Beliefs and investment in children human capital: the case of twins in Benin

Sahawal Alidou †

This version: October 2018 *

Keywords: Beliefs and twins in Benin, parental investment in children human capital, preventive health care.

† IOB – Institute of Development Policy and Management (University of Antwerp), LICOS – Centre for Institutions and Economic Performance (KU Leuven), sahawal.alidou@uantwerp.be
Abstract

Because of its far reaching consequences on income, inequality and welfare, a large economic literature has attempted to uncover the determinants of parental investment in children human capital. So far, most studies in this literature have focused on children characteristics to explain inequalities in parental investment among siblings. As a complement to this mainstream, I investigate whether or not existing beliefs about children’ value affect how parents allocate resource among siblings. To test this hypothesis, I use the case of twins which are venerated and worshiped as deities in several parts of Africa. Based on Demographic and Health Survey (DHS) data from Benin, I find a twins preferential treatment in parental investment in children health. As this result survives various robustness checks and competing explanations, I explore its underlying mechanisms and speculate on whether it should be interpreted as a behavioral anomaly or as the outcome of a neo-classical cost-benefit calculus.
1. Introduction

From moral and human rights perspectives, all children are born equal and should be treated in a similar way by their parents. However and all over the world, parents attach different values to children, based on gender, birth order and cognitive abilities; often leading to unequal resource allocation among siblings. Well-known illustrations of such situations are male preference and related gender discrimination in children health and education in developing countries (e.g. Barcellos et al, 2014; Pasqua et al, 2005). Alike, gender differences are found in children time spent with parents in the developed countries (e.g. Lundberg et al, 2007; Yeung et al., 2001).

Alongside with and often linked to some children characteristics, other factors such as culture and beliefs also affect parental perceptions of children’ value. For instance, in some ethnic groups in Sub Saharan Africa, twins are venerated and worshipped as deities (e.g. the Yoruba1 in Nigeria; Renne, 2001), while they are considered evil and a curse in others (e.g. the Antaboques in Madagascar2). Similarly, children with birth defect or a disorder are perceived in many cultures as punishments from God for parental sin, and are believed to inflict harm and bring bad fortune (Meyerson,1990). Children born to women who died during or short after delivery, children with disabilities and breech born babies also face identical social stigmata in various cultures.3

These examples illustrates the motivation of this paper: in the wake of studies linking magicoreligious beliefs with development outcomes (e.g. Gershman, 2016; Briones Alonso et al., 2016; Stoop et al., 2017…), it explores the impact of parental magicoreligious beliefs on resource allocation among siblings. More specifically, it quantitatively investigates whether magicoreligious beliefs about twins lead to differential treatment of twins with respect to their

---

1 Yoruba is an ethnic group spread across southern Benin and southern-east Nigeria.
singletons counterparts. This hypothesis is tested using children full immunization status - as a measure of parental investment in children health - from four DHS rounds in Benin and a fixed-effect model which exploits plausible-exogeneity of twins birth. The focus on Benin is motivated by three main reasons. First, Benin provides unique empirical advantages to explore the relationship between magicoreligious beliefs and development outcomes (Stoop et al, 2017); second, the country is invariably mentioned for its celebration of twins whenever African twins are mentioned in books or media (Piontelli, 2008); and third, Benin has the highest twinning rate in the world (Segal, 2017; Smits and Monden, 2011).

Overall, results indicate that compared to singletons children, twins are more likely to enjoy full immunization; and this finding survives several robustness checks and competing explanations such as parental compensating behaviour and higher health investment in reaction to early health shocks. In my attempt to uncover this twins preferential treatment, I combine quantitative exploration of various mechanisms, with qualitative insights from a fieldwork conducted in southern Benin. In doing so, I identify family support as the most plausible (and most intuitive) explanation to twins preferential treatment. Furthermore, I speculate on the motives for such preferential treatment to twins, contrasting an interpretation based on parents’ beliefs which fits in a behavioral approach with a neo-classical cost-benefit interpretation in which parents intend to secure and maximize good fortune believed to be provided by twins.

Because of its far reaching consequences on economic growth, distribution and welfare, a large economic literature has developed on parental investment in children human capital. Yet, most studies have focused so far on children characteristics, following the footsteps of Becker and Tomes (1976) who were among the firsts to integrate children endowments in the

---

4 Still, the same analysis is conducted on a dataset expanded to neighboring countries which share in similar twins veneration (Nigeria, Togo and Ghana). Also, I find that twins are worse-off in societies in which they are considered a curse while treated similarly to singletons in cultures where they are not given special consideration (see in the Robustness checks section).

5 I undertook a fieldwork in 10 localities of southern Benin in June 2018 to collect data on beliefs and social norms related to twins through focus groups with mothers and caregivers, and semi-structured interviews with twins and singletons adults.
economic analysis of households investment in children human capital. As such, relatively less attention has been given to factors such as culture and beliefs; at the notable exception of gender differences which has been analyzed with regard to culture and existing social norms. Being (to the best of my knowledge) the first to explicitly link magicoreligious beliefs to parental investment in children human capital, this paper comes a complement to the mainstream economic literature on this topic. It also fits within (i) the economics of magicoreligious beliefs and (ii) the economic literature on intra household resource allocation. More generally, it belongs to the literature on the cultural determinants of development.

Finally, despite huge investments to tackle supply-side constraints, uptake of vaccination (and other cost-effective measures to reduce child mortality) remains low in Sub Saharan Africa (Dupas, 2011). A deeper understanding of the determinants of parental investment in children health is therefore crucial to ‘bridge the last mile’ in order to eradicate children preventable diseases. Hence, some policy implications of my findings are: (i) more attention should be paid to existing beliefs systems and to their impact on parental investment in children health and (ii) policy implementation might include ad hoc mechanisms (e.g. manipulation of beliefs systems) to increase the uptake of preventive health care in Sub Saharan Africa.

The paper is structured in 8 sections. The next section briefly reviews the literature on parental investment in children human capital and section 3 provides a background on Benin. In sections 4 and 5, I present the empirical framework and the data, before discussing the results in section 6. Section 7 tentatively explores the mechanisms behind the findings and section 8 concludes.

2. Literature review

There is a large and still growing literature on parental investment in children human capital, but without so far a consensus on its dominant motive. While some studies have suggested that parental investment reinforces initial endowments and thereby increases inequality among siblings
(Behrman et al., 1994), others have advocated that parents allocate resources in order to alleviate existing gaps in children’ endowments (Behrman et al., 1982; Pitt et al., 1990). More recent studies have found multiple and more complex motivations including favoritism and guilt in parents decisions (Li et al., 2010). Moreover, compensating or reinforcing parental behavior depends on the dimension of human capital of interest as pointed out by Ayalew (2005) and Yi et al (2015). In all cases, inequality in care time and resource allocation among siblings have been studied essentially with respect to children endowments and abilities (Frijters et al, 2013; Akresh et al, 2012; Ayalew, 2005) ; gender (Barcellos et al, 2014 ; Pasqua, 2005) and birth order (Lehman et al, 2018; Ejrnæs and Pörtner 2004). Furthermore, it worth noticing that unequal resource allocation among siblings might be rooted in existing social norms and institutions (for instance gender discrimination is often based on states of marriage market, labor market, laws, social attitudes⁶…) and parents’ perceptions of children prospects⁷. Also, parents may simply prefer a particular child irrespective of the returns (Behrman, 1988).

Although all the previous are important determinants of households investment in children human capital, other variables (e.g. love, friendship, compassion, …) may impact on caring preferences of household members (Cherchye et al, 2015), leading to heterogeneity in parental altruism towards children. Also and often interlinked to some children characteristics (e.g. being a twin, birth defect, breech birth…), factors such as tradition and beliefs might affect resource allocation among siblings through parents perception of children’ value. And the current state of the economic literature leaves to a large extent, such questions unexplored.

Drawing on evidences of magicoreligious beliefs affecting social behavior, human well-being and development outcomes in a significant way (e.g. Gershman, 2016; Stoop et al., 2017;

---

⁶ Pitt et al, 1990
⁷ For instance parents might provide additional resources to less-able children to avoid high inequality in children’s earnings (Behrman et al., 1982).
Briones Alonso et al., 2016; Nunn and Sanchez de la Sierra, 2017; Alidou and Verpoorten, 2018…), and based on qualitative insights (both from socio-anthropological studies such as Renne, 2001; Pector, 2002; and a qualitative fieldwork conducted in southern Benin), this paper engages with understanding how twins magicoreligious beliefs affect parental investment in children human capital. Closely related are studies exploring the impact of culture and social norms on intra household resource allocation. For instance, studying within household allocation of food in rural Nepal, Gittelsohn et al (1997) linked part of the unequal intake of micronutrients and calories to specific food beliefs and practice. In Côte d'Ivoire, Duflo and Udry (2004) documented that social norms not only dictate gender specialization in crop cultivation but also constrain the intra household allocation of income. Based on an experiment conducted in rural areas in northern Nigeria, Munro et al (2011) found that polygamy tend to increase men’ share of available resources and favors an unequal allocation of resources among wives of polygamous households. More generally, this study also belongs to the literature on cultural determinants of human behavior and development outcomes (e.g. Alesina et al., 2016; La Ferrara et al, 2017).

3. Background on Benin

Twins veneration and preferential treatment

In several parts of Africa twins are venerated and assumed to provide good luck to their parents (Renne, 2001). This study features the case of Benin, a small country in West Africa, well known for its highest religious diversity and lowest government restrictions on religion (Barbier and Dorier-Apprill, 2002), and where twins are venerated and worshipped as Voodoo deities⁸. Because of Voodoo resilience in burdensome time and its renaissance with the democratic era, most of the magicoreligious beliefs attached to it – including twins veneration- are still vibrant in

---

⁸ The Voodoo is an African Traditional Religion which originates from Benin. A description of the origin and characteristics of ATR and voodoo is provided in Alidou and Verpoorten (2018).
the country. For instance, Benin is invariably mentioned for its celebration of twins whenever African twins are mentioned in books or media (Piontelli, 2008) and twins gathered together in an annual celebration organized each September in Ouidah9 by the Benin twins association. In fact, twins veneration and giving them special attention and social status can be traced back to at least the early 18th century, when after the death of king Akaba, his twin sister Hangbe ruled the Dahomey kingdom, although this was not customary for women (Attanasso, 2012). Withal, Benin has the highest twinning rate in the World10 (Segal, 2017). Overall, the country provides unique empirical advantages to explore the relationship between twins magicoreligious beliefs and development outcomes.

In Benin, twins are given special names and believed to detain preternatural powers (Leroy et al, 2002). They symbolize original ancestors who gave origin to human race and are said to be able to impinge human beings destiny through their faculty of being in touch with the supreme God (Piontelli, 2008). Upon death, twins are represented by wooden statuettes and are involved in elaborate rituals (Leroy et al, 2002). Besides, magicoreligious beliefs about twins often imply preferential treatment of the twins over the other children, but also equal treatment of twins, irrespective of gender (Pector, 2002; Leroy et al, 2002). As a result twin girls are likely to be positively discriminated and given higher social status compared to singletons girls; partly explaining the aforementioned very uncommon situation of Dahomey kingdom being ruled by a woman11. Although twins veneration in Benin largely roots in Voodoo, it worthy noticing that higher consideration and preferential treatment given to twins is not solely observed in voodoo affiliated cultures. For instance, twins are also venerated by the Bariba (the most important non-voodoo ethnic group in Benin) and are considered to be special human beings in other cultures

---

9 Ouidah is town in southern-east Benin.  
10 27.9 twins per 1000 births (Smits and Monden, 2011)  
11 Based on an in-depth analysis of succession patterns in Dahomey kingdom, Bay (2012) argues that Hangbe actually manages to win the power struggle in the ruling monarchy upon death of her twin brother Akaba. She then nuances this view, suggesting that Hangbe being a twin has been used as an ex-post explanation for her reign in a patriarchal society.
but without necessarily being venerated. Finally, twins veneration in itself might have faded with modernization but the socio-cultural norm and beliefs derived from it seems to persist: 53% of adults twins interviewed during my fieldwork in southern Benin report a preferential treatment during their childhood; about 60% of non-twins adults are from families which still venerate twins; and when they are asked by unknown mothers of twins, 70% of non-twins respondents give money.

**Health care and child mortality**

Substantial progress has been made in health sector in Benin over the past decades: all neonatal-, infant-, and under-five mortality rates have declined between 1996 and 2012. Yet, (under-five) child mortality is still high (115 deaths per 1,000 live births in 2014); utilization of modern medical facilities remains very limited (at about 44% in 2008) and full immunization rates Benin are dangerously low (41.6% in 2014).12

Benin national strategy regarding immunization features large-scale campaigns during which health workers go into houses, trying to reach all children, especially those in remote areas. However, a negative side-effect of such strategy is that instead of taking responsibility for the vaccination of their children (by following-up on their immunization schedule and getting them vaccinated for free at the health center), mothers tend to wait for health workers to pass by their house. And this perverse effect may have actually hampered the endeavors toward universal full immunization in the country (Stoop, 2017).

4. **Empirical strategy**

The identification strategy relies on plausible exogeneity of twins birth (Smits and Monden, 2011; Bhalotra and Clarke, 2016). The empirical model is as follows:

---

$$y_{cmhv} = \alpha_0 + \alpha_1 \text{Child is Twin}_{cmhv} + \varphi_1 X_{cmhv} + \varphi_2 X_{mhw} + \varphi_3 X_{hv} + \Delta \text{Region} + \Lambda \text{DHS year}$$

+ \epsilon_{cmhv} \quad \text{(Eq.1)}$$

where \( c \) indexes children, \( m \) mothers, \( h \) households and \( v \) DHS clusters. \( y_{cmhv} \) is full immunization at child’ first birthday. The explanatory variable of interest is the dummy variable \( \text{Child is Twin}_{cmhv} \) that takes the value one if the child is a twin and zero otherwise. \( X_{cmhv}, X_{mhw} \) and \( X_{hv} \) are vectors containing child-, mother- and household-level covariates which are likely to influence children full immunization. \( X_{cmhv} \) includes : child’s gender, age (in months) and birth-order; \( X_{mhw} \) includes the mother’s age, education in years of schooling, ethnicity and religion while \( X_{hv} \) contains wealth quintile and residence (urban/rural) of the household. I further control for the year in which the DHS survey took place (\( \text{DHS}_{year} \)) and the administrative region in which the household lives (\( \text{Region} \)) fixed effects. \( \alpha_0 \) is a constant and \( \epsilon_{cmhv} \) is an error term. \( \alpha_1 \) is the coefficient of interest and captures the difference in likelihood of full immunization between twins and singletons children.

5. Data

Detailed data on parental investment in their offspring’ human capital together with information on magicoreligious beliefs is very rare, hence the difficulty to study the relationship between the two. In this paper, I pool together data from 4 DHS rounds collected throughout the period 1996-2012 in Benin, and use full immunization of children as a proxy for parental investment in children health. The database contains information on 37,828 children born in the five years preceding the survey. All variables entering (Eq.1) are available for 25,553 children\textsuperscript{13} from 1,944 DHS clusters. Full immunization is defined as receiving at first birthday, all eight vaccines stipulated in the routine immunization schedule in Benin : a dose of Bacillus Calmette-Guerin

\textsuperscript{13} Out of the 37,828 under five years old children, 3,000 have passed away and 8,066 have not yet reach their first birthday at the time of the survey.
(BCG) vaccine at birth (or as soon as possible); three doses of diphtheria, pertussis and tetanus (DPT) vaccine at 6, 10 and 14 weeks after birth; at least three doses of oral polio vaccine (OPV) at birth and at 6, 10 and 14 weeks after birth; and one dose of measles vaccine 9 months after birth. Also, DHS records information on single and multiple births, allowing me to link the likelihood for a child to get full immunization with whether or not he/she is a twin.

Table 1 provides summary statistics for the key variables: average or proportion, standard deviation, and comparison in mean/proportion between twins and singletons children. The control variables, used in the baseline specification, the robustness checks and the competing explanations are summarized in Table A1 in Appendix. Children in the sample are on average 34.30 months old, with 49.28% being females. About 44% of them get full immunization at first birthday and they mostly live in rural area (65.15%). On average, mothers of these children are 29.61 years of age and have little education (1.35 years of schooling). Out of the 25,553 children in the sample, 1,067 are twins (4.18%). On average and compared to singleton children, they are 8.38 percentage points more likely to get full immunization.

6. Results

Table 2 exhibits the baseline results (Col. I), the results with alternative estimation methods (Cols. II to IV) and with more inclusive specifications (Cols. V to VII). Further tests are presented in Tables 3 to 5; results for competing explanations are reported in Tables 6 to 8. Table 9 explores heterogeneity in the results with respect to various socio-demographic characteristics.

Main results

The baseline results (Col. I of Table 2) indicate that compared to singleton children, twins are more likely to get full immunization. More precisely, the twins preferential treatment is significant.

---

14 The results are similar with the number of vaccines received by the child as outcome variable: twins enjoy on average 0.352 more units of vaccines compared to singletons. The estimate is of 0.307 with DHS cluster Fixed Effects and of 0.394 with Household Fixed Effects.
at 1% and estimated at 8.1 percentage points; which is more than four times the effect of gender on children immunization in India (found to be of 1.9 percentage points by Barcellos et al, 2014). Also, it corresponds to the effect of an additional 8 years of education of the mother, and represents close a fifth of the likelihood of full immunization in the sample (which is 44.08%). As expected, household wealth index, mother’s schooling and her religion are other significant determinants of children (not reported but available on request). For instance, children who live in wealthy households, of more educated and of non-voodoo adherent mothers are more likely to complete the routine immunization schedule in Benin.

Robustness checks

To safeguard the main results, I perform nine robustness tests that can be subdivided in three set of checks. In the first set of checks (Table II, Cols. II to IV), I vary the estimation techniques and modalities in three ways: (i) clustering error terms at higher level namely at the administrative region level; and estimating (Eq. 1) as (ii) a probit regression and as (iii) a truncated linear regression.

In a second set of checks (Table II, Cols. V to VII), I move from the baseline parsimonious specification to more inclusive specifications by including DHS-cluster fixed-effects (to capture local and/or supply-side factors), household fixed-effects (to account for unobserved households characteristics) and a set of additional control variables.

Finally, as Benin shares in similar voodoo-rooted beliefs and twins veneration with Nigeria, Togo and Ghana, I replicate the above analysis on a dataset expanded to these three countries. Further, I explore whether twins are worse-off in societies in which they are considered a curse and treated similarly to singletons in cultures where they are not given special status or

---

15 In addition to the robustness checks presented in the main text, I use alternative outcome variables to capture parents investment in children human capital such as the use of bednet (which is measured at mother level and not at child level, so much less in line with the focus of this paper which is on resource allocation among children), the likelihood for a child to be taken to modern medicine facilities upon fever/cough or diarrhea, and child’ body mass index. I find no twins preferential treatment neither for these variables (Results reported in Appendix, Table A2) nor for full immunization in the considered subsamples.
consideration. To increase the relevance of such tests, I used countries that are similar enough to Benin in terms of development outcomes (HDI of 0.515 in 2017) while geographically far away to exclude potential religious/beliefs assimilation: Madagascar (with a HDI of 0.519 in 2017 and where twins are considered a curse in Vatovavy-Fitovinany region) and Senegal (with a HDI of 0.505 in 2017 and where no special treatment of twins is documented for some important ethnic groups)\textsuperscript{16}.

The results in Table 2 show that the \textit{twins preferential treatment}, i.e. the estimated coefficient on \textit{Child is Twin\_emb}, remains positive and significant across all first and second sets of robustness checks. In particular, it remains stable with the error terms clustered at administrative region level (Col. II) and a probit estimation (Col. III), however losing a bit of significance with the former. The results of the truncated regression (Col. IV) indicates that the twin effect is actually much bigger when scaling up the baseline results with the probability that full immunization status is observed for all children. The strong inflation of the $R^2$ in Col. V (from 0.074 in Col. I to 0.261) suggests that the DHS-cluster fixed-effects explain a large amount of variability in children full immunization. But these fixed-effects\textsuperscript{17} are far from knocking out the result as the coefficient of interest is of 6.8 percentage points and remains significant at 1\%. Moreover, the estimated coefficient is of 6.6 percentage points and significant at 5\% in Col. VI, indicating that the \textit{twins preferential treatment} still holds in a household-fixed-effect model. Further controlling for some variables (the number of under five years old children living in the household; mother’s height, her age at first birth, the number of children of her who have died, a dummy variable capturing whether these children died before their first birthday; father’s age and education; access to a doctor, to a nurse and to prenatal health care in the DHS cluster) actually increases the estimated coefficient and the $R^2$ (from Col. VI to Col. VII).

\textsuperscript{16} Data on HDI are from UNDP (2018).
\textsuperscript{17} Note that from here onwards, all regressions includes DHS-cluster fixed-effects.
The third set of checks also consolidate the main results: the estimated twins preferential treatment is of 4.7 to 6.0 percentage points (significant at 1%) when including data from Nigeria, Togo and Ghana (detailed results in Table 3) whereas I find a twins adverse treatment in Vatovavy-Fitovinany region in Madagascar (Panel B of Table 4) and no twins differential treatment in Senegal (Panel B of Table 5).

Competing explanations

The identification strategy relies on the plausible exogeneity of twins birth. Table 6 shows the results of a regression of twinning on mother-level characteristics such as her years of schooling, age, age squared, height, weight, ethnicity, her religion, the total number of her children who have died a dummy variable capturing whether these children died before their first birthday. I also control for access to prenatal health care, access to a doctor and access to a nurse\(^\text{18}\). Out of these variables, mother’s ethnicity, her age, age square, height and the dummy variable capturing whether these children died before their first birthday significantly affect the probability of twinning; some of them are directly included in the baseline specification and all of them are accounted for in the sixth robustness check (Col. VII of Table 2).

A very plausible explanation of twins preferential treatment is that parents invest more in twins health to compensate for their poorer health conditions at birth in order to mitigate potentially adverse consequences on health or cognitive achievements (Rosenzweig and Zhang, 2009). I check in two ways whether my findings pick-up such a compensating behavior: (i) I include child’s birth size in the baseline specification and (ii) compare full immunization of twins to that of singleton children of smaller (smaller than average and very small) birth size. The coefficient of interest is stable (at 0.074) to the inclusion of child’ birth size and twins remains 7.3 percentage points more

\(^{18}\) To measure access to prenatal care, I use the percentage of births with prenatal care in the DHS cluster. Access to a doctor or nurse are proxied by the DHS cluster-level percentage of births with prenatal care given by a doctor or nurse.
likely to have full immunization compared to singletons children of smaller birth size (see respectively Cols. II and V of Table 7). These results also answer another concern that relates to differential mortality between twins and singletons. Indeed, it is arguable that the sub-sample of twins is biased towards those with higher survival rate because of relatively higher health care provision and in such a case, the estimated coefficient would be biased upwards. In so far that the results are not dampen by either including child’s birth size in the baseline specification, or comparing full immunization of twins to that of singleton children of smaller birth size, it is unlikely that they are driven by a selection bias. The results of the truncated regression (which correct the baseline results with the probability that full immunization status is observed for every child, i.e including dead ones) are further reassuring, as the coefficient is much larger and significant at 1% (robustness checks section, Col. IV of Table 2).

As close birth spacing (in particular birth interval is zero between twins) allows for economies of scale in various items such as clothing, food, transport cost, etc., the marginal cost of raising a child might be lower for twins compared to that of singletons. In theory, one explanation to twins preferential treatment could be that gains from these economies of scale are reinvested in twins health. To rule out this explanation, I add preceding birth interval to the bunch of controls in (Eq.1). The twins preferential treatment actually increases to 9.1 percentage points (Col. III of Table 5); the same variation occurs while including preceding birth interval together with child’s birth size (Col. IV of Table 7).

Finally, as children affected by early health shocks are likely to get higher parental health investment (Yi et al, 2015), I introduce a dummy variable capturing whether the child has suffered from either diarrhea, fever or cough in the two weeks preceding the survey in (Eq.1). Results in Cols. II of Table 8 indicate that higher parental investment in twins immunization is not explained by health shocks.
All previous competing explanations are replicated with a household-fixed-effect specification. As shown in Tables A3 and A4 in Appendix, the estimated coefficient is of smaller size and significant at 10%; except when I compare twins to singleton children of smaller birth size (it then loses significance).

**Heterogeneity**

I explore heterogeneity in the results with respect to some child’s characteristics (gender), mother’s characteristics (ethnicity, religion and education) and household characteristics (poverty status and residence area). First and with respect to gender, I include an interaction term \( \text{Child is Twin}_{cmhv} \times \text{Child is Female}_{cmhv} \) in (Eq.1) to check whether \( \text{twins preferential treatment} \) equally applies to girls and boys. Second, to investigate whether lesser uptake of preventive health measures among mothers that are voodoo-adherent (Stoop et al, 2017) also applies to twins, I interact \( \text{Child is Twin}_{cmhv} \) with mother’s voodoo adherence. Third, because twins are venerated as deities in voodoo related ethnicities while it is not necessarily the case for non-voodoo related ones, I interact \( \text{Child is Twin}_{mhv} \) with \( \text{Mother is of voodoo ethnicity}_{mhv} \), based on the prior that \( \text{twins preferential treatment} \) would be higher for voodoo related ethnicities. Fourth, as moving from poorest to richest wealth quintile increase by 18.5 percentage points the likelihood of getting full immunization, I compare the \( \text{twins preferential treatment} \) across non-richer and richer households. To do so, I define the 4\(^{th}\) and the 5\(^{th}\) quintiles of asset ownership quintiles as richer households and then introduce an interaction term \( \text{Child is Twin}_{mhv} \times \text{Child lives in richer household}_{mhv} \) in (Eq.1). Finally, if beliefs and social norms on twins stem from lack of knowledge about human reproduction and are no longer useful in dynamic and modern societies, it is very likely that the \( \text{twins preferential treatment} \) will be reduced or disappear with education and urbanization. Hence, I respectively interact the twin dummy variable with mother education and residence area of the household (urban/rural).

Based on the results summarized in Table 9, there is no evidence of heterogeneity in the estimated \( \text{twins preferential treatment} \) across girls and boys, across voodoo adherents and non-voodoo
adherents, across voodoo ethnicities and non-voodoo ethnicities, and across richer and non-richer households. Additionally, *twins preferential treatment* is not reduced with either education or urbanization.

7. Mechanisms

Based on full immunization of under five years children, I have established that twins enjoy higher level of preventive health care compared to singletons children. After ruling out various competing explanations, I tend to favor beliefs about twins (described in the Background section) as the main explanation to this *twins preferential treatment*. In this section, I try to uncover the underlying mechanisms driving the results. To start with, it is important to recall three things: (i) all eight vaccines stipulated in the routine immunization schedules in Benin are for free; (ii) all children encountered by the health workers during the vaccination campaigns are systematically vaccinated be it at home or not and in presence of parents or not; and (iii) families incur transaction costs (transport cost and opportunity cost of time spent at the health facility) only when a child get vaccinated at the health center. Moreover, twins seems to be as likely as singletons to be taken to modern medicine facilities upon sickness (see footnote 13 or Table A2), considerably reducing the likelihood that higher exposure to medical checks by health workers is driving the results. Consequently, twins higher likelihood of full immunization most probably stems from closer monitoring and follow-up on immunization schedule, combined with a higher willingness to bear the transaction costs of vaccination at the health facility. With this in hand, I investigate – in particular for resource-constrained households – how higher investment (both transaction costs and closer monitoring of the immunization schedule) in twins preventive health care is covered for.

*Family support*
To tentatively test for the family support channel, I add a the number of adults living in the household to (Eq. 1). Results\textsuperscript{19} in Table 10 (Col. II) show that this inclusion has no effect on the coefficient of interest; in fact the number of adult living in the households does not affect full immunization of children. Results remain similar in the subsample of non-richer households (Col. IV). Hence, this tentative test barely endorses the family support channel. As the DHS data do not provide information on transfers (in money or in kind) between households (which would allow an in-depth quantitative exploration), I hereafter rely on my fieldwork conducted in southern Benin to get some qualitative insights on the role of the extended family.

It clearly emerges from the interviews that parents enjoy family support upon twins birth: «Relatives and neighbors help to take care of twins» [Focus group Issaba]; «Sisters and sisters-in-law often assist the family to take care of twins» [Focus group Malanhoui]; «However poor are parents of twins, there will always be assistance from the extended family, neighbors or benevolent people to fulfill basic needs of the twins» [Focus group Za Tanta]; «Twins bless their parents with good fortune and business opportunities, whereof to take good care of them» [Focus group Azove]. And this is not a surprise in itself, given that in most African cultures family members are bound to act for the benefit of the collective, be it the nuclear family or the extended family, the clan or ethnic group (Lloyd and Blanc, 1996). For instance, regarding the decision to invest in children schooling, this implies that the benefits of schooling are expected to be shared (Baland et al., 2016; Mueller, 1984b). Furthermore, the beliefs that twins bring good fortune and happiness is found in some Yoruba\textsuperscript{20} songs in praise of twins (Leroy, 2002, p.135): «...They made the poor rich, they clothed those who were naked. Majestic and beautiful looking twins, natives of Ishokun, let me find means of eating, let me find means of drinking...». Hence, for the extended family, participating in twins catering, care and education might be driven by the following motives: (i) honor the twins to fulfill beliefs and related traditions; (ii) reduce the financial and chores burden

\textsuperscript{19} Results remains the same while replacing number of adults living in the household by number of adult visiting the household.

\textsuperscript{20} Yoruba is an ethnic group spread across southern Benin and southern-east Nigeria; it also belong to the group of ethnicities that historically practice Voodoo.
on the parents and thereby strengthen familial ties; (iii) share in the luck and blessings that twins are believed to bring in the family. Actually, these motives give way to two potential interpretations of the *twins preferential treatment* that do not necessarily oppose each other. The first interpretation is that of parents and extended family behaving according to firmly rooted beliefs related to twins as described in the background section while the second interpretation features expected utility maximization and cost-benefit calculus which resonate well with Becker (2013)’s economic approach.

Beside family support, I also tentatively explore other (unlikely) mechanisms through which parents might avail resources to cover for the transaction costs of vaccination at the health center: resource diversion from singleton children, increase in parental labor supply and reallocation of resources from parents to twins. But I find no evidence of either one or the other channel (results reported in Tables A5 to A7 in Appendix).

**Twins preferential treatment: behavioral anomaly or cost-benefit calculus?**

In the first setting, *twins preferential treatment* is viewed through the lens of behavioral economics. Unlike other parental discrimination strategies based on children’ endowments and prospects, the *twins preferential treatment* as it survives to rationale competing explanations, might appear as a *behavioral anomaly* (Thaler, 1988) which is not yet well explained (Burnham, 2013). As it relates *twins preferential treatment* to magicoreligious beliefs rooted in African Traditional Religion, this paper steps beyond the simple explanation of customs and social norms. Yet, in an economic determinism perspective, it is arguable that the twins belief itself stems from lack of knowledge on human reproduction and that the related social norms and customs which are useful in relatively stationary societies, would have disappeared or at least faded with dynamic growth and modernization (Stigler

---

21 “An empirical result qualifies as an anomaly, if it is difficult to ‘rationalize,’ or if implausible assumptions are necessary to explain it within the paradigm.”
and Becker, 1974). However, I do not find evidence of a reduced *twins preferential treatment* with either urbanization or education (as reported inCols. V and VI of Table 9) ; hence providing support to the behavioral interpretation.

According to Becker (2013), all human behavior can be scrutinized using an economic approach which he describes as a valuable unified framework enriched with non-economic variables and inputs from other fields and disciplines. In this approach, irrationality, values, customs and social norms are seen as ‘tempting but useless explanations’ to human behavior as they actually reflect little grasp of the *pleasure-pain calculus* (in other words a cost-benefit analysis) which govern all human actions, thoughts and behavior. Applied to twins, the economic approach might imply that parents and extended family give preferential treatment to twins: *(i)* to secure and maximize rewards in the form of luck/good fortune and/or *(ii)* to deal with loss aversion given uncertainty of the good fortune to actually materialize, and the *punishment* that might arise from twins not being well treated. The fact that lesser uptake of children preventive health care among mothers that are voodoo adherent (Stoop et al, 2017) does not apply to twins (see Col. II of Table 9) seems consistent with the economic approach interpretation. As Stoop et al (2017) explain their findings by stronger reliance on traditional medicine, my results suggest that when it comes to twins, modern medicine might be used as a complement to traditional medicine by mothers that are voodoo adherent. Twins death caused by seemingly parental neglect or insufficient care would indeed mean curse and anger from deities, and that fear is likely stronger among mothers that are voodoo adherent.

Overall, as one or the other interpretation of the *twins preferential treatment* could not be completely ruled out, it is likely that they are both (at least partly) at play, further promoting the idea that parents’ decisions are based on various and complex stakes (Li et al., 2010). Yet, the important question of the origin of twins beliefs is left unanswered in the above explanation/interpretation of *twins preferential treatment*. In that respect, some hints can be derived
from anthropological studies on materialistic explanations to twins infanticide which is at the extreme opposite of twins veneration. For instance, using pre-industrial ethnographic data, Granzberg (1973) suggested that twins infanticide is found in societies where mothers have heavy workload and minimal amount of help. Some other explanations are that of population control (Daly and Wilson, 1984) and low-viability of twins (Ball and Hill, 1996). However, none of these studies is causal and there is still a way to go with understanding the origin of twins veneration/infanticide using the economic approach of human behavior. Also, the persistence of these beliefs among more educated and urbanized populations, calls for an in-depth exploration of which specific social or rent-seeking purpose they still serve (Leeson, 2017).

8. Conclusion

The central point of this paper was to stress the importance of magicoreligious beliefs as a determinant of parental investment in children human capital and of early childhood inequalities, in the context of developing countries. As a telling example, it investigated the impact of magicoreligious beliefs related to twins, on children full immunization which is used as a proxy for parental investment in children health.

Based on an econometrical analysis enriched with some qualitative insights, and using four DHS rounds from Benin, I found a twins preferential treatment in parental investment in children health. I also identified family support as the most plausible mechanism behind my results. In speculating on the motives for the twins preferential treatment, I contrast an interpretation based on beliefs which fits in behavioral economics with a neo-classical cost-benefit calculus in the spirit of Becker (2013)’s economic approach of human behavior.

Although this paper features a case of magicoreligious belief with a positive impact on children health, other beliefs (e.g. beliefs related to children born to women who died during or short after
delivery and to children with birth defects) might actually be harmful, and in some extreme cases be life-threatening for children.

To the best of my knowledge, this paper is the first to explicitly link magicoreligious beliefs to parental investment in children human capital and to intra households resource allocation. As such, it aims to be a complement to the mainstream economic literature on these topics. It also comes with some policy implications in combating children preventable diseases: (i) more attention should be paid to beliefs systems and their impact on parental investment in children health and (ii) policy implementation might include ad hoc mechanisms (e.g. manipulation of beliefs systems) uptake of preventive health care measures in Sub Saharan Africa. Yet, the twins preferential treatment discussed in this paper needs to be further analysed, for instance using detailed consumption data.
References


## Tables

**Table 1. Sample means and proportions of key variables**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Mean/Proportion</th>
<th>St.Dev</th>
<th>Child is Twin (I)</th>
<th>Child is singleton (II)</th>
<th>Difference (I)-(II)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child is fully immunized</td>
<td>44.08</td>
<td>-</td>
<td>52.11</td>
<td>43.73</td>
<td>8.38***</td>
</tr>
<tr>
<td>Child is twin</td>
<td>4.18</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Child's age</td>
<td>34.30</td>
<td>13.79</td>
<td>34.30</td>
<td>34.35</td>
<td>0.05</td>
</tr>
<tr>
<td>Child is female</td>
<td>49.28</td>
<td>-</td>
<td>49.22</td>
<td>50.42</td>
<td>1.20</td>
</tr>
<tr>
<td>Mother's age</td>
<td>29.61</td>
<td>6.48</td>
<td>31.14</td>
<td>29.54</td>
<td>1.60***</td>
</tr>
<tr>
<td>Mother's education</td>
<td>1.35</td>
<td>2.90</td>
<td>1.37</td>
<td>1.35</td>
<td>0.02</td>
</tr>
<tr>
<td>Residence area (lives in rural area)</td>
<td>65.15</td>
<td>-</td>
<td>68.13</td>
<td>65.02</td>
<td>3.11**</td>
</tr>
<tr>
<td>Household’s wealth quintile</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poorest</td>
<td>23.82</td>
<td>-</td>
<td>21.18</td>
<td>23.93</td>
<td>-2.75**</td>
</tr>
<tr>
<td>Poorer</td>
<td>21.35</td>
<td>-</td>
<td>22.49</td>
<td>21.30</td>
<td>1.19</td>
</tr>
<tr>
<td>Average</td>
<td>20.97</td>
<td>-</td>
<td>21.18</td>
<td>20.96</td>
<td>0.22</td>
</tr>
<tr>
<td>Richest</td>
<td>18.98</td>
<td>-</td>
<td>19.68</td>
<td>18.95</td>
<td>0.73</td>
</tr>
<tr>
<td>Richestest</td>
<td>14.88</td>
<td>-</td>
<td>15.46</td>
<td>14.86</td>
<td>0.60</td>
</tr>
</tbody>
</table>

**Number of observations**  
- 25,553  
- 1,067  
- 24,486

*Source: Authors, based on data from 4 DHS rounds collected throughout the period 1996-2012 in Benin.*
<table>
<thead>
<tr>
<th>Child is twin</th>
<th>(I)</th>
<th>(II)</th>
<th>(III)</th>
<th>(IV)</th>
<th>(V)</th>
<th>(VI)</th>
<th>(VII)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.081***</td>
<td>0.081*</td>
<td>0.080***</td>
<td>0.454***</td>
<td>0.068***</td>
<td>0.066**</td>
<td>0.083**</td>
</tr>
<tr>
<td>(0.020)</td>
<td>(0.035)</td>
<td>(0.053)</td>
<td>(0.133)</td>
<td>(0.020)</td>
<td>(0.032)</td>
<td>(0.037)</td>
<td></td>
</tr>
</tbody>
</table>

Control variables as in Eq. YES YES YES YES YES YES YES
Baseline specification YES YES YES YES YES YES YES
Baseline specification Clustered at region level YES YES YES YES YES YES YES
Marginal effect from a probit specification YES YES YES YES YES YES YES

Truncated regression¶ YES YES YES YES YES YES YES
With DHS-cluster FE YES YES YES YES YES YES YES
With Household FE YES YES YES YES YES YES YES
With Household FE + additional controls variables YES YES YES YES YES YES YES

Control variables as in Eq.1 YES YES YES YES YES YES YES
Clusters 1,944 6 1,944 1,944 1,944 1,944 1,935
Observations 25,553 25,553 25,553 25,553 25,553 25,553 21,957
R-squared 0.074 0.074 0.057 0.261 0.660 0.691
Adj. R-squared 0.074 0.074 0.057 0.198 0.270 0.292

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

Note.— The sample includes under five years old children. Control variables include child level characteristics (sex, age in months and birth order); mother level characteristics (age, education, religion and ethnicity), household-level characteristics (urban/rural residence, wealth quintile), and indicator variables for the administrative region of residence of the household and for the year in which the DHS survey took place. Additional controls comprise the number of under five years children living in the household, mother’s height, her age at first birth, her number of children who have died, a dummy variable capturing whether these children died before their first birthday, father’s age and his education, and access to a nurse, to a doctor and to prenatal health care in the DHS-cluster of residence. Robust standard errors are clustered at the DHS-cluster level and reported in parentheses. ¶ 10,534 observations truncated.
### Table 3. Twins preferential treatment using data from Benin, Nigeria, Ghana and Togo

<table>
<thead>
<tr>
<th></th>
<th>DEPENDENT VARIABLE: FULL IMMUNIZATION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(I)</td>
</tr>
<tr>
<td>Child is twin</td>
<td>0.060***</td>
</tr>
<tr>
<td></td>
<td>(0.011)</td>
</tr>
<tr>
<td>DHS-cluster FE</td>
<td>NO</td>
</tr>
<tr>
<td>Household FE</td>
<td>NO</td>
</tr>
<tr>
<td>Control variables as in Eq.1</td>
<td>YES</td>
</tr>
<tr>
<td>Clusters</td>
<td>6,331</td>
</tr>
<tr>
<td>Observations</td>
<td>80,984</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.219</td>
</tr>
<tr>
<td>Adj. R-squared</td>
<td>0.219</td>
</tr>
</tbody>
</table>

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

Note.— The sample includes under five years old children. Robust standard errors are clustered at the DHS-cluster level and reported in parentheses.

### Table 4. Falsification test: Twins adverse treatment in Vatovavy-Fitovinany region in Madagascar

<table>
<thead>
<tr>
<th></th>
<th>DEPENDENT VARIABLE: FULL IMMUNIZATION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(I)</td>
</tr>
<tr>
<td>Child is twin</td>
<td>0.016</td>
</tr>
<tr>
<td></td>
<td>(0.038)</td>
</tr>
<tr>
<td>DHS-cluster FE</td>
<td>NO</td>
</tr>
<tr>
<td>Household FE</td>
<td>NO</td>
</tr>
<tr>
<td>Control variables as in Eq.1</td>
<td>YES</td>
</tr>
<tr>
<td>Clusters</td>
<td>1,155</td>
</tr>
<tr>
<td>Observations</td>
<td>14,972</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.197</td>
</tr>
<tr>
<td>Adj. R-squared</td>
<td>0.197</td>
</tr>
</tbody>
</table>

**PANEL A: FULL SAMPLE**

**PANEL B: ONLY VATOVAVY-FITOVINANY REGION**

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Child is twin</td>
<td>-0.514***</td>
<td>-0.449***</td>
</tr>
<tr>
<td></td>
<td>(0.125)</td>
<td>(0.148)</td>
</tr>
<tr>
<td>DHS-cluster FE</td>
<td>NO</td>
<td>YES</td>
</tr>
<tr>
<td>Household FE</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>Control variables as in Eq.1</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Clusters</td>
<td>51</td>
<td>51</td>
</tr>
<tr>
<td>Observations</td>
<td>667</td>
<td>667</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.270</td>
<td>0.420</td>
</tr>
<tr>
<td>Adj. R-squared</td>
<td>0.270</td>
<td>0.290</td>
</tr>
</tbody>
</table>

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

Note.— The sample includes under five years old children from Madagascar (DHS rounds 1997, 2003-2004 and 2008-2009). Mother’s ethnicity is not included in the controls as it is missing in the data and is not included in the controls in Panel B. I report estimates for the Vatovavy-Fitovinany region where twins are considered as a curse. Robust standard errors are clustered at the DHS-cluster level and reported in parentheses.
### Table 5. Falsification test: Absence of twins differential treatment in Senegal

<table>
<thead>
<tr>
<th>DEPENDENT VARIABLE : FULL IMMUNIZATION</th>
<th>(I)</th>
<th>(II)</th>
<th>(III)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PANEL A: FULL SAMPLE</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child is twin</td>
<td>0.038*</td>
<td>0.037*</td>
<td>0.046*</td>
</tr>
<tr>
<td>(0.021)</td>
<td>(0.021)</td>
<td>(0.025)</td>
<td></td>
</tr>
<tr>
<td>DHS-cluster FE</td>
<td>NO</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>Household FE</td>
<td>NO</td>
<td>NO</td>
<td>YES</td>
</tr>
<tr>
<td>Control variables as in Eq.1</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Clusters</td>
<td>1,088</td>
<td>1,088</td>
<td>1,088</td>
</tr>
<tr>
<td>Observations</td>
<td>27,193</td>
<td>27,193</td>
<td>27,193</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.273</td>
<td>0.359</td>
<td>0.549</td>
</tr>
<tr>
<td>Adj. R-squared</td>
<td>0.273</td>
<td>0.330</td>
<td>0.338</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>PANEL B: ETHNIC GROUPS WITHOUT REFERENCE TO TWINS</strong></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Child is twin</td>
<td>0.012</td>
<td>0.003</td>
<td>0.016</td>
</tr>
<tr>
<td>(0.024)</td>
<td>(0.023)</td>
<td>(0.031)</td>
<td></td>
</tr>
<tr>
<td>DHS-cluster FE</td>
<td>NO</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>Household FE</td>
<td>NO</td>
<td>NO</td>
<td>YES</td>
</tr>
<tr>
<td>Control variables as in Eq.1</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Clusters</td>
<td>1,037</td>
<td>1,037</td>
<td>1,037</td>
</tr>
<tr>
<td>Observations</td>
<td>21,465</td>
<td>21,465</td>
<td>21,465</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.268</td>
<td>0.364</td>
<td>0.579</td>
</tr>
<tr>
<td>Adj. R-squared</td>
<td>0.268</td>
<td>0.329</td>
<td>0.350</td>
</tr>
</tbody>
</table>

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

Note.— The sample includes under five years old children from Senegal (DHS rounds 1997, 2005, 2010-2011 and 2012-2013). In Panel B, I exclude ethnicities for which a twin preferential treatment is documented (namely Mandingue, Dioula and Soninke). Robust standard errors are clustered at the DHS-cluster level and reported in parentheses.
Table 6: Probability of twinning

<table>
<thead>
<tr>
<th>PROBABILITY OF TWINNING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mother age</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Mother age squared</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Mother education</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Mother education squared</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Mother is voodoo adherent</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Mother height</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Mother weight</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Infant death</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Number of dead children</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Access to prenatal health care</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Access to a nurse</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Access to a doctor</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Clusters</td>
</tr>
<tr>
<td>Observations</td>
</tr>
<tr>
<td>R-squared</td>
</tr>
<tr>
<td>Adj. R-squared</td>
</tr>
</tbody>
</table>

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

Note.— The sample includes mothers of under five years old children. Control variables include mother’s religion and ethnicity, household-level characteristics (urban/rural residence, wealth quintile) and indicator variables for the administrative region of residence of the household and for the year in which the DHS survey took place. We additionally control for the year in which the birth occurred. Robust standard errors are clustered at the mother-level and reported in parentheses.
### Table 7. Competing explanations: birth size and birth spacing.

<table>
<thead>
<tr>
<th></th>
<th>(I)</th>
<th>(II)</th>
<th>(III)</th>
<th>(IV)</th>
<th>(V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child is twin</td>
<td>0.074***</td>
<td>0.074***</td>
<td>0.091***</td>
<td>0.091***</td>
<td>0.073***</td>
</tr>
<tr>
<td>(0.021)</td>
<td>(0.022)</td>
<td>(0.022)</td>
<td>(0.022)</td>
<td>(0.032)</td>
<td></td>
</tr>
<tr>
<td>Birth size (Very large)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Larger than average</td>
<td>-0.005</td>
<td>-0.004</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(0.016)</td>
<td>(0.016)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average</td>
<td>0.001</td>
<td>0.002</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(0.015)</td>
<td>(0.015)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smaller than average</td>
<td>0.011</td>
<td>0.013</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(0.018)</td>
<td>(0.018)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Very small</td>
<td>-0.045*</td>
<td>-0.045*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(0.027)</td>
<td>(0.027)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preceding birth interval</td>
<td></td>
<td></td>
<td>0.001***</td>
<td>0.001***</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.000)</td>
<td>(0.000)</td>
<td></td>
</tr>
</tbody>
</table>

**DHS-cluster FE:** YES YES YES YES YES

**Controls as in Eq.1:** YES YES YES YES YES

**Clusters:** 1,934 1,934 1,934 1,934 1,524

**Observations:** 19,714 19,714 19,714 19,714 4,984

**R-squared:** 0.285 0.285 0.286 0.286 0.517

**Adj. R-squared:** 0.204 0.204 0.205 0.205 0.285

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

Note.— The sample includes under five years old children for which birth size and preceding birth interval are available, except in Col. (V) where the initial is restricted to twins and singleton children of small (and very small) birth size. Robust standard errors are clustered at the DHS-cluster level and reported in parentheses.

### Table 8. Competing explanation: health shocks.

<table>
<thead>
<tr>
<th></th>
<th>(I)</th>
<th>(II)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child is twin</td>
<td>0.063***</td>
<td>0.064***</td>
</tr>
<tr>
<td>(0.021)</td>
<td>(0.021)</td>
<td></td>
</tr>
<tr>
<td>Health shock</td>
<td>0.009</td>
<td></td>
</tr>
<tr>
<td>(0.008)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**DHS-cluster FE:** YES

**Controls as in Eq.1:** YES

**Clusters:** 1,944 1,944

**Observations:** 25,063 25,063

**R-squared:** 0.264 0.264

**Adj. R-squared:** 0.199 0.199

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

Note.— The sample includes under five years old children for which information on health shocks is available. Robust standard errors are clustered at the DHS-cluster level and reported in parentheses.
### Table 9. Heterogeneity in the twins preferential treatment

<table>
<thead>
<tr>
<th></th>
<th>(I)</th>
<th>(II)</th>
<th>(III)</th>
<th>(IV)</th>
<th>(V)</th>
<th>(VI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child is twin</td>
<td>0.084***</td>
<td>0.059***</td>
<td>0.081**</td>
<td>0.063**</td>
<td>0.073*</td>
<td>0.076***</td>
</tr>
<tr>
<td></td>
<td>(0.024)</td>
<td>(0.022)</td>
<td>(0.039)</td>
<td>(0.025)</td>
<td>(0.038)</td>
<td>(0.023)</td>
</tr>
<tr>
<td>Child is twin * Child is Female</td>
<td>-0.032</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.030)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child is twin * Mother is voodoo adherent</td>
<td></td>
<td>0.042</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.053)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child is twin * Mother is of voodoo ethnicity</td>
<td>-0.015</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.046)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child is twin * Child lives in richer household</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.016</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(0.042)</td>
<td></td>
</tr>
<tr>
<td>Child is twin * Child lives in rural household</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-0.008</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(0.045)</td>
<td></td>
</tr>
<tr>
<td>Child is twin * Mother education</td>
<td></td>
<td>-0.006</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.007)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DHS-cluster FE</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Controls as in Eq.1</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Clusters</td>
<td>1,944</td>
<td>1,944</td>
<td>1,944</td>
<td>1,944</td>
<td>1,944</td>
<td>1,944</td>
</tr>
<tr>
<td>Observations</td>
<td>25,553</td>
<td>25,553</td>
<td>25,553</td>
<td>25,553</td>
<td>25,553</td>
<td>25,553</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.261</td>
<td>0.261</td>
<td>0.259</td>
<td>0.260</td>
<td>0.261</td>
<td>0.261</td>
</tr>
<tr>
<td>Adj. R-squared</td>
<td>0.197</td>
<td>0.197</td>
<td>0.195</td>
<td>0.196</td>
<td>0.198</td>
<td>0.198</td>
</tr>
</tbody>
</table>

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

Note.— The sample includes under five years old children. In Col. III, we consider 4th and the 5th asset ownership quintiles as richer households. Robust standard errors are clustered at the DHS-cluster level and reported in parentheses.

### Table 10. Mechanism: family support ?

<table>
<thead>
<tr>
<th></th>
<th>(I)</th>
<th>(II)</th>
<th>(III)</th>
<th>(IV)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child is twin</td>
<td>0.080***</td>
<td>0.077***</td>
<td>0.069**</td>
<td>0.063**</td>
</tr>
<tr>
<td></td>
<td>(0.022)</td>
<td>(0.023)</td>
<td>(0.028)</td>
<td>(0.028)</td>
</tr>
<tr>
<td>Number of adults in the household</td>
<td>-0.001</td>
<td>-0.002</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.003)</td>
<td>(0.004)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DHS-cluster FE</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Controls as in Eq.1</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Clusters</td>
<td>1,915</td>
<td>1,738</td>
<td>1,476</td>
<td>1,353</td>
</tr>
<tr>
<td>Observations</td>
<td>20,083</td>
<td>19,244</td>
<td>13,697</td>
<td>13,105</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.287</td>
<td>0.281</td>
<td>0.298</td>
<td>0.292</td>
</tr>
<tr>
<td>Adj. R-squared</td>
<td>0.209</td>
<td>0.206</td>
<td>0.208</td>
<td>0.205</td>
</tr>
</tbody>
</table>

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

Note.— The sample includes under five years old children. Cols. (II) and (IV) include the number of adults living in the household at the difference of Cols. (I) and (III). In Cols. (III) and (IV) the sample is restricted to children from non-richer households (which are 1st to 3rd asset ownership quintiles). Robust standard errors are clustered at the DHS-cluster level and reported in parentheses.
## Table A1. Sample means and proportions of control variables

<table>
<thead>
<tr>
<th>Variables</th>
<th>Mean/Proportion</th>
<th>St.Dev</th>
<th>Child is Twin (I)</th>
<th>Child is singleton (II)</th>
<th>Difference (I)-(II)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mother’s height (cm)</td>
<td>159.12</td>
<td>6.83</td>
<td>159.53</td>
<td>159.10</td>
<td>0.43**</td>
</tr>
<tr>
<td>Mother’s BMI</td>
<td>22.67</td>
<td>3.95</td>
<td>22.92</td>
<td>22.67</td>
<td>0.25**</td>
</tr>
<tr>
<td>Mother’s age at first birth</td>
<td>19.46</td>
<td>3.91</td>
<td>19.57</td>
<td>19.46</td>
<td>0.11</td>
</tr>
<tr>
<td>Mother is of voodoo ethnicity</td>
<td>65.86</td>
<td>-</td>
<td>76.76</td>
<td>65.38</td>
<td>11.38***</td>
</tr>
<tr>
<td>Mother dead children</td>
<td>0.24</td>
<td>0.94</td>
<td>0.22</td>
<td>0.34</td>
<td>0.02</td>
</tr>
<tr>
<td>Infant death</td>
<td>5.22</td>
<td>-</td>
<td>17.90</td>
<td>4.67</td>
<td>13.23***</td>
</tr>
<tr>
<td>Mother’s religion</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ATR</td>
<td>18.96</td>
<td>-</td>
<td>20.52</td>
<td>18.89</td>
<td>1.63</td>
</tr>
<tr>
<td>Christian</td>
<td>47.45</td>
<td>-</td>
<td>51.08</td>
<td>47.30</td>
<td>3.78**</td>
</tr>
<tr>
<td>Islam</td>
<td>24.96</td>
<td>-</td>
<td>20.71</td>
<td>25.15</td>
<td>-4.44***</td>
</tr>
<tr>
<td>Others</td>
<td>1.67</td>
<td>-</td>
<td>1.41</td>
<td>1.68</td>
<td>-0.27</td>
</tr>
<tr>
<td>No religion</td>
<td>6.95</td>
<td>-</td>
<td>6.28</td>
<td>6.98</td>
<td>-0.70</td>
</tr>
<tr>
<td>Mother is currently working</td>
<td>80.58</td>
<td>0.21</td>
<td>82.53</td>
<td>80.47</td>
<td>2.06**</td>
</tr>
<tr>
<td>Access to prenatal health care</td>
<td>0.87</td>
<td>0.21</td>
<td>0.90</td>
<td>0.87</td>
<td>0.03***</td>
</tr>
<tr>
<td>Access to a doctor</td>
<td>0.06</td>
<td>0.13</td>
<td>0.07</td>
<td>0.06</td>
<td>0.01***</td>
</tr>
<tr>
<td>Access to a nurse</td>
<td>0.79</td>
<td>0.24</td>
<td>0.83</td>
<td>0.79</td>
<td>0.04***</td>
</tr>
<tr>
<td>Number of under five years children in the household</td>
<td>2.25</td>
<td>1.33</td>
<td>2.87</td>
<td>2.22</td>
<td>0.65***</td>
</tr>
<tr>
<td>Father’s age</td>
<td>37.90</td>
<td>9.75</td>
<td>39.83</td>
<td>37.82</td>
<td>2.01***</td>
</tr>
<tr>
<td>Father’s education</td>
<td>2.86</td>
<td>4.30</td>
<td>2.99</td>
<td>2.85</td>
<td>0.14</td>
</tr>
<tr>
<td>Number of adults living in the household</td>
<td>2.75</td>
<td>1.51</td>
<td>2.69</td>
<td>2.76</td>
<td>0.07</td>
</tr>
<tr>
<td>Child’s birth size</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Very small</td>
<td>3.11</td>
<td>-</td>
<td>6.56</td>
<td>2.86</td>
<td>3.70***</td>
</tr>
<tr>
<td>Smaller than average</td>
<td>10.85</td>
<td>-</td>
<td>22.40</td>
<td>10.90</td>
<td>12.40***</td>
</tr>
<tr>
<td>Average</td>
<td>56.56</td>
<td>-</td>
<td>55.76</td>
<td>54.78</td>
<td>0.98</td>
</tr>
<tr>
<td>Larger than average</td>
<td>21.31</td>
<td>-</td>
<td>10.40</td>
<td>21.10</td>
<td>-10.60</td>
</tr>
<tr>
<td>Very large</td>
<td>8.16</td>
<td>-</td>
<td>3.00</td>
<td>8.13</td>
<td>-5.13***</td>
</tr>
<tr>
<td>Preceding birth space</td>
<td>36.54</td>
<td>17.59</td>
<td>16.74</td>
<td>37.58</td>
<td>20.83***</td>
</tr>
<tr>
<td>Child has suffer a health shock</td>
<td>33.92</td>
<td>-</td>
<td>33.11</td>
<td>33.95</td>
<td>0.84</td>
</tr>
</tbody>
</table>

**Number of observations**: 25,553, 1,067, 24,486

*Source: Authors, based on data from 4 DHS rounds collected throughout the period 1996-2012 in Benin.*
Table A2: Twins preferential treatment in other dimension of children health (use of bednet, child’s BMI, likelihood for a child to be taken to modern medicine facility following cough/fever and diarrhea)

<table>
<thead>
<tr>
<th>ESTIMATE OF TWIN PREFERENTIAL TREATMENT</th>
<th>(I)</th>
<th>(II)</th>
<th>(III)</th>
<th>(IV)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>USE OF BEDNET</td>
<td>BMI</td>
<td>MODERN MEDECINE FACILITY FOR COUGH/FEVER</td>
<td>MODERN MEDECINE FACILITY FOR DIARRHEA</td>
</tr>
<tr>
<td>Baseline specification, no FE</td>
<td>0.010</td>
<td>-0.273***</td>
<td>0.064**</td>
<td>-0.009</td>
</tr>
<tr>
<td></td>
<td>(0.016)</td>
<td>(0.082)</td>
<td>(0.032)</td>
<td>(0.048)</td>
</tr>
<tr>
<td>With DHS-cluster FE</td>
<td>-0.004</td>
<td>-0.307***</td>
<td>0.053</td>
<td>-0.001</td>
</tr>
<tr>
<td></td>
<td>(0.016)</td>
<td>(0.082)</td>
<td>(0.036)</td>
<td>(0.061)</td>
</tr>
<tr>
<td>With Household FE</td>
<td>0.010</td>
<td>-0.190</td>
<td>0.070</td>
<td>-0.052</td>
</tr>
<tr>
<td></td>
<td>(0.027)</td>
<td>(0.124)</td>
<td>(0.084)</td>
<td>(0.176)</td>
</tr>
<tr>
<td>Clusters</td>
<td>1,942</td>
<td>1,489</td>
<td>1,642</td>
<td>1,272</td>
</tr>
<tr>
<td>Observations</td>
<td>22,286</td>
<td>18,551</td>
<td>8,393</td>
<td>3,464</td>
</tr>
</tbody>
</table>

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

Note.— The sample include mothers of under five years old children in Col. (I), under five years old children in Col. (II) and under five years old children who have suffered from cough/fever or diarrhea respectively in Cols. (III) and (IV). Robust standard errors are clustered at the DHS-cluster level and reported in parentheses.

Table A3. Summary of other competing explanations using household fixed effects: low birth size and birth spacing

<table>
<thead>
<tr>
<th>DEPENDENT VARIABLE : FULL IMMUNIZATION</th>
<th>(I)</th>
<th>(II)</th>
<th>(III)</th>
<th>(IV)</th>
<th>(V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child is twin</td>
<td>0.062*</td>
<td>0.063*</td>
<td>0.069*</td>
<td>0.071*</td>
<td>0.047</td>
</tr>
<tr>
<td></td>
<td>(0.036)</td>
<td>(0.036)</td>
<td>(0.037)</td>
<td>(0.037)</td>
<td>(0.082)</td>
</tr>
<tr>
<td>Birth size (Very large)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Larger than average</td>
<td>0.007</td>
<td>0.008</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.029)</td>
<td>(0.029)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average</td>
<td>0.012</td>
<td>0.013</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.027)</td>
<td>(0.027)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smaller than average</td>
<td>0.012</td>
<td>0.013</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.033)</td>
<td>(0.033)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Very small</td>
<td>-0.044</td>
<td>-0.044</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.045)</td>
<td>(0.045)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preceding birth interval</td>
<td>0.000</td>
<td>0.000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td>(0.000)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Household FE</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Controls as in Eq.1</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Clusters</td>
<td>1,934</td>
<td>1,934</td>
<td>1,934</td>
<td>1,934</td>
<td>1,524</td>
</tr>
<tr>
<td>Observations</td>
<td>19,714</td>
<td>19,714</td>
<td>19,714</td>
<td>19,714</td>
<td>4,984</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.707</td>
<td>0.707</td>
<td>0.707</td>
<td>0.707</td>
<td>0.905</td>
</tr>
<tr>
<td>Adj. R-squared</td>
<td>0.291</td>
<td>0.291</td>
<td>0.291</td>
<td>0.291</td>
<td>0.596</td>
</tr>
</tbody>
</table>

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

Note.— The sample includes under five years old children for which birth size and preceding birth interval are available, except in in Col. (V) where the initial sample is restricted to twins and singleton children of small (and very small) birth size. Robust standard errors are clustered at the DHS-cluster level and reported in parentheses.
### Table A4. Competing explanation: health shocks.

<table>
<thead>
<tr>
<th></th>
<th>(I)</th>
<th>(II)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child is twin</td>
<td>0.060*</td>
<td>0.060*</td>
</tr>
<tr>
<td></td>
<td>(0.032)</td>
<td>(0.032)</td>
</tr>
<tr>
<td>Health shock</td>
<td>-0.005</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.013)</td>
<td></td>
</tr>
<tr>
<td>Household FE</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Controls as in Eq.1</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Clusters</td>
<td>1,944</td>
<td>1,944</td>
</tr>
<tr>
<td>Observations</td>
<td>25,063</td>
<td>25,063</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.664</td>
<td>0.664</td>
</tr>
<tr>
<td>Adj. R-squared</td>
<td>0.199</td>
<td>0.199</td>
</tr>
</tbody>
</table>

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

Note.—— The sample include under five years old children for which information on health shocks is available. Robust standard errors are clustered at the DHS-cluster level and reported in parentheses.

### Table A5. Mechanism: resource diversion from singletons children?

<table>
<thead>
<tr>
<th></th>
<th>(I)</th>
<th>(II)</th>
<th>(III)</th>
<th>(IV)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Singleton raised with a twin</td>
<td>-0.006</td>
<td>-0.001</td>
<td>-0.036</td>
<td>-0.030</td>
</tr>
<tr>
<td></td>
<td>(0.026)</td>
<td>(0.026)</td>
<td>(0.031)</td>
<td>(0.031)</td>
</tr>
<tr>
<td>Number of under five years children in the household</td>
<td>-0.007**</td>
<td></td>
<td>-0.009**</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.003)</td>
<td></td>
<td>(0.004)</td>
<td></td>
</tr>
<tr>
<td>DHS-cluster FE</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Controls as in Eq.1</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Clusters</td>
<td>1,944</td>
<td>1,944</td>
<td>1,524</td>
<td>1,524</td>
</tr>
<tr>
<td>Observations</td>
<td>24,486</td>
<td>24,486</td>
<td>16,207</td>
<td>16,207</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.262</td>
<td>0.262</td>
<td>0.280</td>
<td>0.280</td>
</tr>
<tr>
<td>Adj. R-squared</td>
<td>0.195</td>
<td>0.195</td>
<td>0.201</td>
<td>0.201</td>
</tr>
</tbody>
</table>

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

Note.—— The sample includes under five years old singletons children. Cols. (II) and (IV) includes the number of under five years children in the household at the difference of Cols. (I) and (III). In Cols. (III) and (IV) the sample is restricted to children from non-richer households (which are 1st to 3rd asset ownership quintiles). Robust standard errors are clustered at the DHS-cluster level and reported in parentheses.
Table A6. Mechanism: increased labor supply?

<table>
<thead>
<tr>
<th></th>
<th>DEPENDENT VARIABLE : WORK STATUS OF THE MOTHER</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(I)</td>
</tr>
<tr>
<td>Mother of twins</td>
<td>-0.003</td>
</tr>
<tr>
<td></td>
<td>(0.007)</td>
</tr>
<tr>
<td>DHS-cluster FE</td>
<td>YES</td>
</tr>
<tr>
<td>Clusters</td>
<td>1,939</td>
</tr>
<tr>
<td>Observations</td>
<td>19,393</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.227</td>
</tr>
<tr>
<td>Adj. R-squared</td>
<td>0.134</td>
</tr>
</tbody>
</table>

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

Note.— The sample includes mothers of under five years singleton children. In Col (II) the sample is restricted to mothers living in non-richer households (which are 1st to 3rd asset ownership quintiles). Robust standard errors are clustered at the DHS-cluster level and reported in parentheses. Control variables include mother's age, education, ethnicity, religion, occupation and household-level characteristics (urban/rural residence, wealth quintile), and indicator variables for the administrative region of residence of the household and for the year in which the DHS survey took place.

Table A7. Mechanism: resource diversion from parents to twins (using mother's body mass index as dependent variable)

<table>
<thead>
<tr>
<th></th>
<th>DEPENDENT VARIABLE : MOTHER BODY MASS INDEX</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(I)</td>
</tr>
<tr>
<td>Mother of twins</td>
<td>-8.626</td>
</tr>
<tr>
<td></td>
<td>(12.868)</td>
</tr>
<tr>
<td>DHS-cluster FE</td>
<td>YES</td>
</tr>
<tr>
<td>Clusters</td>
<td>1,942</td>
</tr>
<tr>
<td>Observations</td>
<td>23,469</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.291</td>
</tr>
<tr>
<td>Adj. R-squared</td>
<td>0.226</td>
</tr>
</tbody>
</table>

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

Note.— The sample includes mothers of under five years singleton children. In Col (II) the sample is restricted to mothers living in non-richer households (which are 1st to 3rd asset ownership quintiles). Robust standard errors are clustered at the DHS-cluster level and reported in parentheses. Control variables include mother’s age, education, ethnicity, religion, occupation and household-level characteristics (urban/rural residence, wealth quintile), and indicator variables for the administrative region of residence of the household and for the year in which the DHS survey took place.