6,868.16	8,569.30
	(7195.91)	(7152.52)	(6413.48)	(3657.81)	(6852.48)
Budget Shares					
Adult's clothing and footwear	0.059	0.057	0.050	0.053	0.056
	(0.042)	(0.045)	(0.035)	(0.030)	(0.041)
Children's clothing and footwear	0.031	0.042	0.050	0.061	0.041
	(0.022)	(0.031)	(0.034)	(0.035)	(0.030)
Food	0.458	0.495	0.526	0.570	0.491
	(0.199)	(0.195)	(0.182)	(0.158)	(0.194)
Housing	0.128	0.105	0.102	0.072	0.111
	(0.114)	(0.110)	(0.107)	(0.088)	(0.110)
Transportation and communication	0.130	0.109	0.107	0.068	0.114
	(0.109)	(0.109)	(0.101)	(0.066)	(0.107)
Health	0.022	0.019	0.018	0.016	0.020
	(0.024)	(0.027)	(0.020)	(0.018)	(0.024)
Education	0.039	0.040	0.041	0.037	0.040
	(0.059)	(0.086)	(0.068)	(0.045)	(0.071)
Vices	0.010	0.013	0.009	0.017	0.012
	(0.027)	(0.042)	(0.018)	(0.038)	(0.033)
Sample size	210	203	105	50	479

Standard deviations are in parentheses.

Table 3.A.3: Summary Statistics for Partnered Female-Headed Households

	FHHs Couples with				All
	1 child	2 children	3 children	4 children	
General Characteristics					
Men's age	33.8	35.3	35.2	35.8	34.9
	(8.42)	(7.90)	(6.62)	(6.75)	(7.62)
Women's age	29.9	30.8	30.9	30.6	30.5
	(6.52)	(7.88)	(6.11)	(5.41)	(6.78)
Men's tertiary education dummy	0.05	0.02	0.00	0.03	0.02
	(0.21	(0.14)	(0.00)	(0.16)	(0.15)
Women's tertiary education dummy	0.02	0.08	0.05	0.11	0.06
	(0.15)	(0.27)	(0.22)	(0.31)	(0.24)
Proportion of male children	0.40	0.58	0.54	0.54	0.51
	(0.49)	(0.37)	(0.32)	(0.26)	(0.39)
Average age of children	6.2	5.8	6.1	6.5	6.1
	(3.86)	(2.60)	(2.31)	(1.57)	(2.86)
Rural household dummy	0.38	0.47	0.59	0.51	0.48
	(0.49)	(0.50)	(0.50)	(0.51)	(0.50)
Weekly expenditure (J$)	6,480.40	6,886.88	7,040.99	6,001.10	6,868.08
	(6347.86)	(3431.00)	(4129.70)	(3500.40)	(3686.95)
Budget Shares					
Adult's clothing and footwear	0.055	0.062	0.058	0.047	0.057
	(0.033)	(0.042)	(0.034)	(0.029)	(0.037)
Children's clothing and footwear	0.032	0.045	0.059	0.055	0.046
	(0.021)	(0.031)	(0.036)	(0.030)	(0.031)
Food	0.497	0.537	0.566	0.624	0.543
	(0.168)	(0.145)	(0.174)	(0.130)	(0.162)
Housing	0.128	0.086	0.075	0.069	0.093
	(0.147)	(0.094)	(0.089)	(0.084)	(0.112)
Transportation and communication	0.115	0.107	0.091	0.086	0.103
	(0.096)	(0.100)	(0.093)	(0.069)	(0.094)
Health	0.018	0.019	0.017	0.011	0.017
	(0.024)	(0.031)	(0.021)	(0.012)	(0.025)
Education	0.038	0.035	0.035	0.041	0.037
	(0.037)	(0.048)	(0.040)	(0.050)	(0.043)
Vices	0.020	0.007	0.012	0.011	0.013
	(0.041)	(0.015)	(0.036)	(0.032)	(0.032)
Sample size	48	62	50	24	159

Standard deviations are in parentheses.

Appendix 3.B Baseline Model and Model Including Mundlak terms

Table 3.B.1: Resource Share Estimates - Baseline Model and Model including Mundlak Terms

		Male-headed Households		Female-headed Households		Single-mother Households	
Household characteristic	Individual type	With Mundlak terms	Baseline model	With Mundlak terms	Baseline model	With Mundlak terms	Baseline model
One child	adults	0.688***	0.676***	0.479***	0.480***	0.441***	0.482***
	children	0.312***	0.324***	0.521***	0.519***	0.559***	0.518***
	each child	0.312***	0.324***	0.521***	0.519***	0.559***	0.518***
Two children	adults	0.636***	0.603***	0.416***	0.405***	0.412***	0.455***
	children	0.364***	0.397***	0.584***	0.595***	0.588***	0.545***
	each child	0.182***	0.199***	0.292***	0.298***	0.294***	0.273***
Three children	adults	0.594***	0.581***	0.416***	0.393***	0.410***	0.444***
	children	0.406***	0.419***	0.584***	0.607***	0.590***	0.556***
	each child	0.135***	0.140***	0.195***	0.202***	0.197***	0.185***
Four children	adults	0.684***	0.670***	0.261***	0.219**	0.150	0.182*
	children	0.316***	0.330***	0.739***	0.781***	0.850***	0.818***
	each child	0.079***	0.083***	0.185***	0.195***	0.213***	0.205***
Other urban areas	adults	-0.081**	-0.094**	-0.109***	-0.096**	-0.147***	-0.121***
	children	0.081**	0.094**	0.109***	0.096**	0.147***	0.121***
Rural areas	adults	-0.144***	-0.136***	-0.082**	-0.087*	-0.117**	-0.112**
	children	0.144***	0.136***	0.082**	0.087*	0.117**	0.112**
Man's age	adults	-0.023***	-0.005**	-	-	-	-
	children	0.023***	0.005**	-	-	-	-
Woman's age	adults	0.012	0.006***	-0.019	0.003	-0.009	0.002

	children	-0.012	-0.006***	0.019	-0.003	0.009	-0.002
Minimum age	adults	0.038**	0.008	0.021*	0.005	0.020	0.013*
of children	children	-0.038**	-0.008	-0.021*	-0.005	-0.020	-0.013*
Number of children	adults	0.119**	0.090***	0.188***	0.104**	0.229***	0.127**
< 3years old	children	-0.119**	-0.090***	-0.188***	-0.104**	-0.229***	-0.127**
Proportion of	adults	0.103	-0.021	-0.152*	-0.029	-0.194**	-0.068*
male children	children	-0.103	0.021	0.152*	0.029	0.194**	0.068*
Man completed tertiary	adults	-0.113*	-0.115**	-	-	-	-
education	children	0.113*	0.115**	-	-	-	-
Woman completed tertiary	adults	0.033	0.056	0.249***	0.249***	0.211***	0.218***
education	children	-0.033	-0.056	-0.249***	-0.249***	-0.211***	-0.218***
Support from others (incl	adults	-0.003	-0.018	-0.062	0.031	-0.094**	0.030
remittances	children	0.003	0.018	0.062	0.031	0.094**	-0.030
Public assistance	adults	-0.167*	-0.009	0.001	-0.065	0.005	-0.077
	children	0.167*	0.009	-0.001	0.065	-0.005	0.077
Partner present in	adults	-	-	0.170***	0.049	-	-
FHH	children	-	-	-0.170***	-0.049	-	-

Standard errors robust to all forms of heteroskedasticity. *p<0.10, **p<0.05, ***p<0.01

Appendix 3.C Estimated Resource Shares - Complete

Table 3.C.1: Resource Share Estimates for Jamaican Households - Complete

		Male-headed Households		Female-headed Households		Single-mother Households	
Household characteristic	Individual type	Estimate	StdErr	Estimate	StdErr	Estimate	StdErr
One child	adults	0.688***	0.083	0.479***	0.069	0.441***	0.068
	children	0.312***	0.083	0.521***	0.069	0.559***	0.068
	each child	0.312***	0.083	0.521***	0.069	0.559***	0.068
Two children	adults	0.636***	0.086	0.416***	0.073	0.412***	0.076
	children	0.364***	0.086	0.584***	0.073	0.588***	0.076
	each child	0.182***	0.043	0.292***	0.035	0.294***	0.038
Three children	adults	0.594***	0.085	0.416***	0.090	0.410***	0.088
	children	0.406***	0.085	0.584***	0.090	0.590***	0.088
	each child	0.135***	0.028	0.195***	0.030	0.197***	0.029
Four children	adults	0.684***	0.105	0.261***	0.098	0.150	0.105
	children	0.316***	0.105	0.739***	0.098	0.850***	0.105
	each child	0.079***	0.026	0.185***	0.025	0.213***	0.026
Other urban areas	adults	-0.081**	0.038	-0.109***	0.039	-0.147***	0.049
	children	0.081**	0.038	0.109***	0.039	0.147***	0.049
Rural areas	adults	-0.144***	0.032	-0.082**	0.041	-0.117**	0.048
	children	0.144***	0.032	0.082**	0.041	0.117**	0.048
Man's age	adults	-0.023***	0.006	-	-	-	-
	children	0.023***	0.006	-	-	-	-
Woman's age	adults	0.012	0.007	-0.019	0.017	-0.009	0.018
	children	-0.012	0.007	0.019	0.017	0.009	0.018
Minimum age of children	adults	0.038**	0.017	0.021*	0.011	0.020	0.015
	children	-0.038**	0.017	-0.021*	0.011	-0.020	0.015
Number of children $<$ 3years old	adults	0.119**	0.054	0.188***	0.068	0.229***	0.067
	children	-0.119**	0.054	-0.188***	0.068	-0.229***	0.067
Proportion of male children	adults	0.103	0.110	-0.152*	0.086	-0.194**	0.089
	children	-0.103	0.110	0.152*	0.086	0.194**	0.089
Man completed tertiary education	adults	-0.113*	0.063	-	-	-	-
	children	0.113*	0.063	-	-	-	-
Woman completed tertiary education	adults	0.033	0.071	0.249***	0.055	0.211***	0.065
	children	-0.033	0.071	-0.249***	0.055	-0.211***	0.065
Support from others (incl remittances)	adults	-0.003	0.035	-0.062	0.038	-0.094**	0.043
	children	0.003	0.035	0.062	0.038	0.094**	0.043
Public assistance	adults	-0.167*	0.091	0.001	0.087	0.005	0.085
	children	0.167*	0.091	-0.001	0.087	-0.005	0.085
Partner present in FHH	adults	-	-	0.170***	0.063	-	-
	children	-	-	-0.170***	0.063	-	-

Standard errors robust to all forms of heteroskedasticity. *p<0.10, **p<0.05, ***p<0.01

Appendix 3.D Average Resource Shares

Table 3.D.1: Average Resource Shares by Household Type

		Male-headed Households		Female-headed Households		Single-mother Households	
Household type	Individual type	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation
One child	adults	0.608	0.093	0.598	0.084	0.591	0.129
	children	0.392	0.093	0.402	0.084	0.409	0.129
	each child	0.392	0.093	0.402	0.084	0.409	0.129
Two children	adults	0.569	0.096	0.554	0.116	0.546	0.107
	children	0.431	0.096	0.446	0.116	0.454	0.107
	each child	0.215	0.048	0.223	0.058	0.227	0.054
Three children	adults	0.521	0.091	0.537	0.104	0.522	0.132
	children	0.479	0.091	0.463	0.104	0.478	0.132
	each child	0.160	0.030	0.154	0.035	0.159	0.044
Four children	adults	0.646	0.098	0.400	0.138	0.281	0.105
	children	0.354	0.098	0.600	0.138	0.719	0.105
	each child	0.089	0.025	0.150	0.0.035	0.180	0.026
All households	adults	0.583	0.100	0.544	0.122	0.549	0.137
	children	0.417	0.100	0.456	0.122	0.451	0.137
	each child	0.267	0.127	0.248	0.118	0.295	0.140

Chapter 4

Child Fostering and the Educational Outcomes of Jamaican Children

Abstract

The practice of informal fostering is prevalent in many developing regions of the world. This study investigates the effects of this practice on educational outcomes in Jamaica using a rotating panel data set of children constructed from six rounds of the Jamaican Survey of Living Conditions. Using panel data allow us to deal more effectively with the problem of endogeneity by applying household and child fixed effects. In addition to estimating the 'short-term' effects of fostering on education in terms of school attendance, we are also able to investigate if any 'long-term' effects exist using the number of years of schooling. Our findings indicate that the effect of fostering on the number of schooling years completed depends on whether the household is a beneficiary of PATH, a conditional cash-transfer programme instituted by the Government of Jamaica in 2001. We show that a foster child that lives within a household that benefits from PATH completes more years of schooling than a foster child who does not, even though generally, biological children tend to accumulate more years of schooling than their foster siblings. With respect to the short-term effects, we find that being a foster child in itself has no direct effect on school attendance in Jamaica.

4.1 Introduction

The practice of informal fostering whereby children with at least one living parent live with extended family members or even friends is prevalent in developing regions such as Africa and the Caribbean. Zimmerman (2003) estimates that 25% of children living in developing countries are fostered for different periods of time, ranging from one year to several years at a time. The characteristics of this practice differ from country to country and may even differ among different ethnic groups within the same country (Isiugo-Abanihe, 1985). More importantly, although fostering may benefit the families involved by strengthening kinship ties and social bonds (Serra, 2009), children may be worse off in households where both of their parents are absent. According to Hamilton (1964), individuals tend to be more altruistic towards one another the more closely they are related, implying that the welfare of foster children may generally be lower than that of biological children within the same household. This line of reasoning together with the high incidence of fostering in poorer regions has stimulated research on the effects of fostering on domestic labour (Ainsworth, 1996), health (Taiwo, 2012), and the educational outcomes (Akresh, 2004) of children involved in this practice. Education, in particular, has long-term implications for the welfare of any individual as it is known to affect future health and labour outcomes (Currie and Thomas, 1999).

In this study, we are able to construct a rotating panel of children from the 2004, 2006, 2007, 2008, 2009, and 2010 rounds of the Jamaican Survey of Living Conditions (JSLC hereafter) enabling us to follow children within the same household for a minimum of two years and a maximum of four years. This means that our panel captures fostering that occurs as a result of the relocation of parents and not children, a phenomenon that is quite common in Jamaica and the Caribbean (Stephenson and Wilsker, 2016). More importantly, the panel data set allows us to control for unobserved household and child characteristics that are constant over time. This is important as some of these omitted variables (such as a household's network quality and a child's ability) are likely to be correlated with the fostering variable, making it endogenous. Hence, by applying household and child fixed effects, we are able to deal more effectively with the problem of endogeneity with respect to our variable of interest and within

our model as a whole. Moreover, most of the research available on the effects of fostering on child welfare use cross-sectional data making it highly probable that estimates from these papers are biased. The only exceptions are Akresh (2004) and Cichello (2003) who investigate fostering decisions in Burkina Faso and South Africa respectively. However, these studies apply fixed effects estimation methods to very short panels consisting of only two periods.

It is also a fact that the majority of studies on informal child fostering focus specifically on African countries. This apparent scarcity of economic literature on fostering in other developing regions, such as the Caribbean, could be due to the absence of data sets that are appropriate for this kind of research. This essay contributes to the literature by focusing on Jamaica, an island country in the Caribbean where child fostering rates are as high as they are in many African countries. According to Wyss (1995), about 20% of children in Jamaica live apart from both of their parents. It is also worth mentioning that the reasons for fostering generally differ between Africa and the Caribbean, and hence the effects of this practice could be different for the two regions. Previous sociological studies on household structure in the Caribbean such as Goody (1975), Sanford (1975), and Russell-Brown et al. (1997) show that due to the unconventional mating and residential patterns that are characteristic of the region, fostering is usually a result of teenage childbearing, the breakdown of non-residential unions, and the migration of parents to find better jobs. Conversely, African children relocate from their natal homes for better education, an apprenticeship, and to reallocate domestic labour and share risk between households (Isiugo-Abanihe, 1985). In other words, while crisis fostering is predominant in the Caribbean, purposive fostering tends to be more prevalent in Africa.

The only other study which looks at the economic effects of fostering within the Caribbean is Gibbison and Paul (2005). Using cross-sectional data from the 1990 round of the JSLC, they also attempt to estimate the effects of fostering on the educational outcomes of Jamaican children. Similar to our study, they measure the effect of foster care arrangements on primary school children's access to education using school attendance variables. They also investigate the relationship between child fostering and the educational achievements of students focusing on a test on reading comprehension and mathematics taken by each child. Their results indicate

that foster boys in particular are generally more likely to have lower educational outcomes.

Our study differs from Gibbison and Paul (2005) in at least three ways. First, apart from capturing the 'short-term' effect of fostering using the school attendance variable, our data set enables us to use the total number of years of schooling to capture the 'long-term' effect as well. In fact, most of the fostering literature on education measure educational achievements using some sort of test (like Gibbison and Paul (2005)) or school enrolment rates as at least one of these variables is usually available within most standard household surveys. Zimmerman (2003), Marazyan (2015a), Marazyan (2015b), and Hampshire et al. (2015) are other examples of such papers.[1] While school enrolment and attendance provide some indication of schooling effort within a particular period of time, it does not necessarily mean that human capital accumulation is taking place since school drop-out rates and class repetition are quite common in developing countries (Anderson et al., 2001; Cichello, 2003). In the present essay, we argue that despite its weaknesses (Hanushek and Woessmann, 2008), the number of years of schooling is a better proxy for human capital accumulation for our context and hence gives better estimates of the long-term effects of fostering on a child's educational attainment. Second, our sample is larger and consists of children in preschool, primary school and secondary school. Third, as previously indicated, the panel structure of our data set allows us to deal more effectively with endogeneity through the use of household and child fixed effects. Indeed, in our study, applying fixed effects estimation methods significantly changes the results. This indicates that controlling for these time-invariant household and child characteristics is important. Moreover, using a more recent data set makes our findings more relevant for present-day policy.

With regard to the short-term effects, we find that being a foster child in itself does not have any significant direct effects on school attendance. As expected, the results show that children in households who are beneficiaries of the Programme of Advancement through Health and Education (PATH hereafter), a conditional cash-transfer programme instituted by the Government of Jamaica in 2001, are less likely to be absent from school. This result is not surprising since regular school attendance is one of the conditions that must be met before

[1] A notable exception to this trend is Cichello (2003) who constructs and uses some kind of school progress variable for the Kwa-Zulu region of South Africa.

cash transfers are sent to households. Nonetheless, it seems that this positive effect of PATH applies more strongly to biological children than to foster children. Our results also indicate that children in households that own their houses or receive support from parents who live elsewhere are less likely to be absent from school. Contrary to this, children in households that receive remittances and windfall receipts tend to be absent from school more often than those who do not.

In terms of the long-term effects of fostering, our findings indicate that foster children tend to complete fewer years of schooling compared to biological children within the same household. However, this effect tends to depend on whether the household is a beneficiary of PATH. We show that a foster child that lives within a household that benefits from PATH completes more years of schooling than a foster child who does not. In fact, a foster child in a household that benefits from PATH completes only 0.15% less schooling years than a biological child in a non-PATH household which corresponds to only about a week of school within this sample. This is encouraging as higher educational attainment is one of the long-term goals of PATH (Levy and Ohls, 2003, 2010). Our results also show that children who live in single-mother households tend to have more years of schooling compared to the other household types. Single mothers may be investing more in the education of their children as a means of insuring their own future incomes as it is common practice in Jamaica for children to take care of their parents (especially their mothers) as they get older (Handa, 1996a,c; Sargent and Harris, 1992).

The rest of the chapter is organized as follows. In Section 4.2, we provide a brief review of the child fostering literature. Section 4.3 describes our data set, presents some summary statistics and discusses the empirical methods we use in estimating our models. In Section 4.4, we present and discuss our main results while Section 4.5 concludes.

4.2 A Review of the Fostering Literature

Early work on child fostering began in the 1960s and was carried out mostly within other social science disciplines including demography, sociology, and anthropology. These studies were mostly descriptive and focused on various countries and regions. For example, Ainsworth

(1967) describes fostering in Uganda, while Goody (1973) and Fiawoo (1978) focus on kinship fostering in Ghana. Other work on Africa include Goody (1982), Isiugo-Abanihe (1985), Bledsoe and Isiugo-Abanihe (1989), and Bledsoe (1990). Sanford (1975) and Goody (1975) carry out sociological studies of fostering within the Caribbean, while Paul (1963) and Keesing (1970) provide an anthropological perspective of the practice within Oceania.

Within the economics literature, studies on child fostering can be divided into two broad categories. The first category of studies investigates the motives or reasons for fostering while the second examines the effects of fostering on various welfare outcomes. The first economic model that examines both demand and supply sides of the fostering market is developed by Ainsworth (1996) using data from Côte d'Ivoire. The results of this study generally support the domestic labour motive of fostering, where children are sent to other households to carry out domestic tasks such as household chores and child minding. Zimmerman (2003) and Akresh (2009) have since further developed the Ainsworth (1996) model and found evidence for educational and risk-coping motives respectively. Serra (2009) also shows that labour and schooling motives could coexist within the same context while recent work on Malawi by Grant and Yeatman (2014) indicates that divorce and remarriage could also be an important reason for sending children away from their natal homes.

The majority of papers that investigate the effects of fostering on child welfare focus particularly on educational outcomes. So far, no consensus has been reached with regard to foster children or host children since results are largely mixed for both groups. Akresh (2004) finds that relative to children from non-fostering households, children from fostering households are more likely to be enrolled in school in Burkina Faso. Similarly, using cross-sectional data, Zimmerman (2003) and Eloundou-Enyegue and Shapiro (2004) find that fostering improves the school enrolment rates of foster children in South Africa and Cameroon, respectively. In contrast, the results of Kielland (2010) and Gibbison and Paul (2005) show that foster children are likely to be worse off in terms of educational outcomes, while Cichello (2003) and Penglase (2017) find no significant differences in educational outcomes between foster children and non-foster children. One can therefore conclude that both the motives and effects of child fostering

depend largely on context and the specific country or region in question.

As already indicated, with a few exceptions, these papers tend to use cross-sectional data sets from Africa and use school enrolment rates as the outcome variable. Our study diverts from this trend by applying child and household fixed effects in estimating the effects of fostering on the number of schooling years a child has completed as opposed to whether he or she is enrolled in school. We also examine a region that has been ignored in most of the literature.

4.3 Empirical Implementation

This section is divided into two parts. We discuss our data set and present summary statistics in the first part of the section. The second subsection explains the estimation techniques used and the specification of our regression models.

4.3.1 Data Set

This essay makes use of the same household survey used in Chapter 3. The Jamaican Survey of Living Conditions (JSLC) is a nation-wide survey that collects data on the living standards of households. It is an important tool used by the government to monitor the country's socio-economic development. The survey began in 1988 and has since been fielded at least once a year except in 2011 when no data were collected. The core modules of the JSLC include health, education, consumption, housing, and social protection. Occasionally, other modules such as youth employment, migration, coping strategies, and remittances are also included within the survey.

As previously mentioned, the JSLC is a subset of a larger survey known as the Labour Force Survey (LFS hereafter). The sampling process for the LFS, and by extension, the JSLC, is done using a one-half panel design where some of the households are followed from two to four consecutive years. Similar to Chapter 3, we take advantage of this one-half panel design to create a panel of households for the following years: 2004-2006 and 2007-2010.[2] Using the

[2]We are unable to use data from the 2005 round because the heath, education, and housing modules are not fielded in that year.

exact same technique (that is, Handa's (2008) technique) and procedure used in Chapter 3, we create a unique household identifier to match households across different rounds of the JSLC.

Next, from this sample of matched households, we follow a similar procedure to match the children in each household across different rounds of the JSLC with a match rate of 67%. Before a unique child identifier is created, we verify that the gender of the child and his/her relation to the household head remain the same. We also confirm that the child's age did not change by more than 2 years. The final sample consists of children between the ages of 2 and 18 who are either preschoolers, enrolled in primary or secondary school. We exclude married teenagers which make up less than 1% of the sample. The sample consists of 1,507 children and 3,794 observations, meaning that on average, a child is followed for at least 2 years. We also use monthly Consumer Price Indices from the Bank of Jamaica to deflate all monetary values with December 2006 as the base value.

With regard to the foster child variable in particular, we are able to follow the foster children whose parents relocate but not those children who move from their natal homes to different households as our data set allows us to match only the children who stay within the same household. To confirm that our final sample captures the nature of child fostering in Jamaica reasonably well, we include all the children who are not included in the panel sample (probably because they move from one household to another) and run a probit model that shows whether the foster child variable predicts inclusion in the final sample. We control for other individual child characteristics, household characteristics, characteristics of the household head, and community characteristics. These results (presented in Appendix 4.A) show that foster child is statistically insignificant and hence does not predict inclusion in the final sample. This provides some secondary evidence of the absence of significant sample selection bias in our final sample, especially with regard to our variable of interest.

Previous studies such as Russell-Brown et al. (1997) and Lloyd and Desai (1992) have defined a foster child as a child living apart from his mother only, because, especially in the Caribbean, mothers have generally been known to take more interest in the welfare of their children than fathers (Clarke, 1999). This is probably due to the matrifocal nature of the society and the fact

that the responsibility of physically caring for children naturally tends to fall more on mothers than on fathers. However, Gibbison (2000) and Morrell et al. (2003) provide some evidence that indicates that fathers take as much interest in their children as mothers. We also test this in the present study and find that the presence of the father, even more than the mother, increases the number of schooling years accumulated by the child and his/her attendance to school. This may reflect the fact that the father, once he is present, is more likely to be the parent paying for the child's education. See Appendix 4.B for these results. Hence, we define a foster child in our context as a child who is living apart from both biological parents. A biological child, on the other hand, is defined as a child living with at least one biological parent. The JSLC, for the periods of our sample, consistently collects information on whether the individuals within the household who play the role of father and mother are actually the child's birth parents. We process this information to determine whether a child is a foster child or a biological child. The rate of child fostering within our sample is 22%, which is quite high when compared to the rates in other West African countries. Akresh (2009), for instance, reports that 15% of the children in Burkina Faso and Ghana are fostered while Marazyan (2015b) reports a fostering rate of 8.5% in Senegal.

The JSLC also consistently collects information on the education of each child. First, we are able to determine the number of days a child is sent to school within a four-week period. We process this information to generate our first outcome variable - the number of days a child is present in school. Information is also collected on the reasons for absence including illness, money problems, and bad weather. This enables us to account for the days that children are absent from school because of illness. Second, the JSLC also collects information on what type of school each child is currently enrolled in, that is, preschool, primary school, secondary school, or a tertiary institution. In addition to this, the JSLC also collects information on the particular grade each child is currently in. We process information from these two variables to generate our second outcome variable - the number of years of schooling. In particular, we are able to calculate the number of years of schooling using the particular grade a child is in and not just the level of education. This means that we are able to differentiate between a child who

completes primary school and one that drops out in the middle of primary school for instance. We also assign one year to each grade irrespective of whether the child repeats a grade or not. Hence, a child who has been in school for a longer period of time because of grade repetition does not have more years of schooling than a child who does not repeat any grade.

We are also able to determine whether a household is a beneficiary of the PATH programme as the JSLC collects information on how long a household has been in receipt of PATH. As already mentioned, PATH is a conditional cash transfer program aimed at promoting the development of human capital by providing health and education grants to eligible households. This programme was designed to replace former social protection programmes such as the food stamps, poor relief, and public assistance. The programme's benefits are conditioned on meeting certain requirements in the short-term including attendance to school and health visits. Eligibility for PATH is determined by a proxy-means test undertaken by the Planning Institute of Jamaica. This test is based primarily on household expenditure and income which we also control for in our model using per-capita expenditure and the assets owned by the household. To carry out the test, potential beneficiaries of the programme are asked to submit information on variables which are strongly related to income and expenditure such as household demographics, dwelling characteristics, and education (Overseas Development Institute, 2006). According to Levy and Ohls (2010), targeting for PATH is quite effective and may even be better than that of similar programmes such as PROGRESA in Mexico. For example, their study shows that while 63% of PATH beneficiaries fall within the 25th percentile of consumption, only 39% of PROGRESA beneficiaries fall within the same percentile.

Finally, our data set allows us to generate other child-specific variables including a child's age; whether the child walks to school; whether the child attends a public school; and whether the child has a chronic disease. We also create other household-specific variables including whether the household owns their home, a television set, and a radio; whether the source of power in the household is electricity; whether the household receives payments specifically to support the children; whether the household receives remittances, property income or any windfall income; the per-capita household expenditure; the number of adults and preschoolers

in the household; the sex ratio of biological children; the proportion of boys; and finally, whether the household includes extended family members. We also control for the characteristics of the household head including age; whether they have completed tertiary education; and whether they have a chronic disease. The gender and marital status of the household head are also controlled for by indicating whether the head is a single mother, partnered female, single father, or partnered male (reference variable). Lastly, we include community characteristics such as the region (Kingston Metropolitan Area, other urban areas, and rural areas) and the distance to the nearest primary and secondary schools.

Summary statistics are presented according to fostering status in Table 4.1. In the last column of the table, we carry out tests for the difference in means between foster children and biological children. The following focuses on the variables which are found to have statistically different means for each group. First, Jamaican foster children tend to be older than their non-foster siblings on average. This is a common finding in the literature as fostering rates tend to increase with age (Cichello, 2003; Penglase, 2017). We also note that generally, children are more likely to live with their mothers than their fathers.

With regard to household characteristics, foster children are more likely to be found in extended family households. This is not surprising because, according to Goody (1975), the grandmother is the most important foster parent within the Caribbean. Also, children within our sample are more likely to be fostered in female-headed households, especially those headed by a single mother. In addition, Table 4.1 shows that fostering households are more likely to receive remittances and other monetary support for the children. They are also more likely on average to be located in a rural area and to be registered on the PATH programme, and less likely to own their home or dwelling.

4.3.2 Model Specification and Estimation Method

We exploit the panel structure of our data set by running fixed effects estimations. This enables us to better control for the endogeneity of our variable of interest by accounting for unobserved household characteristics (such as the quality of a household's network) and child

Table 4.1: Summary Statistics of Sample by Fostering Status

Characteristics	Biological children	Foster children	Difference
Child Characteristics			
Age	9.3	12.7	-3.4***
	(3.09)	(3.98)	(0.13)
Gender (1=male)	0.49	0.48	0.01
	(0.50)	(0.50)	(0.02)
Mother present	0.93	-	-
	(0.26)		
Father present	0.50	-	-
	(0.50)		
Years of schooling	7.03	10.16	-3.12***
	(2.81)	(3.65)	(0.12)
Days present (out of 20 days)	19.25	19.20	0.04
	(2.16)	(2.18)	(0.10)
Household Characteristics			
Log of per capita household expenditure	11.48	11.44	0.03
	(0.66)	0.61)	(0.03)
Extended family	0.37	0.71	-0.34***
	(0.49)	(0.45)	(0.02)
Owns house	0.36	0.22	-0.14***
	(0.48)	(0.42)	(0.02)
Owns a radio	0.78	0.79	-0.01
	(0.41)	(0.41)	(0.02))
Owns a television	0.90	0.91	-0.01
	(0.30)	(0.29)	(0.01)
Receives support for children	0.30	0.46	-0.16***
	(0.46)	(0.50)	(0.02)
Receives remittances	0.36	0.45	-0.09***
	(0.48)	(0.50)	(0.02)
Receives rental income	0.01	0.01	-0.001
	(0.10)	(0.10)	(0.004)
Windfall receipts	0.04	0.05	-0.01
	(0.20)	0.23)	(0.01)
PATH beneficiary	0.33	0.38	-0.05**
	(0.47)	(0.48)	(0.02)
Female-headed household	0.52	0.63	-0.11***
	(0.50)	(0.48)	(0.02)
Single-mother household	0.38	0.50	-0.11***
	(0.49)	(0.50)	(0.02)
Rural household	0.52	0.62	-0.10***
	(0.50)	(0.49)	(0.02)
Sample size	2,969	825	-

Standard deviations are in parentheses.

Null hypothesis for the differences in means test is that the means are statistically equal.

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

characteristics (such as the child's ability and enrolment history) which are constant over time. Since our panel data set is created by following each child within the same household, our identifying assumption is that there are no other time-varying factors that are correlated with parents moving out of or moving back into the household. Although we attempt to control for variables that may cause this assumption to be violated (such as per-capita consumption levels, the level of education of the household head, and the different sources from which a household may receive income), it is possible that due to data restrictions, we have not been able to cover all the time-varying factors that could be correlated with the fostering variable. If this is true, our results may also reflect the crisis that precipitated the fostering in the first place.

With regard to the foster child variable in particular, we have three categories of children within our data set - biological children who remain biological children for the whole panel, foster children who remain foster children for the whole panel, and biological children who become foster children or foster children who become biological children because of the relocation of parents. This means that our fixed effects estimation essentially captures the variation in educational outcomes within a panel for the last category of children whose fostering status change within a panel because their parents move out of or back into the household. While this means that we are only able to explain the effects of fostering that result from the relocation of parents and not children, an important advantage that this scenario creates is the ability to compare the same child as a biological child and a foster child. Moreover, as previously indicated, this kind of fostering which results from parents moving out of the household is characteristic of Jamaica and the Caribbean region in general (Safa, 2007). Teenage girls, for instance, may leave their babies with their mothers to return to school or enter the labour force (Russell-Brown et al., 1997; Isiugo-Abanihe, 1985). Fostering may also be a way to cope with children born out of wedlock, who are products of a transient or non-residential union, or whose parents have divorced (Goody, 1975).

We run similar sets of regression models for two dependent variables: the number of years of schooling and the number of days a child is present in school out of a twenty-day reference period. The number of years of schooling model investigates the long-term or more permanent

effects of fostering on a child's education, while the attendance model is used to test for any immediate or short-run effect. We look at both short-term and long-term effects because it enables us to have a more comprehensive understanding of the subject. More importantly, these different kinds of impact may have different policy implications and hence may require different policy actions.

In addition to this, even though attendance shows some schooling effort, it does not necessarily indicate the accumulation of human capital, as high drop-out rates and grade repetition can be quite common in a developing country like Jamaica (Anderson et al., 2001). In spite of the fact that the number of years of schooling does not capture certain aspects of the quality of education provided (Hanushek and Woessmann, 2008)[3], it provides a good indication of one's educational progress and attainment within our context. Also, as previously discussed, we are able to minimize the flaws of this variable by accounting for grade repetition and drop outs. Essentially, we calculate the number of years of schooling accumulated using the particular grade that each student is in instead of more general categories such as primary, secondary, or tertiary levels.

We specify both regression models as follows:

$$Y_{ijt} = \alpha_{ij} + \beta_1 C_{ijt} + \beta_2 H_{ijt} + \beta_3 P_{ijt} + \beta_4 A_{ijt} + \beta_5 T + u_{ijt} \tag{4.1}$$

where the subscripts i, j, and t denote child, household, and year respectively. Y_{ijt} represents the dependent variable which is either the number of years of schooling or attendance, α_{ij} represents the child and household characteristics which are constant over time, C_{ijt} is a vector of individual child characteristics, H_{ijt} is a vector of household characteristics, P_{ijt} is a vector of the characteristics of the household head, A_{ijt} is a vector of community characteristics, T is a vector of time dummies, and u_{ijt} represents the error term. All standard errors are clustered at the household level to account for the within-household correlation that may exist between children who live in the same household.

Since both of our dependent variables are count variables, we run both models using the

[3]This is true especially when international comparisons are being made.

fixed effects Poisson model developed by Hausman et al. (1984). The coefficients can be estimated using standard conditional maximum likelihood estimation techniques. Wooldridge (1999) proves the robustness of this estimator by showing that it remains consistent under very mild assumptions. His paper shows that a fully robust variance matrix estimator is still valid under the conditional mean assumption only. Hence, although the model is made for count data, it remains consistent if the dependent variable is a continuous variable or has both discrete and continuous properties. The estimator also allows for arbitrary time dependence of the dependent variable for each child. Another advantage of this estimator is the fact the results can be interpreted using semi-elasticities. Margins are not needed to interpret the results as the fixed effects are not actually computed (Kitazawa, 2012; Kemp and Santos Silva, 2016).

4.4 Empirical Results

In this section we discuss our main findings. The first part of the section focuses on the short-term or immediate effects of fostering on education while the second part looks at the more permanent long-term effects.

4.4.1 Short-term Effects

Table 4.2 presents the results of estimating Equation 4.1 for the number of days present in school when both household and child fixed effects are applied. The difference between model I and model II is the inclusion of an interaction term in the latter model which interacts the foster child variable with the PATH variable. We include this interaction term to test whether the effects of PATH on children's educational outcomes differ based on the child's fostering status. Table 4.2 shows that unlike the other variables, including this interaction term changes the magnitude and significance of both the foster child variable and the PATH variable. Our discussion in this section focuses mainly on Model II since the interpretation of the interaction term in particular, may have significant policy implications.

Unlike Gibbison and Paul (2005), foster children suffer no statistically significant disadvantage in model I in terms of attendance. However, once the interaction term is included

Table 4.2: Number of Days Present

	Model I		Model II	
Variables	Estimate	StdErr	Estimate	StdErr
Child Characteristics				
Age	0.0004	0.0080	0.0005	0.0080
Age squared	-0.0004	0.0003	-0.0004	0.0003
Foster child	0.0125	0.0113	0.0345***	0.0126
Attends public school	0.0052	0.0069	0.0051	0.0069
Walks to school	0.0147	0.0096	0.0147	0.0095
Has a chronic disease	-0.0056	0.0089	-0.0058	0.0090
Household Characteristics				
Owns home	0.0197**	0.0095	0.0189**	0.0093
Owns a radio	0.0056	0.0066	0.0062	0.0066
Owns a television set	0.0148	0.0159	0.0163	0.0159
Connected to electricity	0.0113	0.0168	0.0116	0.0169
Receives support for children	0.0192**	0.0076	0.0184**	0.0076
Receives remittances	-0.0123*	0.0067	-0.0118*	0.0065
Receives rental income	-0.0003	0.0154	0.0023	0.0154
Receives windfall income	-0.0223**	0.0109	-0.0236**	0.0110
Number of adults	0.0070	0.0149	0.0070	0.0148
Number of preschoolers	0.0086	0.0074	0.0083	0.0074
Proportion of boys	-0.0043	0.0212	-0.0043	0.0212
Sex ratio of biological children	-0.0020	0.0081	-0.0016	0.0079
Extended family	-0.0130	0.0126	-0.0131	0.0126
Total expenditure per capita	-0.0030	0.0082	-0.0033	0.0082
PATH beneficiary	0.0177	0.0124	0.0321**	0.0127
PATH beneficiary*Foster child	-	-	-0.0556***	0.0155
Household Head Characteristics				
Single father	0.0433	0.0310	0.0358	0.0311
Female with spouse	-0.0039	0.0190	-0.0054	0.0192
Single mother	-0.0168	0.0291	-0.0182	0.0291
Age	0.0029	0.0036	0.0029	0.0036
Completed tertiary education	-0.0086	0.0139	-0.0084	0.0140
Has a chronic disease	-0.0093	0.0086	-0.0094	0.0087
Area Characteristics				
Other urban area (not KMA)	0.0005	0.0076	0.0033	0.0088
Rural area	0.0496	0.0422	0.0565	0.0453
Distance to nearest primary school	0.0001**	0.00003	0.0001**	0.00004
Distance to nearest secondary school	-0.0001	0.0001	-0.0001	0.0001
Time Dummies	yes		yes	

Standard errors robust to all forms of heteroskedasticity. *p<0.10, **p<0.05, ***p<0.01

KMA stands for Kingston Metropolitan Area

in Model II, the coefficient on the foster child variable becomes statistically significant. The PATH variable and the interaction term are also statistically significant in model II. This means that although fostering by itself may not have a direct impact on a child's school attendance, it does have an effect through PATH. In other words, the effect that PATH has on a child's attendance depends on whether the child is a foster child or not. Our findings indicate that PATH has been effective in increasing the rate of attendance of school children. This corroborates the findings of Levy and Ohls (2010) who conduct an evaluation of PATH on school attendance and preventive healthcare visits. Nonetheless, the results show that this positive effect of PATH is biased towards biological children. On average, PATH increases a biological child's attendance by 3.21% and decreases a foster child's attendance by 2.35% (0.0321 - 0.0556) which corresponds to 8 and 6 days of school respectively for our sample. In fact, a foster child in a household that receives payments from PATH is more likely to be absent from school than a foster child who does not benefit from the programme. With school attendance being generally high in Jamaica, this impact is quite significant. This may warrant a re-evaluation of the administration and implementation of the programme with respect to foster children in particular.

We will now discuss the other household characteristics that impact school attendance in a statistically significant way. First, children in households that own their dwelling tend to be absent from school less often. It is likely that this variable is picking up an income effect, that is, households that own their dwelling are likely to be wealthier (this is true in our sample) and more stable and hence make it less likely that school attendance will be hindered by financial problems for instance (Levy and Ohls, 2003). Moreover, households that live in rented homes are more likely to move or be evicted and hence children in such situations may have to be absent from school during such transition periods.

We also find that support received specifically for children from parents who live in Jamaica or abroad increase the rate of school attendance by almost 2%. According to Goody (1975), the parents of foster children usually send money to foster parents as a way of contributing towards the care of their children and also to earn their children's affection and loyalty. On the other

hand, our results show that children in households that receive remittances and windfall receipts tend to be absent from school more often. This could be because these sources of income are usually one-off payments, or at best, intermittent. In the case of remittances, for example, money may only be sent at the beginning of the academic year. The lack of steady income may cause a higher rate of absence from school since non-attendance is usually attributed to money problems (Levy and Ohls, 2003). Moreover, since most of these payments are not sent specifically to cater to the needs of the children in the household, other household members are likely to compete for these resources (Gibbison and Paul, 2005; Duflo, 2003).

Lastly, we investigate our results further by estimating Equation 4.1 applying household fixed effects only. We present these results in Appendix 4.C. A comparison of these results with Table 4.2 shows that the results for school attendance are driven mostly by household fixed effects and not child fixed effects. In other words, school attendance is influenced highly by household characteristics which may be unobserved and not by child-specific characteristics per se.

4.4.2 Long-term Effects

We will now discuss the results of estimating Equation 4.1 for the number of years of schooling when both household and child fixed effects are applied. We present these results in Table 4.3. Similar to Table 4.2, this table presents 2 models where model II includes an interaction term of the foster child and PATH variables. Again, this is one way to test if PATH has a long-run effect on human capital accumulation and if this effect depends on whether the child is fostered or not. Similar to the attendance equations in Subsection 4.4.1, the inclusion of this interaction term affects the magnitudes and significance of both the foster child and PATH variables.

This time, the coefficient of foster child is negative and 10% significant in model I with a p-value of 0.064. Hence, being a foster child in itself seems to have a negative effect on the number of schooling years accumulated although this impact is not highly significant. Nonetheless, once the interaction term is included in model II, the foster child variable, along with the interaction

Table 4.3: Number of Years of Schooling

	Model I		Model II	
Variables	Estimate	StdErr	Estimate	StdErr
Child Characteristics				
Age	0.1494***	0.0087	0.1495***	0.0087
Age squared	-0.0039***	0.0003	-0.0039***	0.0003
Foster child	-0.0145*	0.0078	-0.0257***	0.0082
Attends public school	0.0225**	0.0102	0.0227**	0.0102
Walks to school	-0.0054	0.0062	-0.0054	0.0062
Has a chronic disease	0.0096	0.0081	0.0097	0.0082
Household Characteristics				
Owns home	0.0043	0.0084	0.0049	0.0084
Owns a radio	-0.0086*	0.0047	-0.0089*	0.0047
Owns a television set	0.0180**	0.0086	0.0173**	0.0085
Connected to electricity	-0.0142	0.0118	-0.0142	0.0119
Receives support for children	0.0003	0.0050	0.0006	0.0049
Receives remittances	0.0040	0.0050	0.0038	0.0049
Receives rental income	-0.0362**	0.0135	-0.0374***	0.0135
Receives windfall income	0.0109	0.0069	0.0115*	0.0069
Number of adults	0.0072	0.0108	0.0073	0.0107
Number of preschoolers	-0.0009	0.0061	-0.0007	0.0061
Proportion of boys	-0.0195	0.0185	-0.0195	0.0185
Sex ratio of biological children	0.0039	0.0067	0.0036	0.0066
Extended family	-0.0055	0.0086	-0.0056	0.0086
Total expenditure per capita	-0.0019	0.0053	-0.0018	0.0053
PATH beneficiary	0.0051	0.0086	-0.0045	0.0096
PATH beneficiary*Foster child	-	-	0.0287***	0.0100
Household Head Characteristics				
Single father	-0.0021	0.0224	0.0010	0.0228
Female with spouse	0.0249	0.0175	0.0260	0.0176
Single mother	0.0511**	0.0243	0.0522**	0.0243
Age	-0.0041	0.0027	-0.0042	0.0027
Completed tertiary education	-0.0125	0.0094	-0.0127	0.0094
Has a chronic disease	0.0022	0.0055	0.0022	0.0055
Area Characteristics				
Other urban area (not KMA)	-0.0320	0.0676	-0.0335	0.0675
Rural area	0.0167	0.0726	0.0110	0.0718
Distance to nearest primary school	0.0003***	0.00003	0.0002***	0.00004
Distance to nearest secondary school	0.0002***	0.00003	-0.0002***	0.00003
Time Dummies	yes		yes	

Standard errors robust to all forms of heteroskedasticity. *p<0.10, **p<0.05, ***p<0.01

KMA stands for Kingston Metropolitan Area

term, becomes statistically significant at 1%. This means that the impact that being a foster child has on the number of years of schooling accumulated depends on whether the child has access to PATH or not. First and foremost, it is important to note that our findings in model II indicate that generally, biological children tend to accumulate more years of schooling than their foster counterparts. In particular, foster children with no access to PATH accumulate 2.57% less schooling years. This is equivalent to about 10 weeks of school within our sample. A foster child with access to PATH, on the other hand, tends to accumulate 0.3% (- 0.0257 + 0.0287) more years of schooling than a biological child with access to PATH. This corresponds to only 8 days in our sample. Although these results may seem modest, they show that PATH could indirectly impact the long-term educational outcomes of foster children positively despite the fact that the programme has no direct effect by itself (PATH remains statistically insignificant in model I and II). This is quite encouraging since one of the main objectives of PATH is to improve the quality of human capital in Jamaica.

Model II also shows that the nature of the headship of the household significantly affects the number of years of schooling completed by the children within that household. In particular, children in single-mother households complete 5.22% more years of schooling corresponding to about 21 weeks within our sample. In a matrifocal society like Jamaica's (Safa, 2007), single mothers tend to invest highly in their children's education to ensure a steady flow of income in their old age. Moreover, children in the Caribbean are known to take care of their elderly parents, especially their mothers (Handa, 1996a; Wyss, 1999; Handa, 1996c).

We also find that children in households that receive rental or property income complete less years of schooling. Unlike single mothers, adults in these households may be investing less in their children's education if they expect to continue to receive this income in their old age. In contrast to this, our findings show that children in households that receive windfall income complete more years of schooling. This may indicate that households tend to invest at least a portion of the windfall income they receive in the education of the children within the household. Unlike school attendance, the support received by the household from parents living elsewhere does not seem to have any significant long-term effect on the education of the

children. Our results also indicate that children who attend public schools tend to complete more years of schooling. This is probably because in Jamaica, almost all secondary schools are public while a good number of private primary schools exist.

Other variables that affect the number of years accumulated include owning a radio or a television set. Children in households that own a radio tend to complete less years of schooling. The opposite is true for children in households that own a television set. First, these variables may be picking up an income effect since television sets are generally more expensive than radios. Second, while both of these variables indicate access to information, a radio is likely to make available localized information while a television set could potentially provide more complex world-wide information. Hence, a household that uses a television as its primary source of information and for entertainment may indicate that the parents or guardians in that household, apart from being wealthier, are also relatively more educated (Handa, 1999). This could explain why children in such households tend to complete more years of education.

Similar to Subsection 4.4.1, we investigate our results further by estimating Equation 4.1 applying household fixed effects only. Our results presented in Appendix 4.C show that both child and household fixed effects are important for our results since controlling for unobserved household characteristics only affects either the magnitude, sign, or significance of most of the coefficients. Therefore, we can conclude that this long-term educational outcome is driven by both household and child time-constant characteristics which are unobserved.

4.5 Conclusion

Informal child fostering is a common practice in most developing countries, especially within Africa and the Caribbean. This study investigates the relationship between this practice and the educational outcomes of Jamaican children. We are able to construct a rotating panel of children from the 2004, 2006, 2007, 2008, 2009, and 2010 rounds of the Jamaican Survey of Living Conditions using unique household and child identifiers. Using a panel data set enables us to better control for the endogeneity of the foster child variable by controlling for unobservable household and child characteristics that are constant over time. Most similar

papers use educational outcome variables such as school enrolment and attendance. While these variables are good measures of access to education, we argue that they are not good measures of human capital development. Apart from school attendance, we include the number of years of schooling as an educational outcome variable to measure the long-term effects of fostering on education. In addition to this, we are able to minimize the weaknesses of this variable by accounting for drop outs and grade repetition.

Our findings indicate that the impact of the foster child variable on education depends on whether the child has access to the Programme of Advancement through Health and Education, a conditional cash transfer programme instituted by the Jamaican government to improve human capital development. In terms of school attendance, we find that while PATH improves the attendance of biological children, it tends to reduce the attendance of foster children to school. With regard to the number of years of schooling, on the other hand, we find that although foster children are generally disadvantaged relative to biological children, a foster child with access to PATH completes more years of schooling than a foster child who has no access to the programme. In fact, foster children who live within households that benefit from PATH complete 0.3% more years of schooling than a biological child who has access to PATH. In sum, these results show that PATH has been quite effective in improving the educational outcomes of Jamaican children, even those in foster care.

We also find that other household characteristics such as the gender and marital status of the household head, the assets of the household, and the different forms of income the household receives also affect both school attendance and the number of years of schooling accumulated. For instance, we show that children in single-mother households and households that own a television set tend to complete more years of schooling. The opposite is true for children who belong to households that receive property income and own a radio. We also find that children who belong to households that own their dwelling place or receive support from family living elsewhere specifically for the children are more likely to be present in school. On the other hand, children in households that receive remittances or windfall receipts tend to be absent from school more often.

Lastly, it is important to remember that our data set allows us to investigate only the kind of fostering that results from the relocation of parents and not children. Although this is common in Jamaica and the Caribbean in general, it needs to be taken into account when considering the external validity of our results and its implications for policy formulation and evaluation.

Appendix 4.A Sample Selection Bias

Table 4.A.1: Sample Selection Bias

Dependent Variable - The Probability of Being Included in the Sample		
Variables	Estimate	StdErr
Child Characteristics		
Age	0.1485***	0.0449
Age squared	-0.0070***	0.0023
Foster child	-0.0682	0.1273
Attends public school	-0.2472**	0.1055
Walks to school	-0.1516**	0.0752
Has a chronic disease	0.0349	0.1073
Household Characteristics		
Owns home	0.1047	0.0895
Owns a radio	0.0816	0.0751
Owns a television set	-0.2079	0.1314
Connected to electricity	0.0090	0.1522
Receives support for children	-0.0256	0.0799
Receives remittances	-0.0752	0.0732
Receives rental income	0.3216	0.3334
Receives windfall income	-0.0678	0.1472
Number of adults	-0.0593	0.0711
Number of preschoolers	-0.2309***	0.0712
Proportion of boys	-0.1144	0.1357
Sex ratio of biological children	0.0257	0.0543
Extended family	0.1767*	0.1036
Total expenditure per capita	0.1689**	0.0731
PATH beneficiary	-0.0990	0.1014
PATH beneficiary*Foster child	0.0507	0.1613
Household Head Characteristics		
Single father	-0.2123	0.2004
Female with spouse	-0.3608***	0.1240
Single mother	-0.2699**	0.1202
Age	-0.0109***	0.0038
Completed tertiary education	0.1387	0.1325
Has a chronic disease	0.1124	0.0853
Area Characteristics		
Other urban area (not KMA)	-0.0058	0.1292
Rural area	-0.0008	0.1209
Distance to nearest primary school	0.0014	0.0019
Distance to nearest secondary school	0.0179	0.0150

Standard errors robust to all forms of heteroskedasticity. *p<0.10, **p<0.05, ***p<0.01
KMA stands for Kingston Metropolitan Area

Appendix 4.B A Father's Impact

Table 4.B.1: A Father's Impact

	Attendance		Years of Schooling	
Variables	Estimate	StdErr	Estimate	StdErr
Child Characteristics				
Age	0.0004	0.0080	0.1495***	0.0087
Age squared	-0.0003	0.0003	-0.0039***	0.0003
Mother present	-0.0173	0.0106	0.0045	0.0077
Father present	0.0170*	0.0102	0.0264**	0.0113
Attends public school	0.0051	0.0069	0.0225**	0.0102
Walks to school	0.0149	0.0095	-0.0053	0.0062
Has a chronic disease	-0.0055	0.0089	0.0096	0.0081
Household Characteristics				
Owns home	0.0196**	0.0094	0.0045	0.0085
Owns a radio	0.0055	0.0066	-0.0090*	0.0047
Owns a television set	0.0155	0.0158	0.0186**	0.0086
Connected to electricity	0.0110	0.0167	-0.0144	0.0120
Receives support for children	0.0197**	0.0076	0.0006	0.0050
Receives remittances	-0.0125*	0.0067	0.0037	0.0049
Receives rental income	0.00004	0.0155	-0.0352**	0.0139
Receives windfall income	-0.0223**	0.0109	0.0108	0.0069
Number of adults	0.0073	0.0148	0.0075	0.0108
Number of preschoolers	0.0087	0.0074	-0.0015	0.0062
Proportion of boys	-0.0054	0.0212	-0.0198	0.0186
Sex ratio of biological children	-0.0031	0.0077	0.0031	0.0066
Extended family	-0.0131	0.0126	-0.0052	0.0086
Total expenditure per capita	-0.0029	0.0082	-0.0020	0.0053
PATH beneficiary	0.0176	0.0124	0.0043	0.0086
Household Head Characteristics				
Single father	0.0344	0.0312	0.0006	0.0218
Female with spouse	-0.0031	0.0196	0.0271	0.0178
Single mother	-0.0125	0.0297	0.0588**	0.0252
Age	0.0027	0.0036	-0.0040	0.0027
Completed tertiary education	-0.0088	0.0140	-0.0134	0.0094
Has a chronic disease	-0.0094	0.0086	0.0024	0.0055
Area Characteristics				
Other urban area (not KMA)	-0.0025	0.0067	-0.0331	0.0675
Rural area	0.0479	0.0429	0.0202	0.0732
Distance to nearest primary school	0.0001**	0.00003	0.0003***	0.00003
Distance to nearest secondary school	-0.0001	0.0001	0.0002***	0.00003
Time Dummies	yes		yes	

Standard errors robust to all forms of heteroskedasticity. *p<0.10, **p<0.05, ***p<0.01

KMA stands for Kingston Metropolitan Area

Appendix 4.C Household Fixed Effects

Table 4.C.1: Household Fixed Effects

	Attendance		Years of Schooling	
Variables	Estimate	StdErr	Estimate	StdErr
Child Characteristics				
Age	0.1553	0.1022	0.4869***	0.0367
Age squared	-0.0093*	0.0049	0.0200***	0.0019
Foster child	0.6299***	0.1805	-0.2945***	0.0761
Attends public school	0.1536	0.1430	0.1900***	0.0607
Walks to school	0.2383	0.1634	-0.0764	0.0493
Has a chronic disease	0.0491	0.1849	0.0046	0.0686
Household Characteristics				
Owns home	0.4077**	0.1969	0.0429	0.0740
Owns a radio	0.0811	0.1456	-0.0448	0.0406
Owns a television set	0.3627	0.3435	0.1682**	0.0740
Connected to electricity	0.1848	0.3645	-0.1061	0.1021
Receives support for children	0.2788*	0.1628	0.0325	0.0466
Receives remittances	-0.2408*	0.1449	0.0276	0.0450
Receives rental income	-0.0580	0.3199	-0.2451**	0.1215
Receives windfall income	-0.4314*	0.2469	0.1130	0.0795
Number of adults	0.1540	0.3138	0.0160	0.0874
Number of preschoolers	0.1435	0.1638	0.0055	0.0521
Proportion of boys	0.0263	0.4013	-0.0438	0.1496
Sex ratio of biological children	0.0369	0.1522	0.0144	0.0565
Extended family	-0.3251	0.2657	-0.1048	0.0929
Total expenditure per capita	-0.0410	0.1802	0.0006	0.0513
PATH beneficiary	0.5921**	0.2616	-0.0179	0.0777
PATH beneficiary*Foster child	-0.8364***	0.2529	0.1053	0.1028
Household Head Characteristics				
Single father	0.4893	0.5183	0.0983	0.1851
Female with spouse	-0.0714	0.3564	0.0354	0.2030
Single mother	-0.4503	0.5430	0.2056	0.2243
Age	0.0414	0.0417	-0.0128	0.0235
Completed tertiary education	-0.1038	0.2843	-0.1169	0.0911
Has a chronic disease	-0.1928	0.1855	-0.0043	0.0514
Area Characteristics				
Other urban area (not KMA)	0.0847	0.1925	-0.1919	0.5712
Rural area	1.2115	1.0005	0.2067	0.6091
Distance to nearest primary school	0.0019**	0.0008	0.0029***	0.0004
Distance to nearest secondary school	-0.0027	0.0027	0.0018***	0.0004
Time Dummies	yes		yes	

Standard errors robust to all forms of heteroskedasticity. *p<0.10, **p<0.05, ***p<0.01

KMA stands for Kingston Metropolitan Area

Chapter 5

Concluding Remarks

The three essays of this thesis examine relevant aspects of development including child welfare, poverty, inequality, and gender using empirical methods. To do this, intra-household decisions on resource allocation and child fostering are investigated using data from nation-wide household surveys conducted in Ghana and Jamaica.

The first and second essays apply a modern collective model to estimate individual resource shares in Ghanaian and Jamaican nuclear households respectively. Generally, the results from both papers point to the fact that the welfare of children is closely connected to the welfare of the woman within the household. In other words, improving the well-being of mothers is likely to improve the well-being of children as well. In Ghana, for instance, we find that a larger proportion of the cost of children (in terms of household expenditure at least) falls on the mother. Hence, women and children tend to be more vulnerable to poverty than men. In Jamaica, the resource share estimates show that children tend to receive larger resource shares in female-headed households than in male-headed households. This means that children in relatively poorer female-headed households are somewhat buffered from poverty because a larger share of resources is allocated to them.

Still on the well-being of the child, both papers find some evidence of gender bias albeit in different forms. In Ghanaian households, with respect to clothing and footwear at least, we find strong evidence that parents tend to spend more on the girl child than on the boy child. We argue that this characteristic stems from the maternal system of inheritance and succession

practised by the largest ethnic group in the country since women in this culture are viewed as the maintainers of the lineage or clan. In contrast, female heads (especially single mothers) in Jamaica tend to favour boys to girls because the boy child is more likely to begin to contribute significantly to household income since boys tend to enter the labour market earlier than girls do. We find no evidence of gender bias in male-headed households in Jamaica.

The final paper of the thesis focuses on the impact of a child's fostering status on his or her education. School attendance is used to estimate short-term effects while long-term effects are estimated using the number of years of schooling. The results show that being a foster child in itself does not impact a child's attendance to school. However, a foster child tends to accumulate significantly less schooling years than a non-foster child. This means that although the practice of leaving children with extended family or friends does not seem to affect their education in the short run, it could have some negative long-term effects since the number of years of schooling an individual has is an important determinant of his/her labour and health outcomes in the future. Finally, findings from this essay also indicate that access to Jamaica's main social protection programme (the Programme of Advancement through Health and Education) significantly influences the relationship between child fostering and education.

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