FERTILITY AND THE BOLSA FAMÍLIA PROGRAM: DEMOGRAPHIC DETERMINANTS UNDER CONDITIONAL CASH TRANSFERS IN BRAZIL

by

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FERTILITY AND THE BOLSA FAMÍLIA PROGRAM:

DEMOGRAPHIC IMPLICATIONS OF CONDITIONAL

CASH TRANSFERS IN BRAZIL

Jeffrey O. Nelson, B.Phil

In 2003, the Brazilian government launched the Bolsa Família Program (BFP) to combat severe poverty and inequality. Much literature has explored the effects of the Program on human capital and related indicators (literacy rates, child labor participation, etc). Demographic literature focuses on whether the Program affects fertility, but this literature does not address household fertility decisions of the participants. The purpose of my research is to assess the determinants of fertility among the BFP population. This study uses cross-sectional data from IGBE's 2011 National Household Sample Survey. Via the use of a multiple linear regression methodology it can be predicted that several variables significantly influence the fertility of BFP beneficiaries. Identification of significant variables that influence fertility decisions allows policymakers to focus resources to specific individuals and alter their fertility rates. Should policymakers seek to influence fertility rates (quantity), then, according to the Beckerian model, they also gain the ability to change quality (human capital).

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PREFACE

I would like to use this space to express my sincere gratitude to the faculty and friends that encouraged me to pursue research at an undergraduate level. I express my greatest debt to my advisor and mentor, Fatma El-Hamidi, for her consistent support, patience, and guidance during my Bachelor of Philosophy thesis and in my own personal development. Her positivity and encouragement pushed me to complete this project. Her invaluable advice and knowledge was essential in every step of this thesis, from its inception to its final draft. I would also like to thank my committee members: Marla Ripoll, Barry Ames, and Brian Kovak. Their critiques and suggestions helped strengthen this paper and their professional advice has pushed me to pursue a path of academic research in the future.

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Lastly, I would like to thank my friends and family who supported me throughout the entire thesis process. Their persistent praise and unwavering confidence in me motivate me to complete this project even during the most stressful times.

1.0 INTRODUCTION

Demographers and economists have long studied the relationship between poverty and fertility. On a macro level, modern economic growth is associated with decreased fertility, beginning with high-income countries during the late nineteenth century and followed by low-income countries during the late twentieth century. Despite decreased fertility across the board, empirical observation in the developing world still show that relatively poorer countries generally have higher population growth rates and larger poor households, implying a positive relationship between fertility and poverty both at the national and household levels. Poverty and income are not the only variables that contribute to fertility among the poor. Economic models relating wealth and the production and consumption of time-consuming activities relate changes in economic status to their reproductive choices (Becker 1960, Schultz 2001). Other studies attribute this decline to increased productivity among agricultural sectors (Craig 1990), decreased child mortality rates (Barro and Becker 1989), decreased rates of religiosity (Heaton 2011), and better education for women (Basu 2002) among other variables.

Given the rapid decrease in fertility rates among developing countries in recent decades, scholars have become increasingly interested in discovering the proximate determinants of fertility among the poor (Bongaarts 1978, Bongaarts 1987, Moreno 1991). These studies are generally framed in the context of the demographic transition and their results are contrasted to developed and developing nations. Although several factors contribute to fertility decisions in poor households, perhaps the most important factors include marriage, contraception, abortion, infant mortality, age, income, and education.

As low-income countries have continually grown in recent decades, they are increasingly able to reduce levels of inequality, raise levels of human capital, promote social inclusion and upward mobility, and reduce poverty using government-funded policies. Although the socioeconomic welfare of individuals that receive these regressive transfers is increasing, many of them are still affected by extreme poverty. As developing governments have only implemented significant social welfare policies in recent decades, it may prove useful to study the determinants of fertility among the populations that benefit from such programs. Until now the literature focused on variables that affect fertility on a broad scale but has not explored such variables for specific groups, such as welfare recipients.

This paper studies the determinants of fertility among the population of Bolsa Família Program beneficiaries in Brazil. By drawing on literature that study factors that affect fertility, this paper validates the findings of other studies. It also contributes to the literature by discovering other variables, such as access to technology, which may influence fertility among the welfare receiving population in developing countries. Via Becker's (1961) and Becker and Lewis's (1973) theories on household fertility decisions, this paper provides policymakers a unique perspective of how determinants of fertility can ultimately affect child quality or human capital.

This paper is organized as follows. It first provides a statistical overview of the decrease in fertility rates over the past fifty years and gives several reasons for this trend. Next, it seeks to analyze the proximate determinants of fertility among the poor in developing countries according to the literature. The paper then introduces the Beckerian theory of household fertility decisions, emphasizing the quantity-quality tradeoff and how it applies to fertility decisions among Brazil's poor. An in-depth history and description of the Bolsa Família Program (BFP) follows, with a note on how the program affects fertility. Next the data, methodology, econometric model, hypotheses, and identification strategy of BFP beneficiaries are described in detail. The findings section highlights the significant variables from the regression models and describes the implication of these results in a policy context, with attention to the Beckerian model. It concludes with policy recommendations and suggests avenues for future research.

2.0 FERTILITY

Fertility rates in Brazil have declined at a rapid pace. From 1960 to 2010, total fertility rates (TFR) fell from a high of 6.3 to a current 1.86. Figure (1) shows that fertility declines were fastest in the 1970s and 1980s but have slowed in recent decades. Although fertility is decreasing at a slower rate today, Brazil's fertility rate is now below replacement level. This number is surprisingly low for a developing country and is comparable to rates found in developed countries such as Denmark and Finland. For reference, Argentina's total fertility rate in 2010 was 2.21, Uruguay's was 1.99, Mexico's was 2.32, and the United States' was 2.1 (World Bank). With respect to the pace of decline, Brazil's fertility decreased slightly slower than China and Thailand, but much faster than Mexico, India, and Indonesia (Martine 1996, Muniz 2006).

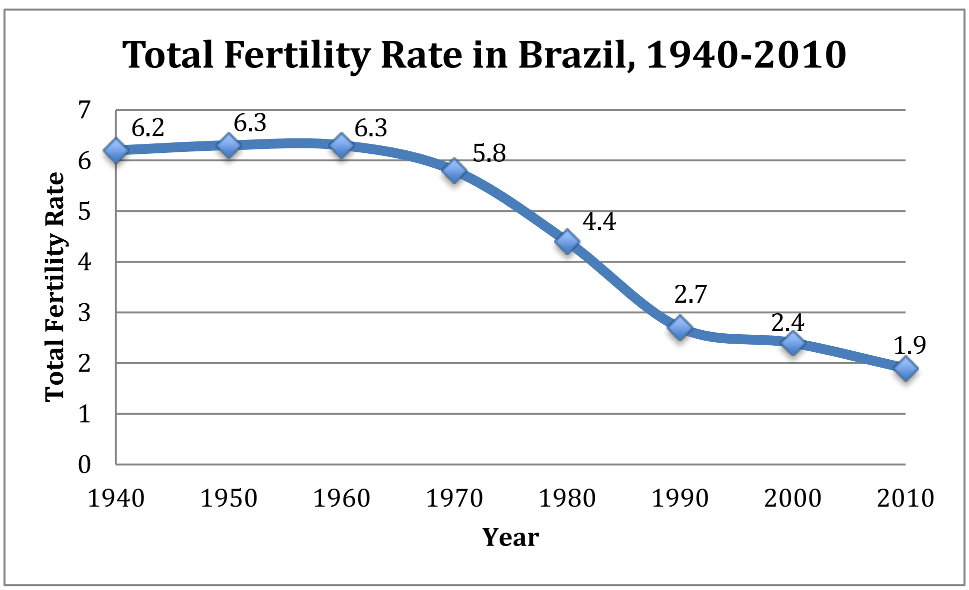

Figure 1. Total Fertility Rate 1940-2010

Source: Instituto Brasileiro de Geografia e Estatística (IBGE), 2010

Despite TFR decreasing throughout all regions and socio-demographic groups in past decades, great interregional variation still exists. The North and Northeast regions have traditionally exhibited the highest TFRs, while the Southeast has shown the lowest. In 2010 the TFR in the North was 2.47, while it was only 1.70 in the Southeast. The literature often attributes this difference to the varied levels of development, different racial composition, religious affiliations, urbanization rates, and industrial opportunity observed between the regions. As figure (2) shows, TFR declined earlier in the South and Southeast due to the relatively early arrival of industry, investment, and modernization. Conversely, the North and Northeast regions boast relatively larger rural populations, higher rates of agricultural production, and lower labor market participation rates. Although the North and Northeastern regions show the highest decrease in TFR during the past decade, historically unequal development rates have not allowed for TFR to converge throughout the country.

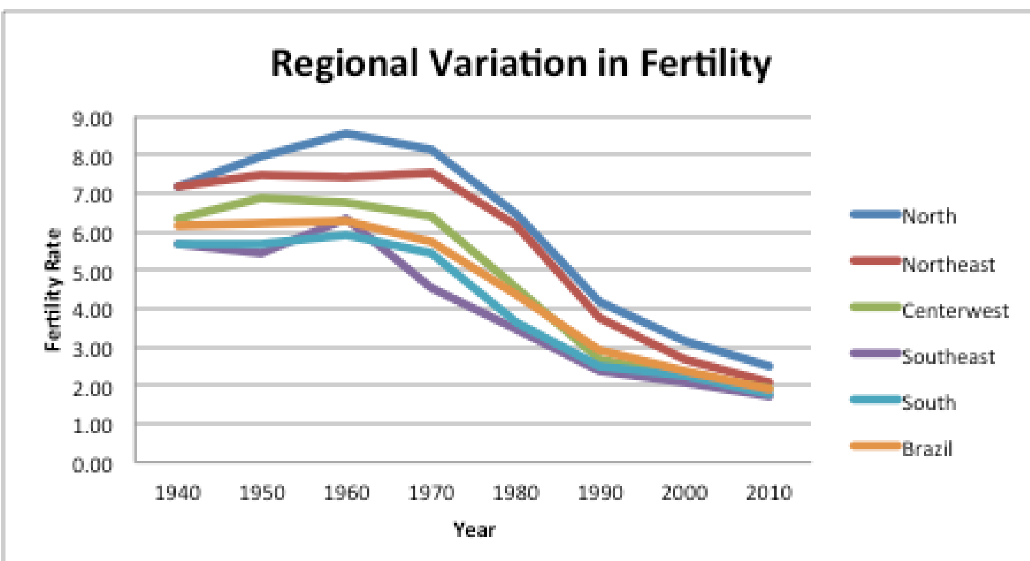

Figure 2. Regional Variation in Fertility

Source: IBGE, 2010

The literature generally observes higher TFR in less developed rural regions, which traditionally have less access to governmental programs (such as healthcare and contraceptives), technology, and are characterized as lower income regions. In Brazil the TFR is significantly higher in rural areas than in urban areas, as shown in figures (3) and (4) below. This holds for all of Brazil's five regions in both 2000 and 2010. It is also worth noting that the TFR has decreased in both rural and urban settings across all regions. Further, this difference is even more significant in the North and Northeast regions.

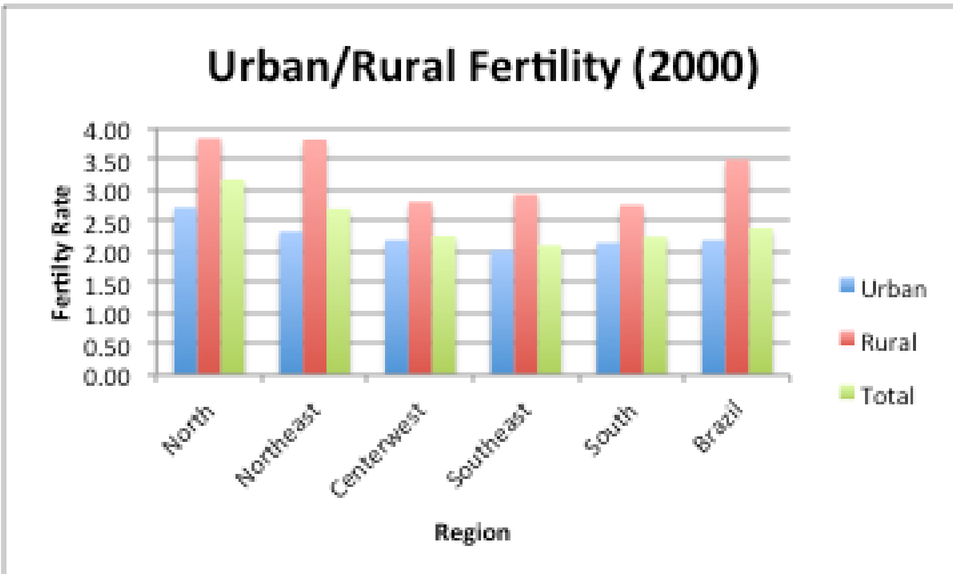

Figure 3. Urban and Rural Fertility (2000)

Source: IBGE, 2010

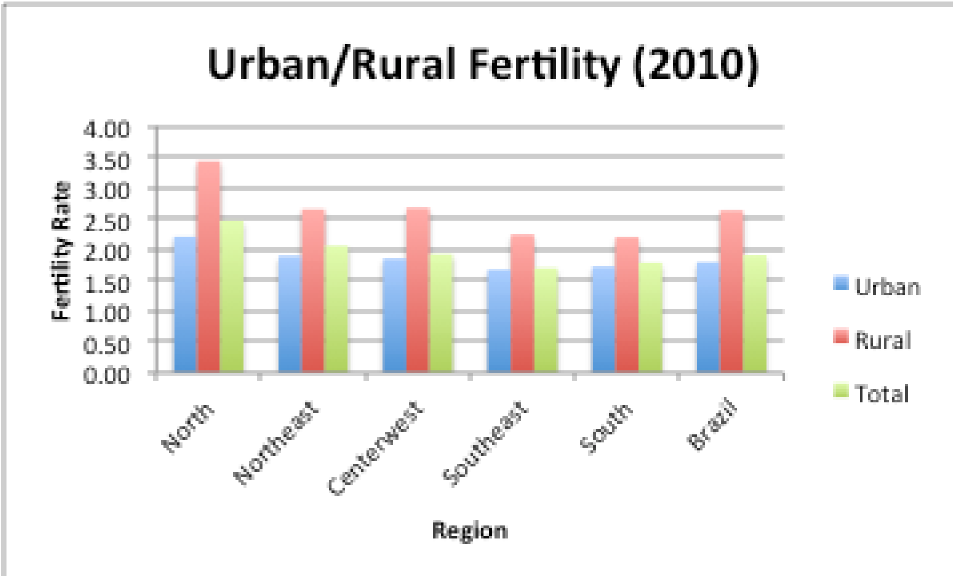

Figure 4. Urban and Rural Fertility (2010)

Source: IBGE, 2010

A further analysis of census data also reveals a difference in the TFR between different racial groups. The population in Brazil is distributed as follows: 46.2% brown, 44.3% white, 8.5% black, .51% indigenous, and .5% yellow. On the aggregate, out of the four races in figures 5 and 6, three decreased their TFR between 2000 and 2010, with the largest decrease found for Black at -24.2%, followed by Brown at -23.0%, and White at -20.5%. Interestingly, the total Indigenous group's TFR was higher than that of all other racial groups and remained constant throughout the decade We must consider this anomaly in this study.

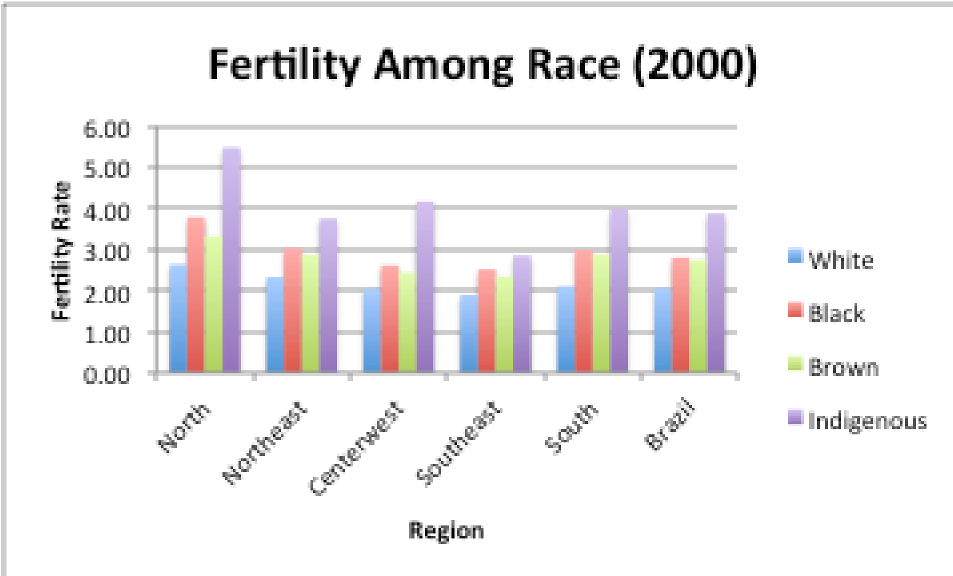

Figure 5. Fertility among Race (2000)

Source: IBGE, 2010

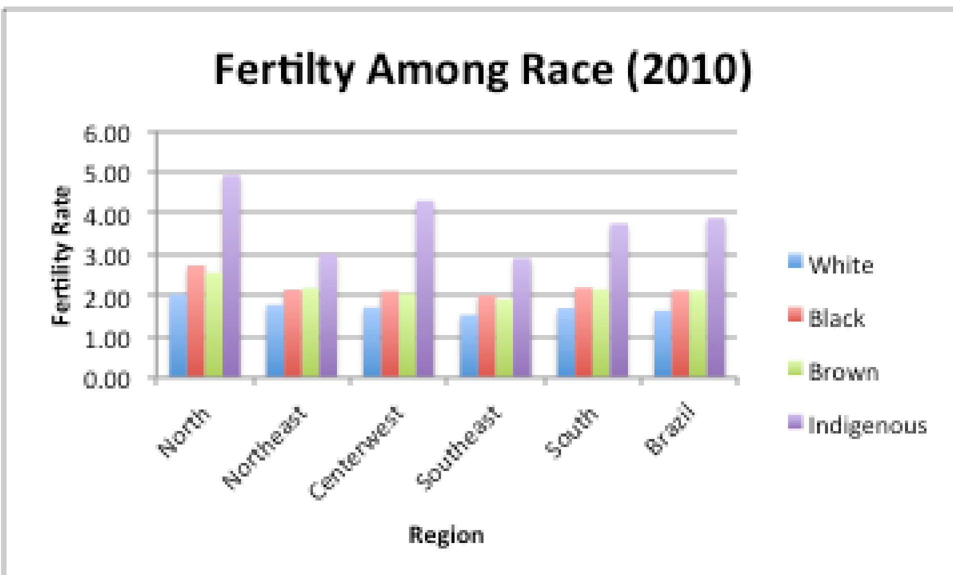

Figure 6. Fertility Among Race (2010)

Source: IBGE, 2010

Mass communication technologies and entertainment are significant in Brazil's fertility decline in recent years. Technologies such as cell phones, internet, television, and radio allow for the mass distribution of information to large populations and have become increasingly accessible and affordable over the past decades. Technologies allow government and other organizations to promote family planning and contraceptive initiatives to a broad populace at minimal cost. Brazil's Ministry of Health maintains a website with detailed information on family planning, sexual education, contraceptives, and other health resources. USAID (2011) writes that mobile devices improve access to reproductive health information between both sexes. Further, they find that several African countries use SMS technology to send messages on family planning to female cellular phone users (USAID 2011). Television media has also affected fertility in Brazil. La Ferrara et al. (2008) finds that in regions covered by television networks that broadcast highly watched *novelas* (soap operas) have significantly lower fertility, as they depict families as smaller than the average Brazilian family. The phenomenon of television entertainment affecting fertility might suggest that the government or other organizations could use this channel of communication to influence fertility or educate the populace about maternal health services. Technological penetration is expected to increase in Brazil and may continue to influence household fertility decisions.

Increased use and availability of contraceptive methods affect fertility throughout the country. The availability of oral contraceptive pills increased greatly during the 1970s, as they became available to purchase at pharmacies without a prescription. Both male (vasectomy) and female sterilization (tubal ligation) became increasingly prevalent during the 1980s and 1990s. The introduction of the Unified Health System in the new 1988 constitution provided free healthcare to all Brazilian citizens, allowing wider access to sterilization. Muniz (2006) finds that sterilization as a contraceptive method increased by 40 percent between 1986-96 and that 40.1 percent of married women were sterilized by 1996. In 2007 Brazil further increased contraceptive access by passing measures to distribute free condoms and improve sexual health education in schools. The Ministry of Health expanded access in 2009, bringing the number of free contraceptives available to eight, including oral pills, injectable birth control shots, and intrauterine devices.

Access to and societal beliefs about abortion provide yet another factor that affects fertility. In 1940 Brazil made abortion illegal except when the woman's life was at risk or in cases of rape. Abortion remains illegal today and is difficult to measure, as women fear potential legal or social consequences for reporting it. One recent study that allowed anonymity found that over 20 percent of Brazilian women in urban areas had received an abortion by menopause (Ogland 2011). Given that abortion exists in Brazil, it is important to understand among which demographics it is most prevalent. Diniz et al. (2012) finds that high-income women have relatively more access to medically safe abortions at private facilities, but that low-income women generally attempt self-induced abortions and later seek care at public facilities after suffering from complications. We may expect a higher incidence of successful abortions among high-income women – the group that also exhibits a relatively lower TFR.

Religious affiliation may also affect the TFR of women in Brazil with respect to abortion. The country has historical roots in the Roman Catholic Church and boasted membership of over 90 percent until 1980. Membership in the Catholic Church has continually decreased since the 1980 census. This decrease has been mirrored with an increase in Protestantism (especially Pentecostalism). Both the Catholic and Pentecostal Protestant churches believe that life begins at conception and strongly oppose abortion (Ogland 2011). Given this belief, females that identify as religious (especially as Catholic of Pentecostal) might exhibit relatively lower fertility rates than non-religious women. The North and Northeast regions, with higher incidences of Afro-Brazilian and indigenous religions might show different TFRs than in regions with higher prevalence of Christian religions (LAPOP 2012).

Brazil has experienced a rapid decline in fertility over the past half century among all socio-demographic groups and regions. Several factors including urbanization and industrialization, increased education and access to contraceptives, and information and communication technologies all contribute to this phenomenon. With respect to Bolsa Família beneficiaries, who represent the country's poorest citizens, it is important to identify the characteristics that affect fertility among this group. The literature suggests that geographic location may play a significant factor, particularly because of the large difference in fertility observed between the North/Northeast and the South/Southeast regions. Access to communication technologies and contraceptives is not evenly distributed, which may also contribute to this inter-regional fertility difference. Religious affiliation may explain fertility differences, as it influences personal beliefs on premarital childbearing and abortion. Literature has repeatedly found that household income levels also influence fertility.

2.1 DETERMINANTS OF FERTILITY AMONG THE POOR

The previous section provided an overview of fertility trends in Brazil during the past half century and highlighted several factors that influenced the fertility among the entire population. This paper intends to find out the determinants of fertility among Bolsa Família beneficiaries in Brazil. This section reviews the literature on the factors that affect fertility among the poorest in the developing world, as this population is similar to the Bolsa Família population.

Bongaarts (1978) provides a framework to analyze the determinants of fertility among the poor. He groups these factors into two groups – proximate determinants and socioeconomic variables. Proximate determinants have direct impact on fertility as they include the biological and sociological factors that can affect fertility. These proximate determinants are influenced by the society in which an individual lives, as well as the society's cultural, social, and economic beliefs. Bongaarts initially discussed eleven different variables that may affect fertility, deriving these factors from Davis and Blake (1956). However, he contended that four determinants were the most important – proportion married, contraceptive use, induced abortion, and postpartum infecundability – as they accounted for up to 96% of fertility trends in developing countries. Several empirical studies confirmed that the proximate determinants suggested by Bongaarts account for much of the change in fertility in developing countries (Chucks 2003, Casterline 1994, Palamuleni 2010). With little doubt these proximate determinants are strongly influenced by societal and cultural beliefs such as religion.

There is strong evidence that finds religiosity affects the fertility of the poor population in developing nations. Heaton (2011) uses data from Demographic and Health Surveys in 30 developing countries and finds that individuals that identify with a particular religious affiliation (Roman Catholic, Protestant, and Islam in this study) are more likely to have higher fertility rates. The study contends that religion affects fertility by influencing two factors: marriage beliefs and contraceptive usage. Religious doctrines tend to encourage marriage at a relatively young age, when the woman is most fertile. Marriage and childbearing are considered central to most major religions, which promote large, strong families. Religious doctrines also tend to oppose the use of contraceptives and denounce abortion (two of the four top proximate determinants of fertility according to Bongaarts).

As Bongaarts (1978) mentioned, other socioeconomic variables affect the fertility of women independent of proximate determinants. Basu (2002) finds a strong negative relationship between education and fertility among the poor. He contends that as women become more educated their social status relative to society increases, offering them increased autonomy in decision-making processes such as childbearing. Educated women are also more likely to have been exposed to sexual education and family planning coursework in school.

Employment status is another socioeconomic variable that affects the fertility of women. Several studies (Bernhardt 1991, Del Boca et al. 2003) contend that employed women produce fewer children than unemployed women, all else equal. One reason that employed woman are more likely to have fewer children is that the monetary benefits gained from wage earning activities raises the opportunity cost of childrearing (Becker 1964). Demographic literature has identified several additional socioeconomic indicators that affect fertility among the poor in the developing world, such as literacy, urbanization, and GNP per capita. The empirical data analysis presented in Section 4 & 5 of this paper will take into account the most relevant proximate and socioeconomic determinants of fertility (subject to availability of the data) in order to identify which variables are significant among the Bolsa Família population. The next section will provide a background on Becker's theory of household fertility decisions to describe how families allocate income with respect to children.

2.2 ECONOMIC THEORY OF FERTILITY

Becker's (1960) seminal paper attempts to describe how households make fertility decisions given that parents have a preference for both the quantity and quality of their children. Becker argued that fertility preferences could be explained using a static model for which children represent a type of normal good and that the demand for such children has two components – a qualitative component that describes the amount and type of expenditures put toward a child, and a quantitative component, which represents the number of children a couple produces. In this static model, parents must chose between the quantity and quality of their children. The given utility function for a married couple is as follows:

$$U = U(n, q, s) \ldots \ldots \ldots \ldots \ldots (1)$$

Where n represents the number of children, q represents the quality of each child, and s represents the standard of living of the parental dyad.

The budget constraint of the couple is given as:

$$I = \pi_c nq + \pi_s s \ldots \ldots \ldots \ldots \ldots (2)$$

Such that I represents the total family income, π_c is the price of goods and services put toward children and π_s is the price of goods and services used by the adults.

Becker (1960) also stresses that according to this model, certain income elasticities of demand must exist:

$$\alpha(\varepsilon_n + \varepsilon_q) + (1 - \alpha)\varepsilon_s = 1 \ldots \ldots \ldots \ldots \ldots \ldots (3)$$

Such that α represents the share of I spent on children, and $(1 - \alpha)$ represents the rest of the income spent on adults. The various value for ε signify the corresponding income elasticities of the number of children, quality, and parental standard of living. In this model Becker argues that $\varepsilon_q > \varepsilon_n$, meaning that given a rise in income, a family would be expected to invest more money in children's quality relative to their quantity on the aggregate.

Becker and Lewis (1973) provide an expanded version of Becker (1960) by attempting to maximize the utility function $U = U(n, q, s)$ subject to the budget constraint. They then propose a new budget constraint that includes the cost of children not due to quality investments as well as the costs of quality that are unrelated to the number of children:

$$I = \pi_n n + \pi_q q + \pi_c nq + \pi_r s \ldots\ldots\ldots\ldots\ldots\ldots.(4)$$

The consequences of the new model are numerous. In the Brazilian context, we may think of the increased availability of contraceptive methods in recent years. Contraceptives reduce the cost of becoming pregnant, which increases the marginal cost of each birth but have no effects on the marginal cost of child quality. Given this example, we expect that the rise in price of a child will reduce *n*, which favors the ratio *q/n* toward higher quality instead of quantity. Contraceptives affect π_n and decrease the elasticity if demand for children. Similar arguments can be made about the elasticity of demand for q. For example, a poor school environment or bad neighborhood for raising a child would decrease π_q (Hotz 1997). Becker and Lewis's (1973) model also claims that the income elasticity of quality is greater than that of quantity. This means that when incomes rise, parents spend relatively more on quality over quantity, but that this larger rise in quality increases the shadow price of quantity, further dissuading parents from choosing quantity.

Researchers have carried out several empirical studies over the years to test the validity of Becker (1960) and Becker and Lewis (1973) claims. Rosenzweig and Wolpin (1980) examine Becker's theory using data that measures education attainment of rural Indian farm households. They find that exogenous increases in fertility lead to a decrease in child fertility. They also recommend that improvements in contraceptives, which affect π_n, equation (4) above, would help increase schooling levels among children. Hanushek (1992) finds further support to Becker's claim, contending that family size significantly affects children's education. He writes that first-born children have a definite advantage in quality (academically) because they have a higher probability of belonging to a small family. Li et al. (2008) study a dataset of children students in China and find evidence to support the quality-quantity tradeoff by noting that family size is negatively correlated with education attainment.

This paper examines how fertility differs among low-income groups – especially participants in the Bolsa Família Program. Identification of the proximate determinants of fertility among this group proves extremely useful in a policy context. Policymakers could allocate resources to incentivize fertility change in groups possessing these factors. According to the Beckerian model outlined above, should policymakers alter household child quantity, they may also affect child quality. Policies designed to reduce quantity (and consequently increase quality) are in-line with the BFP's plan, which seeks to raise long-term human capital. Another observation of the Beckerian model regards the income elasticity of demand, ε_i. Given that $\varepsilon_q > \varepsilon_n$, equation (3) above, changes to income transfers or stipend amounts from the BFP have a larger effect on the quality of children than the quantity. When determining future BFP payment amounts they should recognize that payment increases theoretically raises human capital more than the number of children a family decides to produce.

2.3 CONDITIONAL CASH TRANSFERS AND FERTILITY

The discussion of income's effects on household fertility is relevant when considering income transfer programs. Conditional cash transfer (CCT) programs are one type of income transfer programs that may influence fertility decisions. CCTs generally provide a monthly cash stipend to a family according to the number of children in the household. That is, a family receives a marginal increase in their stipend for each additional marginal child. This has led to some criticism that CCT programs may increase the fertility rates of program participants, as they tend to reward large families. Here it is important to note that this section of the literature review is intended to give the reader a background on the Bolsa Família Program and fertility. Although this paper does not seek to study whether participation in the Program is a significant determinant in household fertility decisions, this section (as well as Section 3.0) provides a useful contextual framework in which the empirical portion of this study can be framed.

CCT programs distribute money to program participants provided they fulfill specific conditions. Conditions generally attempt to increase the level of human capital among program participants. Examples include school attendance requirements or required immunizations and health checkups. Oftentimes those participating in CCT programs are among the country's poorest groups and lack the ability to pay for education and healthcare services. As such, governments generally subsidize healthcare and education where CCTs exist. Schultz (1997) finds that this subsidization leads parents to invest relatively more in human capital of their children (quality) and decrease fertility (quantity). This finding is contrary to the previous finding, which predicts that CCT programs would increase fertility. We find similar ambiguity of how social welfare affects fertility using empirical examples.

Brewer et al. (2010) examine the introduction of the Working Families' Tax Credit in the United Kingdom, which increased welfare benefits to households with children. The study finds that fertility does indeed respond to financial incentives, increasing the number of births by almost 15% for couples (though no significant increase among single women). Baughman and Dickert-Conlin (2009) find that increasing benefits of the Earned Income Tax Credit in the United States leads to a very small decrease in fertility among program recipients. Moffit (1997) provides a detailed summary of fertility and welfare literature and finds that increased generosity of welfare benefits is usually associated with higher fertility. This effect is larger for white women relative to black women. Moffitt further stresses that these results are weakened because they are highly sensitive to the methodology employed in each study.

Authors have begun to study the effects of welfare benefits on fertility in the Latin American context in recent years. Stecklov et al. (2007) provides the most comprehensive study of how CCTs affect beneficiary fertility in Latin America. The authors study Mexico's Education, Health, and Nutrition Program (PROGRESA), the Family Assistance Program (PRAF) in Honduras, and the Social Protection Network (RPS) in Nicaragua. The study employs randomly assigned treatment and control groups in order to generate panel data. It found that Mexico's PROGRESA has almost no effect on fertility. Schultz (2001) finds similar results, indicating no statistically significant effect on fertility. Todd and Wolpin (2006) construct a model relating PROGRESA's effects on fertility and schooling and estimate that the program would have little effect on fertility.

Stecklov et al. found that in the Nicaraguan case, the RPS had a very small positive effect on fertility rates, but that this statistic was not significant. In a separate study, Todd et al. (2012) examine the RPS's effects on birth spacing among program participants. They conclude that the

Program increases birth spacing, which decreases fertility (contrary to findings on the same program in Stecklov 2007). Interestingly, Stecklov finds that Honduras's PRAF has a strong positive effect on childbearing, leading to a 2-4 percentage increase in the probability of birth among beneficiaries.

Empirical data of how CCT programs in Latin America affect fertility appear to lack consistency. Stecklov et al. (2007) provides one explanation as to why PROGRESA and RPS showed no increase in fertility while the PRAF did lead to an increase. During the two years included in the panel data parents in Mexico and Nicaragua were unable to enroll in PROGRESA or RPS after the program had commenced. Participants of the two programs received a lump sum benefit regardless of whether they produced more children. In contrast, Honduras's PRAF allowed new parents to enroll in the program if they became eligible by bearing a child. The PRAF's benefit also increased a marginal amount per each child. One may attribute the different results observed by the PRAF to the financial incentives it provided to produce more children. This study suggests that program design plays an important role in determining whether unintended consequences may occur given a certain policy (Fiszbein and Schady 2009). In the next section this study will outline Brazil's CCT program, the Bolsa Família, and review similar literature on whether program participation affects fertility. Then, empirically will transition to the determinants of fertility among BFP participants

3.0 BRAZIL AND THE BOLSA FAMÍLIA

Conditional cash transfer programs in Brazil began in 1996 with the introduction of the Child Labor Eradication Program (PETI). PETI provided participants a cash stipend on the condition that their children achieved at least 80 percent attendance and attended an after school program that significantly lengthened the amount of time the child spent at school. The Program intended to reduce the labor supply generated by children while raising human capital among participants simultaneously (Yoon et al. 2001). PETI's success led to the development of the Bolsa Escola program, which expanded coverage and raised the monthly stipend that beneficiaries received. Both PETI and the Bolsa Escola required children to regularly attend school and each had a minimum and maximum age (7-15 and 6-15 respectively). As such, it is unlikely a family would have increased fertility in response to these programs, as they would have to wait between six and seven years to receive benefits.

In 2001 policymakers introduced the Bolsa Alimentação, a conditional cash transfer program that aimed to reduce infant mortality and increase nutrition among Brazil's poorest citizens. The eligibility window for this program was significantly different from the PETI and Bolsa Escola, ranging from six months to six years of age. Consequently, households no longer had to wait six years to receive increased benefits per marginal child – they only had to wait six months. Although Bolsa Alimentação's reduced waiting period may have provided greater financial incentives relative to PETI and Bolsa Escola, Rocha (2009) writes that it was unlikely to significantly raise fertility rates.

Brazil soon introduced several other federal social programs including Auxilo Gas and the Programa Cartão Alimentação, which provided gas and food subsidies respectively. Given that each program had its own financing schedules, eligibility requirements, and administering agencies, the operation of social programs was bureaucratic and inefficient. In 2003 under the direction of newly elected president Luiz Inácio Lula da Silva (Lula) Brazil introduced the Bolsa Família Program (BFP), seeking to consolidate social programs and improve efficiency. The BFP would also better target potential participants, encourage the joint promotion of health and education in youth, and strengthen the oversight and evaluation processes (Lindert et al. 2007). In December 2003 – two months after its introduction – the BFP served 3.8 million families. Over the past decade, the program has grown exponentially, now serving more than 13 million families or over 50 million Brazilians.

The BFP's approach to social assistance is two-pronged. Firstly, the BFP provides families with a small cash stipend in order to reduce immediate short-term poverty. Recipients receive a stipend between R$32 (US$16.2) to R$306 (US$155) per month, depending on the number of children in the family. Secondly, the BFP seeks to interrupt the persistence of intergenerational poverty. The BFP's conditions stipulate that children maintain at least 85 percent school attendance and that they receive regular vaccinations and health checkups. Over time, the BFP seeks to foster a healthier and better-educated society, which may result in relatively higher long-run economic growth.

The BFP is the largest CCT program of its kind in the world. As such, it has generated a multitude of literature that examines its effectiveness. One study finds that the BFP increased school enrollment rates by 5.5% in grades 1-4, and 6.5% in grades 5-8. The report also finds that the BFP decreased dropout rates and increased scholastic performance throughout Brazil (Glewwe and Kassouf 2008). Neto (2010) reinforces these findings, writing that the BFP increased enrollment over 2%. The BFP also sought to increase health related indicators of youth by requiring children to attend regular checkups and acquire immunizations. Soares (2010) wrote that the BFP "had no impact on child immunizations" and that it had little impact on child nutrition. Impacts in Andrade et. al (2007) are similar, with no significant evidence that the BFP helped improve height, weight, and body mass index among program participants. The literature suggests that the BFP has helped boost education indicators but has had less effect on health indicators – two areas policymakers anticipated would improve.

Additional intended impacts of the BFP include poverty reduction and decreased income inequality. Soares (2006) found "that the Gini index fell by 4.7 percent from 1995 to 2004 and that the Bolsa Família was responsible for 21 percent of that fall" (Soares 2010). On the topic of poverty, Zepeda (2006) finds that the BFP reduced poverty by 12%. Soares and Sátyro (2010) also write that the BFP has significantly reduced the poverty gap among Brazilians. Policymakers have thus realized the intended effects of the BFP with respect to poverty and inequality according to reports using short-term data.

The majority of the BFP's evaluations concern its effectiveness with respect to its *intended* consequences, including health, education, poverty, and inequality statistics. A relatively unexplored field attempts to uncover some of the BFP's *unintended* consequences on statistics such as fertility. This paper will first examine some of these unintended consequences with respect to fertility, and then move on to discuss how fertility trends differ among BFP beneficiaries in general.

To examine whether the BFP affects participant fertility, we must first analyze the Program's structure. The BFP categorizes recipients into two categories: poor and extremely poor. Extremely poor families are those which earn less than R$70 per person. They receive a base payment of R$70 per month regardless of how many children are in the family. Because this amount is fixed, it should not theoretically have any effect on fertility decisions. Poor families are those with a monthly income between R$70-140 per person. These families do not receive a base payment.

The BFP also provides beneficiaries stipend related to the amount of dependent children exist in a given family. For each marginal child until the limit of five, a BFP beneficiary receives an additional R$32 per month. This amount is the same regardless of whether the family is categorized as poor or extremely poor. This additional per-child monthly stipend could incentivize parents to have one or more additional children. As the BFP is the primary source of income for some Brazilian households, it is possible that some families attempt to maximize household earnings by producing more children. Further, if we consider children normal goods (Becker 1960, 1973) then an increase in income would also increase fertility. Since the income elasticity of demand for quality is higher than quantity, increased income would promote quality to an even greater extent.

It should be noted that Brazilian policymakers foresaw that the BFP might encourage child production. Initially, BFP beneficiaries could only receive a marginal increase in monthly payment until the third child. This limit eventually rose to five in order to expand the Program to larger families, but in no way motivates unlimited child production due to financial benefits. Moreover, the BFP's design only allows families to receive stipends for two teens ages 16 to 17

(Variable Benefit Linked to Teen, BVJ), and once a child reaches 18 years of age, his or her stipend is discontinued.

As a result, if households anticipate that a child will 'age out' of the Program, they may be encouraged to produce an additional child to continue receiving the monthly stipend. It should be noted that expectations of BFP's continuation plays an important factor in determining the household supply and demand for children. If program participants believe that the Program will discontinue in the near future, we expect they would be less likely to produce additional children, as the marginal cost of each additional child will greatly exceed the marginal benefit afforded by the BFP. Conversely, if program participants expect that the BFP will continue in the long term, they may be more inclined to produce a child with the intention of receiving cash stipends for a considerable amount of time.

Authors have published three papers on the topic of the BFP's effects on fertility in recent years. Rocha (2009) uses bi-yearly data from Brazil's National Household Sample Survey (PNAD) between the years 1995-2007 in conjunction with the 2006 PNAD supplement, which included specific questions about the BFP. This study employs three methodological approaches. Firstly is a difference in differences method, which considers a treatment and control group created using PNAD's fertility and income data. The second uses the 2006 PNAD supplement and attempts to discover whether beneficiaries are likely to increase fertility under the condition that they may receive additional money for more children (up to a limit of three). Lastly, looks at the effect of treatment on the treated (beneficiaries) using Propensity Score Matching. Rocha concluded that the BFP decreased fertility among program beneficiaries, but that this statistic was not significant for any of the three methodologies.

Signorini and Queiroz (2011) use Bolsa Família data included in the PNAD's supplemental survey in 2004 and 2006. Because the PNAD survey in 2004 and 2006 is not panel data and did not survey the same households, Signorini and Queiroz use a Propensity Score Matching method to create analogous treatment and control groups. They reduced the sample to only include women of reproductive age (15-50 years) that had a monthly income eligible for participation. After matching the 2004 and 2006 groups they calculate the average treatment effect on the treated for each group and compare the difference. They find that in 2004, the probability of having a child in the last year was 6.3 percent for the treated group relative to the control group. In 2006, they calculated this statistic to be -5.6 percent, resulting in a positive .7 percent increase between the two years using a difference-in-difference approach. However, Signorini and Queiroz conclude that this small positive impact was not statistically significant, and thus the BFP has no effect on the fertility of program participants.

Most recently, Simões and Soares (2012) used the 2006 National Demographic and Health Survey (PNDS), which includes women's health, fertility, and demographic statistics. The PNDS is particularly useful because it allows the researchers to control for covariates. They use two models to evaluate the BFP's effects on fertility – a two-stage Heckman model and a Generalized Method of Moments method. The study concludes that BFP beneficiaries had lower fertility rates than non-beneficiaries with statistical significance. They also note that this effect was more pronounced among lower income groups. These conclusions are different than those provided by Rocha (2009) and Signorini and Queiroz (2011), which found that, the BFP had no significant effects on fertility of participants. Simões and Soares write that the difference in results may stem from the different methodologies used among the studies. They observe that a similar situation occurred with the case of Nicaragua's RPS, where Stecklov et. al (2007) find no statistical significance of a CCT on fertility, but Todd et. al (2011) do.

This study does not build off of the previous ones discussed, as it does not examine how the BFP affects the fertility of beneficiaries. The previous literature review attempts to provide a succinct background on BFP fertility literature. This study seeks to identify trends and discrepancies in fertility rates among different socio-demographic groups given that a family participates in the Program. It employs data from Brazil's 2011 PNAD survey and uses a multiple linear regression methodology. I anticipate that this paper will contribute to the literature by providing a relatively holistic picture of fertility rates among BFP beneficiaries and identify variables that policymakers may utilize to alter fertility rates according to the identified sub-groups. Should policymakers motivate BFP participants to change their fertility (quantity), then according to the Beckerian model, it may be possible to alter the child quality (human capital) too.

3.1 BOLSA FAMÍLIA IDENTIFICATION

The most significant limitation of the data is that it does not include a question that asked whether a household participated in the Bolsa Família Program nor did it ask the amount of money a household receives from conditional cash transfer programs. Despite these limitations, I use this data because it is representative of the entire Brazilian population and includes a specific section on maternity and fertility, which other surveys lack. Moreover, the majority of the literature that investigates the relationship between fertility and the BFP use PNAD data.

Because the purpose of this paper is to look at how fertility rates differ among beneficiaries, I seek to identify BFP participants using other variables in the data set. Higgins (2012) notes that the PNAD survey includes eight variables for non-labor income. One of these variables is labeled "Other Income", which is described as financial income such as dividends and interest from savings and dividend and from government social programs (such as the Bolsa Família).

To identify households that received transfers from the BFP I begin by identifying all households that reported an "Other Income" that corresponds to one of the possible combinations of BFP payments listed in Table. Next, I limit the study only to households eligible to participate in the BFP – households with at least one child between ages 5 and 17 and earning a per capita familial income of less than R$140 per month. Families earnings between zero and R$70 per person receive a basic transfer of R$70 (unconditional transfer), R$32 per child between ages 5 and 15 (up to five), and R$38 per child between ages 16 to 17 (up to two), provided they fulfill the Program conditions. Families earning between R$70 and R$140 per person do not receive a basic transfer, but do receive R$32 per child between ages 5 and 15 (up to five), and R$38 per child between ages 16 to 17 (up to two), provided the BFP's education and health conditions are met. Unfortunately the PNAD survey does not provide specific data on each individual child's health and education statuses. As such, this model assumes that children of each BFP participant family completes the necessary human capital requirements

Higgins (2012) refers to a methodology employed by Barros et al. (2007), in which the researchers attempted to separate CCT programs out of the 2005 PNAD data given that there were no specific survey questions about the transfers. In 2005 Brazil had already implemented the BFP but was also phasing out several other CCT programs. In order to separate government social program transfers from other income Barros et al. calculate all possible combinations of transfer payments that could stem from CCT programs like the BFP and only analyze households that receive payments matching one of the amounts. This methodology is applicable to the 2011 PNAD and requires a calculation of all possible combinations of payments under the BFP. These values are listed in the BFP Payment Schedule Table in the appendix. The graph below shows the distribution of income stemming from the "Other Income" category. Note that the large spikes correspond with the exact values of Bolsa Família transfers.

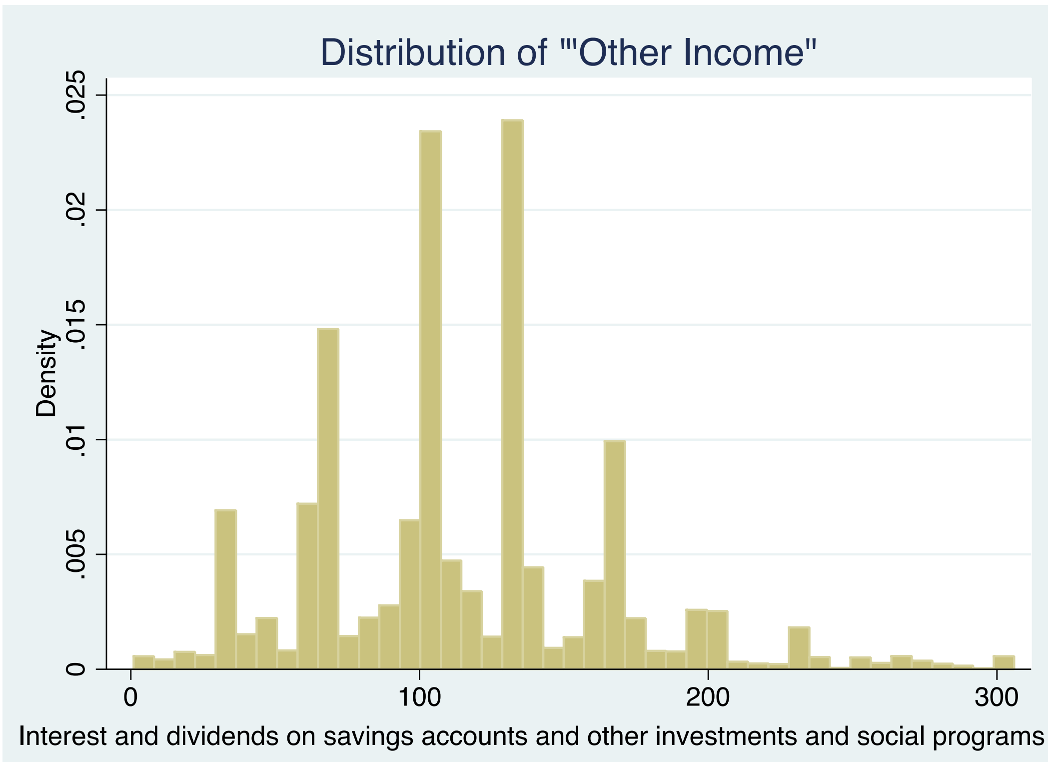

Figure 7. Distribution of Other Income

As Higgins (2012) notes, families that participate in Bolsa Família and incorrectly report their monthly non-labor income, or those families that rounded up to the nearest R$10 would be excluded from this analysis because they would no longer report an *exact* BFP transfer amount. Further, Bolsa Família beneficiaries that *do* receive interest or dividends on financial investments and report this amount alongside their cash transfer would be excluded. This analysis assumes that BFP beneficiaries do not receive (or do not report) other income stemming from financial investments, as the extremely poor are usually excluded from these markets.

All models include restrictions to analyze only BFP beneficiaries, as suggested by Barros et al. (2007) and Higgins (2012). In accordance with the BFP's eligibility criteria, only households with a familial per capita income below R$140 per month are included. Additionally, families are required to have more than one child, and this child must be eligible to attend school (between the ages of 5 and 17). Lastly, respondents must have reported receiving "Other Income" corresponding to an exact amount of one of the 24 stipend possibilities.

4.0 DATA AND METHODOLOGY

This study of fertility among the Bolsa Família population in Brazil utilizes data from the 2011 Household Sample National Survey (PNAD). The PNAD nationally representative survey administered by the Brazilian Institute of Geography and Statistics (IGBE) on a bi-yearly basis (except during Census years). Much like a census, the PNAD collects information on educational attainment, the labor market, housing conditions, fertility, and income. The 2011 PNAD includes observations from 358,919 households.

Table 1 illustrates the descriptive statistics of both the BF participants sample and the larger sample. (those who may or may not benefit from the BFP). The restricted sample includes 1,746 households and the large sample includes 36,608 households. The original sample includes higher number of observations because this study is restricted to those who provided responses to all questions.

	Study Sample	Population Sample
	mean	mean
VARIABLES	(sd)	(sd)
Children	2.633	1.688
	(1.474)	(1.089)
Age (years)		
11 to 15	0.000	0.000
	0.000	0.000
16 to 20	0.0292	0.0177
	(0.168)	(0.132)
21 to 25	0.069	0.106
	(0.254)	(0.308)
26 to 30	0.180	0.149
	(0.385)	(0.356)
31 to 36	0.248	0.198
	(0.432)	(0.398)
36 to 40	0.211	0.196
	(0.408)	(0.397)
41 to 45	0.134	0.190
	(0.341)	(0.392)
46 to 50	0.0853	0.169
	(0.279)	(0.375)
Education (years)	6.610	10.02
	(3.921)	(4.258)
Employed	0.894	0.959
	(0.308)	(0.197)
Hours Worked	2.320	2.942
	(1.100)	(1.075)
Log Income	5.523	7.268
	(0.626)	(3.865)
Infant Mortality	0.180	0.1000
	(0.649)	(0.440)
Region (%)		
Urban	0.588	0.883
	(0.492)	(0.322)
North	0.223	0.151
	(0.416)	(0.358)
Northeast	0.558	0.269
	(0.497)	(0.444)
South	0.060	0.149
	(0.237)	(0.357)
Southeast	0.122	0.288
	(0.327)	(0.453)
Centerwest	0.0229	0.0698
	(0.150)	(0.255)
Race / Color (%)		
White	0.252	0.428
	(0.434)	(0.495)
Black	0.106	0.0923
	(0.308)	(0.289)
Brown	0.643	0.443
	(0.479)	(0.497)
Yellow	0.00401	0.00500
	(0.0632)	(0.0705)
Indigenous	0.0109	0.00538
	(0.104)	(0.0732)
Family Type		
Single Mother	0.397	0.246
	(0.489)	(0.431)
Couple w/ Child	0.593	0.663
	(0.491)	(0.473)
Other Type	0.00687	0.0333
	(0.0826)	(0.179)
Couple w/o Child	0.000	0.087
	0.000	(0.282)
Marrital Status		
Single	0.596	0.416
	(0.491)	(0.493)
Married	0.0882	0.0624
	(0.284)	(0.242)
Separated	0.0309	0.0338
	(0.173)	(0.181)
Divorced	0.0338	0.0662
	(0.181)	(0.249)
Widow	0.0178	0.0236
	(0.132)	(0.152)
Marriage Type (Religiosity)		
Religious	0.0641	0.0280
	(0.245)	(0.165)
Civil	0.104	0.140
	(0.305)	(0.347)
Union	0.304	0.289
	(0.460)	(0.453)
Religious & Civil	0.056	0.121
	(0.230)	(0.327)
Technology		
Internet	0.123	0.506
	(0.329)	(0.500)
Cell Phone	0.580	0.845
	(0.494)	(0.362)
Observations	1746	36608

Table 1. Descriptive Statistics

Source: Author's own calculations. PNAD, 2011

The descriptive statistics shown in Table (1) highlight characteristics of Bolsa Família beneficiaries relative to the overall sample. BFP participants, on average, have one more child, are 5 years younger, have three years less schooling, and have less income relative to the sample. 42% of BFP beneficiaries reside in rural areas compared to only 11.7% of the larger sample. They are also significantly technologically disadvantaged – only 12.3% have accessed the Internet in the three months prior to the survey compared to 50.6% of the sample. 58% of BFP participants owned a cell phone at the time of the survey, while 84.5% of the sample owned one.

From a racial perspective, BFP participants are more likely to be brown relative to the broader population (64.4% vs. 44.3%) and less likely to be white (25.2% vs. 42.8%). They are more likely to reside in the North (22.3% vs. 15.1%) and Northeast (55.8% vs. 26.9%) compared to the larger sample. BFP beneficiaries are less represented in the South relative to the sample (6% vs. 14.9%) and the Southeast (12.2% vs. 28.8%).

From a family type perspective, BFP beneficiaries are much more likely to be single mothers compared to the population (39.7% vs. 24.6%). They are also more likely to be single with respect to marital status (59.6% vs. 41.6%). Lastly, BFP beneficiaries are more likely to identify their marriages as religious (6.4% vs. 2.8%) and less likely to identify it as civil or civil and religious. Now that I have given a brief overview of the samples to be analyzed, I will discuss the model that uses this data.

4.1 THE MODEL

In order to assess how various explanatory variables affect household fertility decisions among Bolsa Família Program beneficiaries in Brazil this paper employs a multiple linear regression model.

Given the data set $\{y_i, x_{i1}, \ldots, x_{ip}\}_{i=1}^{n}$, a multiple linear regression model relates the dependent variable y_i to p vectors of x_i in a linear manner.

$$y_i = \alpha + \beta_1 x_{i1} + \cdots + B_p x_{ip} \text{ such that } i = 1, \ldots, n\ldots\ldots(5)$$

Where y_i represents the number of children that a given respondent reported giving birth to, α denotes the control variable, x_i is a vector of covariates (age in years, years of education, urban or rural location, employment status, hours worked at job per week, logarithm of total household income, family composition, race, marital status, region, marriage type, access to the Internet, and cell phone ownership), and β_p is the parameter vector that corresponds to the various explanatory variables previously mentioned.

This paper will analyze the parameter vectors, B_p, to determine the most significant variables that affect fertility among BF beneficiaries.

Variable	Definition	Variable	Definition
Number of Children	Number of Children Respondent Has	**Marital Status**	
Age	Current Age of Respondent (Dummies)	Single	0 = No 1 = Yes
1	11 - 15 years	Married	0 = No 1 = Yes
2	16 - 20 years	Separated	0 = No 1 = Yes
3	21 - 25 years - Excluded (Reference Group)	Divorced	0 = No 1 = Yes
4	26 - 30 years	Widow	Excluded (Reference Group)
5	31 - 35 years	**Region**	
6	36 - 40 years	Centerwest	0 = No 1 = Yes
7	41 - 45 years	North	0 = No 1 = Yes
8	46 - 50 years	Northeast	0 = No 1 = Yes
Education	Number of Years of Education	Southeast	0 = No 1 = Yes
Urban	0 = Rural 1 = Urban	South	Excluded (Reference Group)
Employed	0 = Unemployed 1 = Employed	**Marriage Type**	
Hours Worked	Time Respondent Worked in Hours	Religious	0 = No 1 = Yes
Log Income	Logarithm of Total Income	Civil	0 = No 1 = Yes
Infant Mortality	Number of infants that died	Civil and Religious	Excluded (Reference Group)
Family Type		Union	0 = No 1 = Yes
Single Mother	0 = No 1= Yes	**Technology**	
Couple with child	0 = No 1= Yes	Internet	0 = Respondent Has Not Used Internet in Previous 3 Months 1 = Respondent Has Used Internet in Previous 3 Months
Other Type	Excluded (Reference Group)	Cell Phone	0 = Respondent Does Not Own a Cellular Phone 1 = Respondent Owns a Cellular Phone
Race / Color		Technology Age	
White	Excluded (Reference Group)	1	Age (1 + 2 + 3)
Black	0 = No 1 = Yes	2	Age (4+ 5 + 6)
Brown	0 = No 1 = Yes	3	Age (7 + 8)
Yellow	0 = No 1 = Yes		
Indigenous	0 = No 1 = Yes		

Table 2. Explanatory Variables and Definitions

Source: PNAD, 2011

4.2 PREDICTIONS AND HYPOTHESIS

Table 2 provides a list of the explanatory variables used in the multiple linear regression model, as well as their definitions and how the dummy variables were coded.

As this paper studies fertility among the Bolsa Família population, the dependent variable is the number of children that a respondent reported producing. The PNAD did not include a specific variable for the number of children; instead, it asked mothers to report the number of boys and the number of girls they gave birth to. The dependent variable is the total number of boys and girls per mother.

Age is a significant factor in determining the number of children a woman will produce because women are most fertile at young ages and become increasingly infertile at older ages. It is reasonable to predict that age will have a negative relationship with fertility. The literature (Martin and Juarez 1995, Basu 2002) suggests that education leads to lower fertility rates and that this relationship is especially strong among women. The PNAD survey considered age a continuous variable, but this study partitions *age* into dummy variables for every five years. Further, this study imposes a lower limit of *age* at 11 years and an upper limit at 50 years. The youngest case of a women giving birth in the data set is 13 years old, which is included in the 11-15 year old dummy. An upper limit of 50 is consistent with the literature. Salihu et al. (2003) find that pregnancy beyond the age of 50 years is highly uncommon without the use of in-vitro fertilization and is extremely risky to the fetus. It is unlikely that BFP participants have access to private health care facilities or would be able to pay for in-vitro fertilization, further decreasing the likelihood that a woman over 50 could produce a child.

Education allows women to become formally introduced to contraceptives and family planning programs as part of classroom curriculums. It increases the social status of women and increases gender equality, providing them greater autonomy in decision-making processes regarding fertility. Finally, educational attainment gives women an increased choice of wage-earning opportunities, which raises the opportunity cost of childbearing, decreasing fertility.

It is likely that urban women will produce fewer children than rural women, all else constant. The net benefits to having more children are higher to parents in rural areas relative to urban areas. In rural areas, children often help with farming activities at early ages and continue to work for the family as they grow older. The net benefits of large families are substantially lower in urban areas, where children are less likely to work at young age and the marginal cost of raising a child is relatively higher. The statistics from IGBE census data in Brazil provided in section (2) of this paper also support the hypothesis of relatively lower fertility rates in urban areas.

Employment status will likely influence the fertility decisions of Brazilian women. Employment increases a woman's wage-earning potential, which raises her opportunity cost of spending time raising children. As the opportunity cost of childbearing increases, she is expected to produce fewer children. In addition to whether a woman is employed, the number of hours worked may also affect fertility decisions. Under the assumption that there exists a tradeoff between the number of hours a woman may spend raising her child and working, then it is plausible that a higher number of hours worked per week will decrease fertility preferences. The literature is mixed on how income affects fertility. Myrskylä (2009) finds a J-shaped trend, while Furuoka (2009) contends that high development and income is strictly associated with lower fertility. According the Beckerian framework, one would expect that higher income is associated with higher fertility (quantity), as children exhibit a positive income elasticity of demand.

rRegion may act as a determinant of fertility among the BFP population. The PNAD did not include a question that asked for the respondent's region, but instead asked for the state. I used a map from the IGBE website to group all of the states into their respective regions and generated a new variable for each region. Despite the high variation in fertility rates across different regions in the entire population, the sample of BFP beneficiaries studied here do not exhibit the same trends. Among the study sample the average low fertility rate is in the Northeast

(2.45) and the high is in the North (2.91). As such, I do not predict significant regional differences.

Fertility varies widely among different racial groups in Brazil and may act as a potential significant determinant. In the general population, the respondents that identify as white have the lowest average fertility rates, while the indigenous group has the highest. This trend holds for the group of BFP participants in 2011, where whites produced 2.36 children on average and indigenous produced 3.46. However, the variation between the other races is much smaller, as brown respondents produced 2.68 children, blacks 2.65 children, and yellow 2.57 children. Among the BFP beneficiaries the indigenous group appears an outlier relative to the other racial categories. This study predicts that race may not prove significant in fertility determination with the exception of the indigenous group

Region and race are highly related in Brazil. Indigenous and black groups have a larger presence in the North and Northeast regions of the country while white, yellow, and brown are more commonly found in the South and Southeast. However, among the BFP population in this study the distribution of race among region is quite different, as illustrated in Table 4 below.

Region	White (mean) (sd)	Brown (mean) (sd)	Black (mean) (sd)	Yellow (mean) (sd)	Indigenous (mean) (sd)
North	0.167	0.250	0.175	0.232	0.579
	(0.374)	(0.433)	(0.348)	(0.425)	(0.507)
Northeast	0.505	0.579	0.573	0.623	0.389
	(0.501)	(0.494)	(0.496)	(0.488)	(0.489)
South	0.117	0.0294	0.0486	0.072	0.005
	(0.321)	(0.169)	(0.216)	(0.261)	(0.067)
Southeast	0.178	0.0988	0.178	0.072	0.023
	(0.374)	(0.299)	(0.384)	(0.261)	(0.149)
Centerwest	0.031	0.035	0.0216	0.000	0.005
	(0.138)	(0.156)	(0.146)	0.000	(0.067)

Table 3. Distribution of Race and Region for BFP beneficiaries

Source: author’s own calculations. PNAD, 2011

Table 4 gives the distribution of race for each region in percentage terms. It shows that across all races, most BFP beneficiaries live in either the North or Northeastern regions. The majority of white, brown, black, and yellow reside in the Northeast, and the majority of indigenous live in the North. Few BFP participants live in the South or Southeast, although this rate is higher for white and black. This distribution is quite different than the one described earlier, in which white and yellow dominated the South while black and indigenous were more prevalent in the Northern regions. In order to gain a fuller understanding of how region and race influence fertility, this paper will include interaction variables in the empirical model. Table 3 lists the interaction variables and their respective definitions.

Interaction Variables

Variable	(Race*Region)
BrownNorth	Brown*North
BrownNortheast	Brown*Northeast
BrownSouth	Brown*South
BrownSoutheast	Brown*Southeast
BrownCenterwest	Brown*Centerwest
WhiteNorth	White*North
WhiteNortheast	White*Northeast
WhiteSouth	White*South
WhiteSoutheast	White*Southeast
WhiteCenterwest	White*Centerwest
BlackNorth	Black*North
BlackNortheast	Black*Northeast
BlackSouth	Black*South
BlackSoutheast	Black*Southeast
BlackCenterwest	Black*Centerwest
YellowNorth	Yellow*North
YellowNortheast	Yellow*Northeast
YellowSouth	Yellow*South
YellowSoutheast	Yellow*Southeast
YellowCenterwest	Yellow*Centerwest
IndigenousNorth	Indigenous*North
IndigenousNortheast	Indigenous*Northeast
IndigenousSouth	Indigenous*South
IndigenousSoutheast	Indigenous*Southeast
IndigenousCenterwest	Indigenous*Centerwest
Techage1Internet	Techage1*Internet
Techage2Internet	Techage2*Internet
Techage3Internet	Techage3*Internet
Techage1CellPhone	Techage1*CellPhone
Techage2CellPhone	Techage2*CellPhone
Techage3CellPhone	Techage3*CellPhone

Table 4. Interaction Variables Used In Regression Models

Family type could have a measureable effect on household fertility decisions. The 2011 PNAD survey asked households to report whether the family was a single mother (above and below age 14), couple with or without a child (above and below age 14), or another type of family. For this study the "above and below age 14" groups are combined. Further, the *couple without a child* variable does not appear in the regression because the BFP stipulates that a family must have at least one child of schooling age. Given that *Other Type* is the reference group, this paper anticipates that *Couple w/ Child* will have a positive and significant coefficient because two individuals in a family are able to share the costs of childrearing. Couples also allow one partner to engage in wage-earning activities while the other individual cares for the child. Single mothers face a tradeoff between working and taking care of a child in terms of hours spent and wage-earning potential that is forgone. This paper hypothesizes that single mothers will not exhibit positive or significant coefficients. Along a similar vein, marital status may affect fertility. Single parents face higher marginal costs per child and higher opportunity costs for taking care of children. Conversely, married parents share the marginal cost of a child and have lower child-working tradeoffs. Presumably, separated, divorced, and widowed respondents would have faced situations similar to married respondents at sometime in their life. As such, this paper hypothesizes that respondents that reported being married or previously married are relatively homogeneous with respect to fertility. However, the variable *Single* is predicted to have a significant and positive coefficient relative to the base group, widow.

Religiosity and religious affiliation may influence fertility decisions among BFP participants. The literature review in section 2 finds that poor, religious households in developing nations are likely to have higher fertility rates than non-religious households, all else constant. This is due to relatively early age of marriage, lower use of contraceptives, and emphasis on the family. The descriptive statistics show that BFP beneficiaries are more likely to identify as religious than the general population. Given this information, this study predicts that religious couples will exhibit positive and significant fertility relative to the reference group.

Apart from the traditional determinants of fertility, access to technology might play a significant role in contemporary household decisions. BFP participants are less educated, less likely to have private health care, and less able to afford contraceptives relative to the general population. The BFP beneficiaries that own a cell phone or have access to the Internet have relatively more exposure to maternal and sexual health and family planning initiatives put forth by the Brazilian Ministry of Health and NGOs compared to beneficiaries that lack access. This study expects that access to technology will have a significant and negative effect on the fertility of BFP beneficiaries. Further, because of differences in cell phone and Internet usage between the young and elderly (the younger generation have a higher propensity to use technologies), this study again benefits by segmenting the continuous variable, *age*, into five-year dummy variables.

This section attempts to provide the reader insight regarding the data and methodology employed in this paper before presenting the findings. A brief description of the descriptive statistics highlights the differences between the population of BFP beneficiaries and the Brazilian population in general. An overview of the Multiple Linear Regression model and thorough descriptions of the explanatory variables allow for reproducibility of this study. Lastly, this section provides hypotheses to how the covariates are expected to affect fertility when applied in the model. The next section discusses the findings of the regression models as well as the policy implications that can be drawn from the results.

5.0 FINDINGS

An understanding of the determinants of fertility among Bolsa Família beneficiaries offers policymakers greater understanding of how poor households make fertility decision and how they may influence such factors. Should policymakers desire to direct resources to affect significant determinants, they may also affect the quantity of children a family produces. Applying Becker's theory of the quantity-quality tradeoff, then identification of variables that affect quantity will allow policymakers to also influence child quality. This section presents the results of the Multiple Linear Regression (MLR) model presented in Section 4. Table 5 includes two MLR models. The first is the (MLR) with all of the explanatory variables as outlined in Section 4. The second is an MLR that includes the same explanatory variables as the first model, but also considers interaction terms between region and race highlighted in Section 4. It should be noted that variables are weighted using the statistic *Peso da Pessoa*, included in the 2011 PNAD.

For further reading, Table 7 in the Appendix provides alternate versions of the models included below. Models (1) and (4) do not include religion or technology. Models (2) and (5) do not include regional variables. Models (3) and (6) are the same as models in Table 5 below. All models focus on the determinants of fertility among the BFP population and those including interaction variables are denoted as such.

VARIABLES	Without Interaction children	With Interactions children
Age		
11 - 15 years	Omitted	Omitted
16 - 20 years	-0.430***	-0.447***
	(0.108)	(0.113)
21 - 25 years	Reference	Group
26 - 30 years	0.417***	0.418***
	(0.0884)	(0.107)
31 - 35 years	0.724***	0.735***
	(0.0953)	(0.111)
36 - 40 years	0.929***	0.955***
	(0.106)	(0.125)
41 - 45 years	0.610***	0.537***
	(0.128)	(0.160)
46 - 50 years	0.419**	0.352*
	(0.170)	(0.202)
Education (Years)	-0.0514***	-0.0500***
	(0.00992)	(0.0101)
Employed	-0.546***	-0.537***
	(0.126)	(0.125)
Hours Worked	-0.0146	-0.0108
	(0.033)	(0.0328)
Log Income	0.935***	0.931***
	(0.107)	(0.108)
Infant Mortality	0.247***	0.252***
	(0.063)	(0.0628)
Region		
Urban	-0.212**	-0.217**
	(0.089)	(0.090)
North	0.207	-0.72
	(0.146)	(0.842)
Northeast	-0.129	0.114
	(0.130)	(0.288)
South	Reference	Group
Southeast	0.0811	-0.568
	(0.158)	(0.848)
Centerwest	0.00218	-0.255
	(0.200)	(0.423)
Race / Color		
White	Reference	Group
Black	0.444***	1.141
	(0.124)	(0.873)
Brown	0.166**	-0.146
	(0.075)	(0.423)
Yellow	-0.307	-0.657
	(0.195)	(0.406)
Indigenous	0.906*	1.172
	(0.533)	(0.939)
Family Type		
Single Mother	0.666	0.626
	(0.424)	(0.432)
Couple w/ Child	1.137***	1.112***
	(0.373)	(0.381)
Other Type	Reference	Group
Marrital Status		
Single	-0.0664	-0.0501
	(0.239)	(0.242)
Married	-0.228	-0.209
	(0.256)	(0.261)
Separated	0.185	0.216
	(0.291)	(0.295)
Divorced	-0.278	-0.269
	(0.287)	(0.294)
Widow	Reference	Group
Marriage Type (Religiosity)		
Religious	0.270	0.240
	(0.250)	(0.254)
Civil	0.0464	0.0451
	(0.157)	(0.159)
Union	0.122	0.0990
	(0.211)	(0.214)
Religious & Civil	Reference	Group
Technology		
Internet	-0.189*	0.483
	(0.100)	(0.684)
Cell Phone	-0.148*	0.0615
	(0.069)	(0.285)
Interactions		
YellowXNorth		2.033**
		(0.869)
Constant	-2.876***	-2.740***
	(0.821)	(0.910)
Observations	1746	1746
R-squared	0.297	0.304

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5. Multiple Linear Regression Models (3 & 6)[1]

Source: Author's Own Calculations

[1] Only significant interaction variables are reported in this table. A complete table of interaction variables is available in the appendix.

Both models find that additional years of education significantly reduces the number of children, though at a very small magnitude. This finding is consistent with the hypothesis given in Section 4, because education increases the social status and equality with men, offering women greater autonomy and influence in household decisions such as the decision to have a child. Further, educated women are more likely to be exposed to school curriculum that includes sexual education and family planning guides. Despite education proving significant, the coefficients are extremely small (-.0514 and -.0500) for the two models. As such, each year does of education *does* reduce the quantity of children a women will produce, but only to a very small extent.

As predicted earlier, there exists a significant negative relationship between employment and fertility among BFP beneficiaries in both models. One explanation for this is that wage-earning potential raises the opportunity cost of having a child and thus reduces fertility. The employment coefficient is relatively large – employed women have on average -.546 and -.537 children compared to non employed women in the model without interactions compared to the model with interactions, respectively. However, the number of working hours was insignificant, indicating that the tradeoff between hours spent on childrearing and hours spent in wage-earning activities might not be very strong. Related to employment is the variable *Log Income*, which is positive and significant in both models. As income increases, a female is more likely to have additional children. This finding supports the Beckarian model, which predicts that fertility increases when income rises because the income elasticity of demand for the quantity of children, ε_n is positive. Given that the income elasticity of demand for quality, ε_q is greater than ε_n, then income increase may result in relatively high improvements in child quality.

The variable *Urban* can be considered a determinant of fertility among BFP beneficiaries, as it is significant and negative in both models. Consistent with this paper's predictions, urban families are expected to have between .212 to .217 fewer children on average, all else equal. Such trends are reflected in the literature, which finds that rural families have higher fertility because the net benefit for each marginal child is higher than that for urban families, particularly for poor families. Of the five geographic regions, none came significant in either model. Although the regions exhibit significantly different fertility patterns in the overall sample, they do not prove significant among the group of BFP beneficiaries.

The race variable uses *White* as a reference group, as it is associated with the lowest fertility rate. As such, Section 4 predicted that all other races would have positive coefficients relative to the reference. The first model shows *Black*, *Brown*, and *Indigenous* as significant with positive coefficients:.444, .166, and .906 respectively. Although the first model in Table (5)'s output is similar to the predictions provided in Section 4, second model's findings are quite different. In model 6 the group *Yellow* is the only significant variable, and the sign is negative relative to the reference group. The difference between the two models is that model 6 includes interaction variables between race and region as potential determinants of fertility. An interaction term between region and race captures the effect of region on fertility. This emphasizes the fact that race and region are related in Brazil, among the group of BFP beneficiaries.

Section 4 predicted that couples would have more children than single parents, as couples are able to share the upbringing cost of children, making each marginal child relatively cheaper for each individual. The *Couple with Child* variable proves very significant and positive for both models, with 1.14 children more than the reference group on average. However, such predictions did not hold with respect to marital status. Not one variable that designated marital status proved significant. As such, these variables, according to this model, are not significant determinants of fertility among the BFP participants. Measures of religiosity produce like results. Although this paper predicted that religious affiliation would prove a significant explanatory variable in fertility determination, the analysis finds that none of the four categories are significant. This finding is surprising, because in the larger sample, religious couples tend to have more children on average than non-religious couples.

Lastly, this study analyzes whether access to technology affects fertility decisions. Access to Internet and cell phone are significant and negative in the first model, implying that technological access may decrease fertility among the BFP population. Such an outcome was predicted in Section 4, as Brazil's Ministry of Health initiatives have promoted family planning, reproductive education, and contraceptive availability through online and social media channels. Nonetheless, the second model includes interaction variables between age and technology. Inclusion of the interaction variables renders *Cell Phone* and *Internet* insignificant. However, in Table (8), interaction variables *Techage2XInternet*, *Techage1XCell,* and *Techage2XCell* are significant. As such, even though *Internet* or *Cell Phone* are not significant variables by themselves, when age is also a factor, they become significant. *Techage1* captures respondents between age 11 and 25 and *Techage2* corresponds to respondents between age 26 and 40. As such, fertility decreases significantly among women ages 26 to 40 that have Internet access. Further, cell phone ownership is a significant factor in reducing fertility among women between age 11 and 40.

Much of the current literature focuses on the demographic transition and the proximate determinants of fertility among entire populations. This study limits its scope on a smaller scale by analyzing strictly participants in the Bolsa Família Program. Using a Multiple Linear

Regression model, this paper tests several explanatory variables that may influence fertility among this group, including age, education, employment status, income, infant mortality, urban or rural location, race, family type, and access to technology. Identification of these variables is necessary for policymakers when they consider the demographic composition of BFP recipients and how they respond when these variables change. Policymakers may influence fertility rates among BFP beneficiaries by focusing resources to affect these particular variables. The next section discusses the policy implications of these findings in greater detail and concludes with recommendations for future research.

6.0 CONCLUSIONS AND POLICY IMPLICATIONS

The purpose of this study is to identify the determinants of fertility among participants in Brazil's Bolsa Família Program. Previously, much of the literature attempted to determine the proximate determinants of fertility in developing countries. This study tests several of the previously identified variables in the literature including education, income, employment, age, infant mortality and whether an individual lives in an urban or rural setting. Contrary to previous findings of the literature, this study found that marital status and religiosity are not significant in influencing household fertility decisions among BFP participants. However, this paper identified several variables that significantly influenced fertility among female BFP beneficiaries. These variables include age, education, employment status, income, infant mortality rate, whether a respondent lived in an urban or rural area, and Internet access and cell phone ownership among certain age groups.

The statistical analysis of the 2011 PNAD survey included in this paper allows policymakers to better understand how fertility varies among different socio-demographic groups that participate in the BFP.

For example, one significant determinate of fertility among the BFP population is employment. If a woman is employed, she is likely to produce fewer children than an equivalent woman that is unemployed or out of the labor force. If policymakers were to enact legislations or policies in favor of lower rates of fertility among women enrolled in the BFP, then employment policies would best achieve this goal. Under Becker's theory, decreased fertility (quantity) would be met with increased human capital (quality) for her existing children. Given that the BFP intends to raise long-term human capital, policy that reduces fertility through one of the significant variables found in this study will indirectly increase child quality and help the Program achieve its goals. One example is access to technology. As section 5 discussed, cell phone ownership and access to the Internet is a significant factor among age 11 to 40 and age 26 to 40, respectively. If policymakers were to increase access of these technologies among BFP beneficiaries that belong to these age groups using subsidies, they may observe a decrease in fertility among this group. Such a decrease in the quantity of children due to technology could lead these parents to invest relatively more in their child's quality.

It is important to remember the results found in this paper only apply to the population of BFP beneficiaries in Brazil. Despite the recent popularity of CCT programs in the developing world, this study lacks external validity. As such, a topic for future research would be to examine the variables that affect fertility among CCT participants in other country contexts. Such research would allow scholars to draw broader implications on fertility in the developing world. Future research should also consider using a data from a survey that has an explicit question about the Bosla Família Program, rather than generating a best estimate. Moreover, the 2011 PNAD did not include detailed information about the children that benefited from the BFP, nor their education level or health status. The data only identified whether a child was male or female and resided within a student's age range (ages 5 to 17). further research could strengthen and build upon this paper's results. it would allow researchers to draw even stronger conclusions about fertility decisions. As a note, the 2004 and 2006 PNAD surveys included a supplement on CCT programs in Brazil, but no subsequent PNAD surveys have.

A significant limitation of this study is the fact that PNAD provides only cross sectional data. Fertility is a dynamic process that takes place over time. Further, BFP beneficiaries sometimes drop out and reenroll in the Program. Panel data would allow researchers to identify common characteristics of households that exhibit certain traits over time (such as dis- and re-enrollment) and track the life cycle determinants of fertility of the BFP population over time.

APPENDIX A

Bolsa Família Program Payment Schedule

No. Children	No. Children 16-17	Familiar Per Capita Income:	
<15 Years Old	**Years Old**	<R$70.00	R$70 - 140
(Variable)	**(BVJ**	**Monthly Stipend**	
0	0	R$70.00	-
1	0	R$102.00	R$32.00
2	0	R$134.00	R$64.00
3	0	R$166.00	R$96.00
4	0	R$198.00	R$128.00
5	0	R$230.00	R$160.00
0	1	R$108.00	R$38.00
1	1	R$140.00	R$70.00
2	1	R$172.00	R$102.00
3	1	R$204.00	R$134.00
4	1	R$236.00	R$166.00
5	1	R$268.00	R$198.00
0	2	R$146.00	R$76.00
1	2	R$178.00	R$108.00
2	2	R$210.00	R$140.00
3	2	R$242.00	R$172.00
4	2	R$274.00	R$204.00
5	2	R$306.00	R$236.00

Table 6. Bolsa Família Payment Schedule

Source: Ministério do Desenvolvimento Social e Combate à Fome, 2013

	Without Interaction Variables			With Interaction Variables		
	1	2	3	4	5	6
VARIABLES	children	children	children	children	children	children
Age						
11 - 15 years		Omitted			Omitted	
16 - 20 years	-0.459***	-0.431***	-0.430***	-0.454***	-0.447***	-0.447***
	(0.106)	(0.110)	(0.108)	(0.112)	(0.111)	(0.113)
21 - 25 years		Reference Group			Reference Group	
26 - 30 years	0.411***	0.415***	0.417***	0.429***	0.424***	0.418***
	(0.0885)	(0.0878)	(0.0884)	(0.107)	(0.107)	(0.107)
31 - 35 years	0.731***	0.728***	0.724***	0.750***	0.747***	0.735***
	(0.0943)	(0.0950)	(0.0953)	(0.110)	(0.110)	(0.111)
36 - 40 years	0.943***	0.920***	0.929***	0.961***	0.950***	0.955***
	(0.105)	(0.107)	(0.106)	(0.122)	(0.126)	(0.125)
41 - 45 years	0.637***	0.578***	0.610***	0.563***	0.517***	0.537***
	(0.127)	(0.129)	(0.128)	(0.153)	(0.160)	(0.160)
46 - 50 years	0.430**	0.415**	0.419**	0.372*	0.351*	0.352*
	(0.167)	(0.171)	(0.170)	(0.196)	(0.202)	(0.202)
Education (Years)	-0.0577***	-0.0521***	-0.0514***	-0.0499***	-0.0524***	-0.0500***
	(0.00959)	(0.0101)	(0.00992)	(0.0100)	(0.0101)	(0.0101)
Employed	-0.553***	-0.572***	-0.546***	-0.534***	-0.554***	-0.537***
	(0.126)	(0.124)	(0.126)	(0.124)	(0.123)	(0.125)
Hours Worked	-0.0141	-0.0224	-0.0146	-0.0134	-0.0131	-0.0108
	(0.032)	(0.033)	(0.033)	(0.0325)	(0.0325)	(0.0328)
Log Income	0.915***	0.923***	0.935***	0.930***	0.894***	0.931***
	(0.103)	(0.098)	(0.107)	(0.107)	(0.0985)	(0.108)
Infant Mortality	0.249***	0.245***	0.247***	0.253***	0.250***	0.252***
	(0.061)	(0.064)	(0.063)	(0.0641)	(0.0625)	(0.0628)
Region						
Urban	-0.282***		-0.212**	-0.289***		-0.217**
	(0.088)		(0.089)	(0.089)		(0.090)
North	0.242*		0.207	-0.679		-0.72
	(0.144)		(0.146)	(0.845)		(0.842)
Northeast	-0.108		-0.129	0.257		0.114
	(0.129)		(0.130)	(0.277)		(0.288)
South		Reference Group			Reference Group	
Southeast	0.0941		0.0811	-0.558		-0.568
	(0.157)		(0.158)	(0.848)		(0.848)
Centerwest	0.00415		0.00218	-0.328		-0.255
	(0.199)		(0.200)	(0.412)		(0.423)
Race / Color						
White		Reference Group			Reference Group	
Black	0.433***	0.426***	0.444***	1.140	1.105	1.141
	(0.124)	(0.123)	(0.124)	(0.868)	(0.883)	(0.873)
Brown	0.172**	0.163**	0.166**	-0.146	-0.152	-0.146
	(0.075)	(0.074)	(0.075)	(0.419)	(0.435)	(0.423)
Yellow	-0.365*	-0.363*	-0.307	-0.644	0.649*	-0.657
	(0.202)	(0.214)	(0.195)	(0.403)	(0.391)	(0.406)
Indigenous	0.879*	0.964*	0.906*	1.163	0.233	1.172
	(0.533)	(0.519)	(0.533)	(0.933)	(0.472)	(0.939)
Family Type						
Single Mother	0.498	0.797**	0.666	0.540	0.675*	0.626
	(0.396)	(0.390)	(0.424)	(0.382)	(0.399)	(0.432)
Couple w/ Child	1.132***	1.253***	1.137***	1.137***	1.151***	1.112***
	(0.394)	(0.338)	(0.373)	(0.381)	(0.346)	(0.381)
Other Type		Reference Group			Reference Group	
Marrital Status						
Single	0.0626	-0.125	-0.0664	0.0557	-0.125	-0.0501
	(0.100)	(0.235)	(0.239)	(0.100)	(0.238)	(0.242)
Married	-0.0751	-0.3	-0.228	-0.0779	-0.280	-0.209
	(0.139)	(0.252)	(0.256)	(0.140)	(0.258)	(0.261)
Separated	0.323	0.128	0.185	0.318	0.149	0.216
	(0.210)	(0.289)	(0.291)	(0.207)	(0.292)	(0.295)
Divorced	-0.158	-0.357	-0.278	-0.161	-0.357	-0.269
	(0.195)	(0.281)	(0.287)	(0.197)	(0.292)	(0.294)
Widow		Reference Group			Reference Group	
Marriage Type (Religiosity)						
Religious		0.328	0.27		0.316	0.240
		(0.248)	(0.250)		(0.253)	(0.254)
Civil		0.0281	0.0464		0.0162	0.0451
		(0.155)	(0.157)		(0.159)	(0.159)
Union		0.17	0.122		0.138	0.0990
		(0.206)	(0.211)		(0.211)	(0.214)
Religious & Civil		Reference Group			Reference Group	
Technology						
Internet		-0.212**	-0.189*		0.444	0.483
		(0.100)	(0.100)		(0.680)	(0.684)
Cell Phone		-0.210***	-0.148*		0.0390	0.0615
		(0.067)	(0.069)		(0.284)	(0.285)
Constant	-2.761***	-2.954***	-2.876***	-2.761***	-2.638***	-2.740***
	(0.814)	(0.790)	(0.821)	(0.905)	(0.900)	(0.910)
Observations	1746	1746	1746	1,746	1,746	1,746
R-squared	0.293	0.288	0.297	0.303	0.301	0.304

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 7. Regression Models 1 - 6

Interaction Variables	4	5	6
BrownXNorth	1.238	0.534**	1.240
	(0.875)	(0.249)	(0.876)
BrownXNortheast	0.0139	0.128	0.000632
	(0.386)	(0.241)	(0.388)
BrownXSouth	0.464	0.498	0.466
	(0.361)	(0.359)	(0.364)
BrownXSoutheast	0.795	0.248	0.781
	(0.882)	(0.275)	(0.885)
BrownXCenterwest	0.598	0.335	0.589
	(0.519)	(0.309)	(0.522)
WhiteXNorth	0.761	0.0552	0.757
	(0.926)	(0.409)	(0.930)
WhiteXNortheast	-0.247	-0.147	-0.264
	(0.480)	(0.380)	(0.484)
WhiteXSouth	-0.262	-0.232	-0.261
	(0.388)	(0.403)	(0.391)
WhiteXSoutheast	0.602	0.0381	0.590
	(0.928)	(0.408)	(0.933)
WhiteXCenterwest		-0.278	
		(0.438)	
BlackXNorth		-0.699	
		(0.846)	
BlackXNortheast	-1.038	-0.897	-1.050
	(0.850)	(0.810)	(0.855)
BlackXSouth	-0.807	-0.812	-0.841
	(0.857)	(0.867)	(0.863)
BlackXSoutheast		-0.515	
		(0.846)	
BlackXCenterwest	-0.795	-1.061	-0.787
	(0.958)	(0.863)	(0.962)
YellowXNorth	2.006**		2.033**
	(0.869)		(0.869)
YellowXNortheast		-1.251***	
		(0.238)	
YellowXSouth		-1.312***	
		(0.233)	
YellowXSoutheast			
YellowXCenterwest			
IndigenousXNorth			
IndigenousXNortheast		1.060	
		(0.851)	
IndigenousXSouth			
IndigenousXSoutheast			
IndigenousXCenterwest			
Techage1XInternet	-0.0492	-0.546	-0.534
	(0.139)	(0.685)	(0.691)
Techage2XInternet	-0.217*	-0.668	-0.680
	(0.126)	(0.658)	(0.664)
Techage3XInternet	-0.183	-0.561	-0.545
	(0.269)	(0.621)	(0.627)
Techage1XCellPhone	-0.209*	-0.289	-0.268
	(0.113)	(0.303)	(0.304)
Techage2XCellPhone	-0.192**	-0.265	-0.242
	(0.0874)	(0.286)	(0.286)
Techage3XCellPhone	-0.0755	-0.127	-0.105
	(0.146)	(0.227)	(0.228)
Observations	1,746	1,746	1,746
R-squared	0.303	0.301	0.304

Standard Error in Paranthesis
*** p<0.01, ** p<0.05, * p<0.1

Table 8. Regression Results for Interaction Variables in Models 4 - 6

BIBLIOGRAPHY

Andrade, M. V., Chein, F. and Ribas, R. P. 2007. “Políticas de Transferência de Renda e Condição Nutricional de Crianças: Uma Avaliação do Bolsa Família”. Cedeplar Discussion Text Series, No. 312. Belo Horizonte, Cedeplar.

Barro, Robert and Gary S. Becker. 1989. “Fertility Choice in a Model of Economic Growth.” Econometrica 57 (2): 481–501.

Barros, Ricardo Paes, Mirela de Carvalho, and Samuel Franco. 2007. “O Papel das Transferências Públicas na Queda Recente da Desigualdade de Renda Brasileira.” In Desigualdade de Renda no Brasil: uma análise da queda recente, edited by Ricardo Paes de Barros, Miguel Nathan Foguel, and Gabriel Ulyssea, Chapter 16, Volume 2. Brasília: IPEA.

Basu, Alaka Malwade. 2002. "Why does Education Lead to Lower Fertility? A Critical Review of Some of the Possibilities." World Development, 30(10): 1779-1790.

Baughman, Reagan and Stacy Dickert-Conlin. 2009. "The Earned Income Tax Credit and Fertility." *Journal of Population Economics* 22: 537-563.

Becker, Gary. 1960. "An Economic Analysis of Fertility, in Demographic and Economic Change in Developed Countries." Conference of the Universities, National Bureau Committee for Economic Research, Princeton University Press, Princeton, pp. 209-240.

Becker, Gary S., and H. Gregg Lewis. (1973). “On the Interaction between the Quantity and Quality of Children.” *Journal of Political Economy* 81: S279-S288.

Becker, Gary. 1991. *A Treatise on the Family*. Cambridge: Harvard University Press.

Bernhardt, Eva M. 1991. "Fertility and Employment." European Sociological Review 9 (1): 25-42.

Black, Dan A., Natalia Kolesnikova, Seth G. Sanders, and Lowell J. Taylor. (Forthcoming). “Are Children ’Normal’*?*” *Review of Economics and Statistics*.

Bongaarts, John. 1978. “A Framework for Analyzing the Proximate Determinants of Fertility.” *Population and Development Review*, 4: 105-12.

Bongaarts, John. 1987. “The Proximate Determinants of Exceptionally High Fertility.” *Population Development and Review*, 13(1): 133-139.

Brewer, Mike, Anita Ratcliffe, and Sarah Smith. 2010. “Does Welfare Reform Affect Fertility? Evidence from the UK.” *Journal of Population Economics*, 25: 245-266.

Cohen, Alma, Rajeev Dehejia, and Dimitri Romanov. 2007. "Do Financial Incentives Affect Fertility?" *NBER* Working Paper 13700.

Craig, Lee. 1990. "Farm Output, Productivity, and Fertility Decline in the Antebellum Northern United States." Journal of Economic History, 50 (2): 432-434.

Del Boca, Daniel, Silvia Pasqua, and Chiara Pronzato. 2003. " Analyzing Women's Employment and Fertility in Europe: Differences and Similarities in Northern and Southern Europe." Center for Household, Income, Labor, and Demographic Economics.

Diniz, Simone G, Ana Flávia Pires Lucas d'Oliveira, and Sonia Lansky. 2012. "Equity and Women's Health Services for Contraception, Abortion, and Childbirth in Brazil." *Reproductive Health Matters* 20: 94-101.

Fiszbein, Ariel and Norbert Schady. 2009. *Conditional Cash Transfers for Attacking Present and Future Poverty*. Policy Research Report. World Bank: Washington DC.

Foster, Andrew and Mark R. Rosenzweig. 2006. “Does Economic Growth Reduce Fertility? Rural India 1971-1999.” NCAER India Policy Forum, Delhi, India.

Furuoka, Fumitaka. 2009. "Looking for a J-Shaped Development-Fertility Relationship: Do Advances in Development Really Reverse Fertility Declines?" *Economics Bulletin*, 29: 3067-3074.

Glassman, Amanda, Jessica Todd and Marie Gaarder. 2009. “Latin America: Cash Transfers to Support Better Household Decisions.” Ch. 6 in *Performance Incentives for Global Health: Potential and Pitfalls*, edited by Rena Eichler, Ruth Levine and the Performance-Based Incentives Working Group. Washington, DC: Center for Global Development.

Glewwe, P. and Kassouf, A. L. 2008. “The Impact of the Bolsa Escola/Familia Conditional Cash Transfer Programs on Enrollment, Grade Promotion and Drop out Rates in Brazil” Anais do XXXVIII Encontro Nacional de Economia. Salvador, Anpec.

Handa, Sudhandhu and Benjamin Davis. 2006. “The Experience of Conditional Cash Transfers in Latin America and the Caribbean.” *Development Policy Review*, 24(5): 513-536.

Higgins, Sean. 2012. “The Impact of Bolsa Família on Poverty: Does Brazil’s Conditional Cash Transfer Program Have a Rural Bias?” *Journal of Politics and Society*, 23 (1): 88-125.

Hotz, V. Joseph, Jacob Alex Klerman, and Robert J. Willis. 1997. “The Economics of Fertility in Developed Countries.” in *Handbook of Population and Family Economics*, edited by Mark R. Rosenzweig and Oded Stark, 275-347. Amsterdam: Elsevier Science.

Instituto Brasileiro de Geografia e Estatística. 2010. "Síntese de Indicadores Sociais: Uma Análise das Condições de Vida." Ministério do Planejamento, Orçamento e Gestão, Instituto Brasileiro de Geografia e Estatística: Rio de Janeiro.

La Ferrara E, Chong A, Duryea S. 2008. “Soap Operas and Fertility: Evidence from Brazil”. Washington, DC: Inter-American Development Bank.

Laroque, G. and B. Salanie. 2005. “Does Fertility Respond to Financial Incentives?,” CEPR Discussion Paper Series, No. 5007. London: Centre for Economic Policy Research.

Li, Hongbin, Junsen Zhang, and Yi Zhu. 2008. "The Quantity-Quality Trade-Off of Children in a Developing Country: Identification using Chiense Twins." Demography, 45(1): 223-243.

Lindert, Kathy, Anja Linder, Jason Hobbs and Bénédicte de la Brière. 2007. “The Nuts and Bolts of Brazil’s Bolsa Familia Program: Implementing Conditional Cash Transfers in a Decentralized Context.” Wolrd Bank Social Protection Working Paper No. 0709.

Martin, Teresa Castro and Fatima Juarez. 1995. "The Impact of Women's Education on Fertility in Latin America: Searching for Explanations." *International Family Planning Perspectives,* 21(2): 52-57 & 80.

Ministério do Desenvolvimento Social e Combate à Fome. "Valores dos Benefícios". Accessed December 10, 2012. http://www.mds.gov.br/bolsafamilia/valores-dos-beneficios

Moffitt, Robert A. 1997. "The Effect of Welfare on Marriage and Fertility: What Do We Know and What Do We Need to Know?" Discussion Paper no. 1153–97, Institute for Research on Poverty, Johns Hopkins University.

Moreno, Lorenzo. 1991. “An Alternative Model of the Impact of Proximate Determinants on Fertility Change: Evidence from Latin America.” *Population Studies*, 45: 313-337.

Myrskylä, Mikko, Hans-Peter Kohler, and Francesco C. Billari. 2009. "Advances in Development Reverse Fertility Declines." *Nature* 460: 741-743.

Ogland, Curtis P. and Ana Paula Verona. 2011. “Religion and Attitudes Toward Abortion and Abortion Policy in Brazil.” *Journal for the Scientific Study of Religion* 50(4): 812-821.

Perova, Elizaveta. 2010 “Three Essays on Intended and not Intended Impacts of Conditional Cash Transfers.” PhD diss., University of California, Berkeley.

Pörtner, Claus Chr. 2001. “Children as insurance”. Journal of Population Economics. 14: 139-146.

Rawlings, Laura B., and G. M. Rubio. 2003. “Evaluating the Impact of Conditional Cash Transfer Programs: Lessons from Latin America.” Washington: World Bank.

Rocha, Romero. 2010. “Programas Condicionais de Transferência de Renda e Fecundidade: Evidências do Bolsa Família.” Presented at the 31st Encontro Brasileiro de Econometria.

Rosenzweig, Mark R. and Kenneth I. Wolpin 1980. "Testing the Quantity-Quality Fertility Model: The Use of Twins as a Natural Experiment." *Econometrica*, 48 (1): 227-240.

Salihu, Hamisu M, Nicole M. Shumpert, Martha Slay, Russell Kirby, and Greg R. Alexander. 2003. "Childbearing Beyond Maternal Age 50 and Fetal Outcomes in the United States." *Obstetrics & Gynecology*, 102 (5): 1006-1014.

Schellekens, Jona. 2009. "Family Allowances and Fertility: Socioeconomic Differences." *Demography* 46(3): 451-468.

Schultz, Paul. 1997. "The Demand for Children in Low-Income Countries." In Handbook of Population and Family Economics. Edited by M. R. Rosenzweig and O. Stark. Vol. 1A, chap. 8. Amsterdam: North-Holland.

Schulz, T. Paul. 2001. "School Subsidies for the Poor: Evaluating the Mexican Progresa Poverty Program." Center Discussion Paper 834, Economic Growth Center.

Signorini, Bruna A., and Bernardo L. Queiroz. 2011. "The Impact of Bolsa Família in the Beneficiary Fertility." Universidade Federal de Minas Gerais Cedeplar Discussion Text No. 439.

Silveira Neto, R. M. 2010. "O Impacto do Programa Bolsa Família Sobre a Frequência à Escola: Estimativas a Partir de Informações da Pesquisa Nacional por Amostra de Domicílios (PNAD)". Bolsa Família 2003–2010: Avanços e Desafios Volume 2. Brasília, Ipea, 53–71.

Simões, Patrícia and Ricardo B. Soares. 2012. "Efeitos do Programa Bolsa Família na Fecundidade das Beneficárias." *Revista Brasileira de Economia*, 66(4): 445-68.

Soares, F. V., Ribas, R. P. and Osório, R. G. 2010. "Evaluating the Impact of Brazil's Bolsa Família: Conditional Cash Transfers in Perspective". Latin American Research Review. 45(2): 173–190

Soares, S. and Sátyro, N. 2010. "O Programa Bolsa Família: Desenho Institucional, Impactos e Posibilidades Futuras". Ipea Discussion Text Series, No. 1424. Brasília, Ipea.

Stecklov, Guy, Paul Winters, Jessica Todd, and Ferdinando Regalía. 2006. "Demographic Externalities from Poverty Programs in Developing Countries: Experimental Evidence from Latin America." Department of Economics Working Paper Series No. 2006-1. American University, Washington DC.

Stecklov, Guy, Paul Winters, Jessica Todd, and Ferdinando Regalía. 2007. "Unintended Effects of Poverty Programmes on Childbearing in Less Developed Countries: Experimental Evidence from Latin America." *Population Studies*, 61(2): 125–140.

Todd, Jessica E., Paul Winters, and Guy Stecklov. 2012. "Evaluating the Impact of Conditional Cash Transfer Programs on Fertility: The Case of the *Red de Protección Social* in Nicaragua." *Journal of Population Economics*, 25: 267-290.

Todd, Petra E., and Kenneth I. Wolpin. 2006. "Assessing the Impact of a School Subsidy Program in Mexico: Using a Social Experiment to Validate a Dynamic Behavioral Model of Child Schooling and Fertility." *American Economic Review*, 96(5): 1384-1417.

Yap, Yoon-Tien, Guilherme Sedlacek, and Peter Orazem. 2001. "Limiting Child Labor Through Behavior-Based Income Transfers: An Experimental Evaluation of the PETI Program in Rural Brazil." World Bank, Washington, D.C.