

Contraception Employed:
Using Economic Models to Predict the Effect of
Employment on Condom Usage in Brazil

Seth Merkin Morokoff

Princeton University

May 2015

Abstract

Two separate theoretical frameworks suggest that employment may have a negative directional effect on the probability of condom usage in the developing world. However, this prediction initially seems counterintuitive. Due to the dearth of literature predicting condom usage in Brazil, despite its high incidence of HIV infection, I examine the estimated effects of various measures of employment on condom usage at last intercourse for both men and women. Using data from the 1996 Demographic and Health Survey, I estimate the effects of current employment and year-round employment on the probability of men using a condom at last intercourse as well as the effects of current employment, earning income through formal or informal work, and working outside of the home on the likelihood of women using a condom at last intercourse. I find that year-round employment decreases the likelihood of men using a condom at last intercourse by 31%. Further, working outside of the home increases the probability of women using a condom at last intercourse by 22%.

1 Introduction

The Brazilian National AIDS Program has been widely lauded as the leading example of an institutionalized strategy against HIV/AIDS in a middle-income country by various news outlets, non-governmental organizations, policymakers, and academics. Much of the praise focuses on the country's landmark 1996 decision to provide free universal antiretroviral therapy to any HIV-positive resident. However, prevention of HIV transmission through improved sexual education and promotion of safer sexual health behaviors that limit risk exposure (i.e., the proliferation of condom use) still plays a critical—if less exciting—role. Okie (2006) explains that widespread condom usage in a population not only cuts treatment costs for the government, but mathematical models predict that delivering large-scale antiretroviral treatment without effective prevention measures would worsen the AIDS epidemic in many countries due to the existence of healthy vectors in the population who can live normally with treatment but continue to transmit the virus.

Despite the successful proliferation of condom usage among the Brazilian population, with the rate of individuals reporting condom use at first sexual intercourse rising from 4% in 1986 to 48% in 1999 (Brazilian Ministry of Health, 2003), few studies focus on what factors predict condom use among a nationally representative sample. Two separate investigators who conducted recent studies on condom usage in Brazil cite a lack of national studies and a lack of attention paid to male sexual behavior in the literature focused on Brazilian sexual behavior (Calazans *et al*, 2005 and Merchan-Haman *et al*, 2002). In those studies that do exist, income and education are perhaps the strongest and most consistent correlates of condom usage. However, little analysis of the effect of employment on condom use has been conducted despite two prominent theoretical frameworks suggesting employment may have a negative directional effect on the probability of condom usage in the developing world—a prediction that feels counterintuitive and seems problematic for continued development.

The desired fertility model presented by Pritchett (1994) suggests that individuals in the developing world act rationally to achieve fertility targets based upon the utility they derive from having children and monetary or temporal constraints limiting the number of children they can

afford. In this model, stable employment would decrease rates of condom usage due to reduced fears of uncertainty regarding future employment increasing desired fertility or relaxing the budget constraint placed upon fertility and increasing the number of children affordable to the individual. In contrast, the family planning gap theory argued by Bongaarts and Sinding (2009) suggests many individuals in the developing world lack access to contraception. Therefore, people with greater resources necessary to obtain contraception including money, transportation, and time are more likely to use contraception. After controlling for income in this model, full-time employment would also decrease the rate of condom usage due to the workday diminishing the amount of time individuals have to procure contraception. I test these theories by estimating the effects of various measures of employment on the likelihood of condom use at last intercourse.

Using nationally representative data from the 1996 Demographic and Health Survey, I create probit models to analyze a sample of sexually active men and women of reproductive age who are not otherwise impeded from conceiving a child through sterilization; infecundity; or, in the case of women, current pregnancy. Reproductive age for women is defined as age 15 through 45 based on the background literature. No such age restriction exists for the male sample, which includes individuals between age 15 and 59. Individuals in the analysis sample are also not currently attending school. A full derivation of the analysis sample is presented in the data section of the paper.

I find that two measures of employment are consistently significant across all iterations of the model: year round employment for men and working outside the home for women. As predicted by the economic theory, year round employment has a negative association with condom use at last intercourse and decreases the likelihood of a man using a condom by 31%. However, working outside the home has a positive association with condom usage at last intercourse, increasing the probability of a woman using a condom by 22%. Finally, I check the robustness of the employment coefficients by controlling for a separate mechanism in which risky sexual behavior prompts individuals to use condoms with greater frequency.

2 Background

2.1 Specifics of the Brazilian Context

Several factors make Brazil a unique context to examine condom usage and sexual health behavior. The three primary factors repeated in the literature are: (1) the decentralized nature of the HIV/AIDS program which focuses on community-based strategies rather than national federal policy, (2) the legal status of prostitution and sex work which increases the number of members in at-risk populations but also increases their visibility, and (3) the overwhelming majority of the population that identifies as Roman Catholic - a religion that officially condemned condom usage during the period of when the DHS data were collected. A final consideration is the availability of condoms to Brazilian consumers and their preferences regarding alternate forms of contraception.

Gómez (2010) writes that the Brazilian Ministry of Health began to promote decentralization within its National AIDS Program in the 1990s. In 1994 under the administration of a new president focused on building Brazil's international reputation by successfully responding to the AIDS crisis, the country began receiving loans from the World Bank to execute HIV prevention policy. The federal government distributed that money to states which implemented regional policies. However, aware of the fact that a number of states had proven incapable of rendering effective HIV prevention policy, the Ministry of Health also pursued formal partnerships with NGOs to supplement funds and revamp strategy in the regions making the least progress. Further, Levi and Vitória (2002) write that certain policies focus exclusively on specific municipalities and cities. For instance, one major use of funding in Rio de Janeiro—the second largest city in Brazil—is free condom distribution and HIV prevention campaigns during Carnival. Therefore, while models of condom usage in Brazil including state indicators as part of a geographic fixed effects model to avoid problems of endogeneity through controlling for omitted factors specific to certain areas of Brazil ought to be considered, state indicators may over-control for condom availability since HIV-prevention policy is determined at the state level. The majority of the economic literature related to Brazilian condom usage fails to test models with state indicators because most of the studies only analyze data from one city.

A second consideration comes with the legal status of prostitution in Brazil. Okie (2006) writes that by 2001, due to targeted efforts by the National AIDS Program, 74 percent of Brazilian sex workers reported consistent use of condoms with clients. The prevalence of HIV infection among female sex workers has remained low and stable for an at-risk population. According to a 2005 report by the Brazilian Ministry of Health, about six percent of female sex workers are infected with HIV. Evidence from studies of health economics indicates that Brazilian sex workers are rational economic actors. Miranda *et al* (2011) find commercial sex workers were 9.01 times more likely to have used a condom at last sexual intercourse than other women in a logistic regression model of women under 30 years old in Vitória, Brazil. Shah (2013) finds that male sex workers within developing regions of Latin America demonstrate rational economic behavior by charging a compensating differential for disease risk for unprotected sex in areas with high STI prevalence. Certain states within Brazil have notably higher rates of HIV prevalence than others. Specifically, states in the Northern, Northeastern, and Southern regions of Brazil have consistently exhibited higher rates of HIV than states in other regions, and those in the Southeastern region exhibit much lower rates of HIV prevalence (United Nations General Assembly Progress Report, 2012). Therefore, clear regional differences in STI prevalence present the possibility to control for endogeneity with state indicators, although the potential for state indicators to over-control remains present.

The third consideration related to condom usage in Brazil is the strength of the Roman Catholic Church in society. 74% of Brazilians identify as Roman Catholic, in a 2007 census conducted by the Brazilian Institute of Geography and Statistics. Martine (1996) provides a history of the key factors in Brazil's declining fertility. He writes in the mid-1980s the Catholic Church began to support natural methods of contraception, which steered women towards sterilization and illegal abortions. However, liberal factions of practitioners of Catholicism began to clash with the traditional leadership by counseling community members to use methods like the birth control pill and condoms. In an overview of Brazilian HIV policy, Levi and Vitória (2002) find that during the 1990s religious associations began to partner with community groups and NGOs to form civil society organizations that focused on the prevention of HIV, thereby partially removing the stigma associated with condom usage within the Catholic community of Brazil. Despite the official stance

of the Church against condoms, Calazans *et al* (2005), Gupta (2000), Juarez and LeGrand (2005), and Juarez and Martin (2006) all estimate being Catholic has a positive effect on condom usage either at last sexual intercourse or first sexual intercourse, depending on the paper.

The final consideration concerns the availability of condoms to Brazilian consumers and their preferences regarding alternate forms of contraception. Condoms carried significant monetary cost for those in low income brackets in Brazil relative to necessary goods like food and other forms of contraception like sterilization. As mentioned, Martine (1996) finds that female sterilization was the most widely used method of birth control through the mid-1980s with women often consenting to sterilization to reduce their lifetime fertility. Sterilization was also practiced involuntarily as part of caesarian section deliveries on women from favela slum areas who had already birthed three children. However, beginning in the 1970s, fertility rates were already in rapid decline, and contraceptives—notably the birth control pill—were widely available for those who could afford them. Gómez (2010) argues that condom usage would not proliferate among the general population until 1994, when a new Brazilian president promoted HIV prevention policy. Statistics comparing studies by the Brazilian Ministry of Health over time show that while only four percent of the Brazilian population had used a condom during their first sexual encounter in 1986, that rate had increased to 48% in 1999. Martine (1998) adds a description of the three varieties of condom available in Brazil during the 1990s: imported condoms, Jontex condoms produced in Brazil under a license from Johnson and Johnson, and local brands of condoms. Imported condoms did not represent a significant portion of the market, and were sold only in specialty shops. Jontex condoms were widely available in supermarkets and pharmacies, but cost more than \$1 USD apiece—a price that was prohibitively expensive for those Brazilians living in favela slums. In neighborhood pharmacies, the local brands were available within the price range of the favelados. However, quality control was inconsistent, and the condoms were prone to breaking. Therefore, the proliferation of free government-sponsored health clinics during the 1990s, which supplied Jontex condoms as part of their HIV prevention strategy, greatly increased condom usage, especially in the lower socio-economic classes. Juarez and Martin (2006) note that even in their study of low-income adolescent males from slum areas of Brazil using data from 2000, less than one percent of respondents described

condoms as prohibitively expensive or unavailable, meaning condoms were widely available to those who wanted them during the period.

2.2 Review of Past Literature Modeling Condom Usage in Brazil

Calazans *et al* (2005), Merchan-Hamann *et al* (2002), and Miranda *et al* (2011) are the only three studies out of the seven reviewed that use current employment of the individual survey respondent as a covariate in their models. Calazans *et al.* (2005) find a statistically significant positive association between having never worked and lack of condom usage at last intercourse when using current employment as the reference category; this corresponds to a negative association between never having worked and condom use at last intercourse—the dependent variable most commonly used in the literature. Merchan-Hamann *et al* (2002) find current employment has no effect on the dependent variable “risky sexual behavior,” which the authors define as less than a frequent level of condom usage (frequency of condom use is self-reported in their survey as always, frequent, occasional, or rarely/never). Miranda *et al* (2011) initially find a slight negative association between formal employment (defined as either part-time or full-time income-generating work) and condom use at last intercourse using not being employed as the reference; however, the variable is not statistically significant, and the investigators drop it from subsequent models.

The conflicting direction of the results acts as motivation to further investigate the effect of employment on condom use at last intercourse. Further, each of the studies only includes current employment as a covariate, whereas other aspects of employment such as working full-time versus part-time or working outside of the home potentially affect condom use at last intercourse; more variables of interest ought to be explored under the umbrella of employment. Finally, both Calazans *et al* (2005) and Miranda *et al* (2011) have flaws in their implementation of using current employment as a covariate. Calazans *et al* (2005) only includes current employment when estimating a subgroup model for individuals with steady partners. The authors choose to exclude current employment from the model of individuals with casual partners without explanation. Miranda *et al* (2011) drop employment as a covariate from the final model as part of their variable elimination scheme, thus obscuring its estimated effect on condom use at last intercourse after controlling for

other covariates. I have not found any previous studies that correct for these issues. I address this gap in the literature by estimating the effects of five measures of employment on condom usage at last intercourse, and including these employment statistics as the variables of interest in each model variation I test.

Two other gaps in the literature mentioned previously stem from the limited analysis samples used in prior studies. The most obvious gap is the lack of studies using nationally representative data. Out of the seven studies reviewed, only Calazans *et al* (2005) analyze a nationally representative sample, and the study does not include a model with state indicators, which as mentioned previously, could limit bias of the estimated effects in the model or could over-control for the availability of condoms. Gupta (2000) uses data from the 1996 Demographic and Health Survey that I use as well; however, she subsets the data to target only adolescent women in nine states of the northeastern region of Brazil as her population of interest. Juarez and LeGrand (2005), Juarez and Martin (2006), Merchan-Hamann *et al* (2002), Miranda *et al* (2011), and Silveira *et al* (2005) all use data collected from a single city. Therefore, to the best of my knowledge, no study of condom usage in Brazil attempts to control for endogeneity from omitted variables with geographic fixed effects. I address this gap in the literature by incorporating state indicators into two iterations of my model, remaining cognizant of the potential issues.

The second gap arises due to the dearth of literature regarding male sexual behaviors in Brazil. Although four of the seven studies reviewed here include men in their sample, most target a narrow subgroup of men that fails to represent the typical Brazilian population. Further, three of the studies target groups that are unlikely to be employed, and therefore cannot examine the effect of my variable of interest: employment. Juarez and LeGrand (2005) and Juarez and Martin (2006) both examine condom use among males under age 20 in favela slums outside of the city Recife, a group unlikely to hold formal employment of any kind. Merchan-Hamann *et al.* (2002) analyze a sample of male and female students currently enrolled in secondary school, but current students are less likely to simultaneously hold employment. Calazans *et al* (2005) uses a nationally representative sample of men and women, ages 15 through 24. Only Calazans *et al* (2005) and Merchan-Hamann *et al* (2002) compare the likelihood of men reporting condom use at last sexual intercourse to the

likelihood of women reporting condom use at last sexual intercourse. Calazans et al. (2005) finds being male is positively associated with condom use at last intercourse. Merchan-Hamann *et al* (2002) finds being male is a positive correlate of risky sexual behavior—meaning men are less likely to report using condoms frequently than women. I address this gap in the literature by using a nationally representative sample of men and women after excluding groups that are unlikely to be employed like students to obtain a cleaner sample.

In general, the studies reviewed here use multivariate logistic regression models with coefficients expressed in terms of odds ratios to ease interpretation. Juarez and Martin (2006) and Miranda *et al* (2011) each regress condom usage at last intercourse on various demographic covariates and covariates related to an individual’s sexual history using logistic models. Calazans *et al* (2005) regresses lack of condom usage at last intercourse on these factors using a logistic model; since condom use is a binary variable, the direction of his results can be flipped to represent condom use at last intercourse to ease comparison with the previously mentioned studies. Silveira *et al* (2005) use the same dependent variable as Juarez and LeGrand (2006) and Miranda *et al* (2011), but the authors choose a Poisson regression to analyze their data because the outcome prevalence in their study (i.e., condom usage at last sexual intercourse) is greater than 10%, which can lead to overestimation of odds ratios. Gupta (2000) uses contraceptive use at first intercourse as the dependent variable in a logistic model, but notes that condoms represent 87% of the contraceptives used at first intercourse in the sample. Juarez and LeGrand (2005) similarly use condom usage at first sexual intercourse as the dependent variable in a logistic model. Merchan-Hamann *et al* (2002) uses Wilcoxon rank-sum tests to identify statistically significant covariates to the dependent variable “risky sexual behavior,” which the authors define as less than a frequent level of condom usage (frequency of condom use is self-reported as always, frequent, occasional, or rarely/never).

The studies converge on the following four points: (1) a significant difference in condom usage among young people according to the type of partnership at last sexual intercourse, with use being more frequent with casual partners than with steady partners; (2) a significant decline in condom usage with increasing age after reaching a certain threshold around age 20 (during adolescence, increasing age may predict higher prevalence of condom usage); (3) a significant positive association

between education and condom usage; (4) a positive association between identifying as Catholic and condom use at last intercourse. Other demographic variables have conflicting directional effects and significance within the group of studies.

3 Theoretical Framework

Two major theoretical frameworks exist to evaluate contraception use in the developing world: the desired fertility model and the family planning gap model. Pritchett (1994) provides evidence for the economic argument that couples behave rationally to achieve fertility targets, thinking of children somewhat like durable goods. Couples jointly choose their bundle of children based on the utility derived from each additional child, constrained by the number of offspring they can afford. To test the theory, Pritchett (1994) combines data from the World Health Survey and Demographic and Health Surveys to compare women's self-reported desired fertility with their actual fertility, as well as their access to family planning clinics and the availability of contraception. Pritchett (1994) finds that changes in individual demand for children rather than the proliferation of family planning clinics fuel the demographic transition. In his model, income and education are statistically significant factors that decrease a woman's desired fertility.

Although employment is not included in the model, the previous two results suggest that it would also reduce a woman's desired fertility since all three factors signal the advancing status of a woman in society. Additionally, employment opportunities induce a substitution effect in which time spent raising children becomes more costly since the woman could use that time to earn income. The substitution effect would cause women to reduce their desired fertility. Finally, employment would reduce the time a woman could spend raising children, reducing her temporal budget constraint and thus limiting fertility. For men, employment ought to increase desired fertility, since men are typically expected to work formally rather than raise children. Stable employment would increase desired fertility due to reduced fears of uncertainty regarding future employment. Employment could also expand the monetary budget, allowing couples to meet previously unattainable fertility desires. Decreased desired fertility in women predicts a higher likelihood of condom usage at last

intercourse, meaning that for women employment ought to have a positive relationship with condom use, according to the desired fertility framework. Increased desired fertility in men predicts a lower likelihood of condom use, meaning that for men employment ought to have a negative relationship with condom usage.

Pritchett (1994) notes that the emergence of AIDS—an important consideration in Brazil—introduces complications into contraceptive decision-making that his model does not address. Further, the desired fertility framework downplays contraceptive costs in low-income regions as well as potential incongruences introduced by gender power dynamics in assuming men will comply with women's desired fertility.

Other economists argue a family planning gap exists due to the inaccessibility of contraception. Bongaarts and Sinding (2009) cite the simple statistic that 137 million women reported to the 2002 WHS that they did not hope to get pregnant but failed to practice any form of modern contraception as evidence that the family planning gap exists. Bongaarts and Sinding (2009) provide a brief overview of the theoretical factors that contribute to an individual's unmet desire for contraception: monetary costs of the contraception, monetary and temporal costs of transportation to providers of contraception, and social barriers like shame or spousal resistance.

In testing the theory, Bongaarts (1997) finds subsidized condoms and birth control pills in family planning clinics of developing countries contributed to half of the overall decline in fertility rates between 1960 and 1990. Tsui and Herbert (2011) contribute a more exact model showing for every 16 percentage point increase in contraceptive use, national fertility rates in developing countries fall by one child per woman. After controlling for income in this model, employment predicts a decrease in the rate of condom usage for both men and women due to the reduced time with which they have to procure contraception. Again, the family planning gap framework does not explicitly incorporate the effects of potential transmission of sexually transmitted infections, which could potentially alter individual preferences if individuals attempt to minimize their health risks by adopting condom usage. In this scenario, those who previously could not afford to buy contraception would substitute money or time away from other goods to buy protection from the risk of STIs.

Juarez and LeGrand (2005) model the estimated effect of a variety of demographic factors on condom use of low income males at first intercourse, and although the authors do not include employment in the regression, they do discuss potential negative mechanisms specific to the Brazilian context that align with the family planning gap framework. Discussing adolescents, Juarez and LeGrand (2005) argue that although the government and various non-governmental organizations distribute condoms for free, the exchange only occurs at health clinics, which have weekday working hours and require registration. Because adolescents are less likely than adults to plan ahead, younger people often do not have access to condoms as they need them. However, a similar argument applies to the employed: Because fully employed individuals work during business hours, they may not be able to participate in these programs. If they are low-income earners, alternative sources of condoms may be prohibitively expensive.

One relevant consideration when using employment as the variable of interest is the diverging characteristics of employment between men and women. Employment often conflicts with child-bearing desires of women, and it is possible that women are less likely to work if they are members of households within a high-income bracket. Further, differing questions related to female employment signal different potential mechanisms. For instance, if women who earn income are more likely to use condoms, then the additional monetary resources potentially triggered the substitution effect under the desired fertility framework or removed barriers to contraception when considering the family planning gap theory. Alternatively, if working outside the home predicts increased condom usage for women, then diminished temporal resources to devote to children decreases fertility using desired fertility theory, whereas increased mobility through improved transportation removes a barrier to contraception under the family planning gap framework.

Given these considerations, I posit that an individual's likelihood for condom use at last intercourse is a function of his desired fertility, his demographic characteristics that will act as constraints under the family planning gap framework, and his partners demographic characteristics:

$$CU_i = f(DF_i, DC_i, DC_p) \tag{1}$$

Although neither framework accounts for the implications of sexually transmitted infections, risk of transmission does represent a possible alternative mechanism through which individuals alter their sexual health behavior based on an perceived metric of their level of risk. Although testing that mechanism is not the goal of this paper, adding a vector of covariates to the model indicating whether an individual participates in risky sexual behavior and understands how to mitigate that risk through condom usage. Controlling for these variables in the regression will help to test whether the estimated effect of employment on condom use at last intercourse is robust.

4 Data

The 1996 Brazil Demographic and Health Survey is a nationally representative cross-sectional study of 13,283 households in Brazil decomposed into individual interviews with 12,612 women; 2,949 men; and 1,319 couples. The two-stage clustered sampling technique first randomly selects districts to sample with weighting based upon seven regional populations before randomly subsampling households within those districts. Therefore, the study samples more clusters and more households from the northeastern region—which contains over 30% of Brazil’s population—than from any of the other regions. In general, clustered data may correlate at the community level, because a variety of endogenous factors present in the community that influence behavior, warranting the use of clustered standard errors in subsequent regression models.

The survey samples individuals ages 15 and older, meaning certain adolescents younger than 15 who have already reached the point of sexual initiation will not be represented in this study of condom use at last intercourse. Unlike other DHS studies, the sample of women includes individuals who are both married and unmarried. DHS studies from other countries often include only unmarried women in the sample.

Questions regarding sexual health behaviors such as condom usage are retrospective and self-reported in the 1996 Brazil DHS (i.e. Did you use a condom at the time of your last sexual intercourse?), which may seem intuitively unreliable. However, retrospective surveys are frequently used in sexual health research, and both Morris (1993) and Cleland and Ferry (1995) show that the

data gathered in retrospective surveys on sexual behavior are generally reliable in both developed and developing countries, respectively. Further, Becker and Costenbader (2001) analyze the data provided by couples in the 1996 Brazil DHS to compare husbands' reported contraceptive use compared to that of their wives. In Brazil, they find that husbands did not report significantly higher condom usage at the time of last intercourse than their wives—a conclusion which increases the validity of the accuracy of the self-reported responses recorded in the data set.

The DHS is highly appropriate for studying the association between employment and condom use at last intercourse because it: (1) is a nationally representative data set with a large sample size; (2) includes a variety of measures of employment (i.e., current employment, self employment, paid employment, work outside the home); (3) includes a rich set of relevant control variables related both to demographics and to the respondent's sexual history, which are thought to influence condom use based on economic theory and ease comparisons to prior studies using similar controls; (4) is highly regarded for reporting well-collected, quality data in contrast to the majority of the studies in the relevant literature whose authors conduct their own surveys to collect data; and (5) includes state indicators, allowing the model to control for potential omitted variable bias through geographic fixed effects.

The DHS program has conducted three studies in Brazil: one in 1986, another in 1991, and a third in 1996. Although all three meet the five benefits of using DHS data listed above, I choose to analyze the data from 1996 for two reasons. First, Gupta (2000) combines the three surveys and finds that while the number of adolescent women reporting condom usage at first intercourse in 1986 was negligible, the rate had increased to nearly half of women in 1996. Therefore, I choose the 1996 data to introduce heterogeneity into the dependent variable, condom use at last intercourse. Second, as mentioned in the literature review, the year 1994 represents a natural break in HIV prevention policy in Brazil due to the election of a new president who actively pursued creation of a National AIDS Program with funding from the World Bank. Therefore, awareness and availability of condoms ought to be greater after the 1994.

Despite these advantages, there are limitations to the DHS data. First, the survey asks no questions to discern whether individuals are employed part-time or full-time, thus limiting the

depth of my analysis. Second, although the survey asks participants to report their current income, the DHS obscures that data to preserve anonymity. Therefore, income—perhaps the most common of the demographic controls included in studies on sexual behavior in the developing world—cannot be used as a covariate when relying on the DHS. The DHS does construct a household wealth index for individuals based upon the combined incomes of household members and ownership of various appliances. Third, individuals clearly bias certain responses due to social stigma. Only 2 men out of the 2,949 sampled report ever engaging in homosexual behavior; 38 individuals do not respond to the question. Populations like men who have sex with men are often separated into subgroups due their high risk of contracting STIs. However, due to the homogeneity of the responses, I can neither exclude them from the analysis sample, nor control for them with an indicator variable in regression models. Finally, the survey does not ask male or female participants whether they are currently trying to conceive a child. Questions related to the respondents desire for children were asked and answered with a high response rate; however, because this data lacks a timing component, it cannot distinguish individuals who did not use a condom at last intercourse in an attempt to conceive.

My analysis sample is separated into a data set for men and another for women both of which include only sexually active individuals of reproductive age who are not otherwise impeded from conceiving a child through sterilization; infecundity; or in the case of women, current pregnancy. Reproductive age is defined as age 15 through 45 for women based on the background literature. No such age restriction exists for the male sample, which includes individuals between age 15 and 60. Although male ages could have been restricted for symmetry with the female data, they were not for four reasons: (1) no theoretical reason exists to exclude men over 45 when considering condom usage as men remain fertile throughout their life; (2) 14 percent of men over age 45 sampled in the DHS reported using a condom at last intercourse—although this number is lower than the rate of condom usage for younger age groups, it still shows prevalence of use among older demographics; (3) regression models described later in this paper that restricted male age to a maximum of 45 (but were ultimately not included in this paper) lost valuable evidence of trends in condom usage related to age; and (4) restricting the age of men in the analysis reduces the sample size of an already small group.

Although all sexually active individuals can benefit from condom usage to reduce the incidence of STI transmission, those who are not currently capable of conceiving a child cannot reap the family planning benefits of condom use—an important consideration given 36 percent of the male DHS sample and 25 percent of the female DHS sample report using condoms only for family planning purposes and not for STI protection. Both samples also exclude respondents who are currently enrolled in school, as full-time students are less likely to be employed. Professions that would systematically decrease access to condoms due to geographic constraints like serving in the military are not present in the raw DHS data because surveys are only conducted in residential households. A step-by-step derivation for each set is listed below.

Of the 2,949 male participants in the DHS, only 2,701 had previously engaged in sexual intercourse. Of those, 15 respondents were dropped from the analysis because they reported no knowledge of condoms. An additional 823 were dropped because they reported using an alternate form of contraception at last intercourse instead of using a condom. 370 were dropped because they were sterile—either naturally or due to vasectomy, leaving 1493 individuals who meet the requirements of these restrictions related to the dependent variable condom use at last intercourse. An additional 354 participants were excluded from the male analysis sample because they were still enrolled in school, which would somewhat impede current employment, leaving 1,139 observations. All remaining participants responded both to the survey question regarding condom use at last intercourse and the question regarding current employment. An additional 43 participants were dropped from the analysis sample due to non-response to survey questions used as covariates. The final analysis sample includes 1,096 observations.

Those in the analysis sample are more likely to have used a condom at last intercourse, more likely to be currently employed, more likely to live in rural areas, more likely to fall into the lowest wealth quintile, less likely to fall between the ages 15 and 19, and less likely to be married.

Of the 12,612 female participants in the DHS, only 9,952 had previously engaged in sexual intercourse. Of those remaining, 67 respondents were dropped from the analysis sample because they reported no knowledge of condoms. An additional 3,158 were dropped because they reported using an alternate form of contraception at last intercourse instead of using a condom. 548 were

dropped because they were currently pregnant. 2,497 were dropped because were infertile or had undergone a sterilization procedure. Finally, 306 women were dropped from the sample because they were over the maximum reproductive age of 45, leaving 3,378 individuals who meet the requirements of these restrictions related to the dependent variable condom use at last intercourse. An additional 536 participants were excluded from the female analysis sample because they were still enrolled in school, which would somewhat impede current employment. After these exclusions based on theory had been made, an additional 5 women were dropped from the sample due to non-response to the survey question regarding condom use at last intercourse. Finally, 6 participants were dropped due to non-response to survey questions regarding their employment. An additional 337 participants were dropped from the analysis sample due to non-response to survey questions used as covariates. The final analysis sample includes 2,494 observations.

Those in the analysis sample are more likely to have used a condom at last intercourse, more likely to fall within the lowest wealth quintile, more likely to have at least one child, less likely to fall between the ages 15 and 19 and less likely to have had multiple sexual partners.

Table 1 presents summary statistics of the dependent variable condom usage at last intercourse and the variables of interest related to employment for both the male and female analysis samples separately.

5 Methodological Approach

In modeling the impact of current employment on condom use at last intercourse among men and women in Brazil, I estimate the following equation:

$$CU_i = g(E_i, DF_i, DC_i) \quad (2)$$

where condom use at last intercourse is a function of an individual's current employment E , his desired fertility DF which controls for the desired fertility theory of contraceptive use, and his demographic characteristics DC which control for variables included in the family planning gap framework. As noted, few prior studies examine the effect of employment on condom usage.

Those studies that do include employment as a covariate in regression models do not compare the differences in the effect employment has on condom use among men and women in Brazil.

My study begins the process of addressing this gap by examining various measures of employment through probit models for a male analysis sample and a female analysis sample. The male analysis sample and the female analysis sample are examined separately to more fully understand the effect of employment on each gender due to the many covariates included in the regression that are expected to have diverging directional effects between genders based on the literature review.

Five differing measures of employment are introduced into separate models as variables of interest. The variables of interest introduced into the models of male behavior are: (A) an indicator variable signaling whether the individual is currently employed and (B) a factor variable measuring whether the respondent is employed year-round as opposed to seasonally, occasionally, or not employed. These are not included in the same model, but rather run independently due to collinearity between the variables. The variables of interest introduced into the models of female behavior are: (C) an indicator variable signaling whether the individual is currently employed, (D) an indicator variable representing whether the individual earns income, and (E) an indicator variable signaling whether the individual works outside of her home as opposed to working inside the home or not working. Again, these are treated as three independent variables of interest and tested individually in separate models.

The analysis estimates multivariate probit models for the effects of each measure of employment on condom use at last intercourse, controlling for a host of potentially confounding variables that account for desired fertility framework and the family planning gap framework. A number of different model specifications were considered to assess robustness of the results and explore patterns within the estimates. Two of these modifications to the general model are included in the results of the paper. The first adds state indicators to the model. The second adds a vector of covariates related to participation in risky sexual behaviors and sexual education, which as argued earlier present a different mechanism by which an individual would alter his sexual health behavior and therefore can test the robustness of the estimated effects for each measure of employment.

6 Multivariate Analysis

Table 2 presents a summary of probit estimates of the effects of the five measures of employment on the probability of condom use at last intercourse using four differing models with increasing adjustments. Model 1 includes no covariates. Model 2 includes a measure of desired fertility and a vector of covariates representing demographic characteristics. Model 3 adds state indicators to the controls in Model 2. Model 4 adds covariates related to participation in risky sexual behaviors and sexual education, which as argued earlier present a different mechanism by which an individual would alter his sexual health behavior and therefore can test the robustness of the estimated effects of employment. Each cell contains the estimated probit coefficient, the standard error corrected for state clustering of observations (in parentheses), and the marginal effect [in brackets].

In all models, the varying measures of employment exhibit diverging effects for men and women. The direction of the effect of increased employment for men is negative across all four models and both variables of interest, even when not statistically significant. The direction of the effect of increased employment for women is positive across all four models and the three variables of interest, even when not statistically significant. The magnitude of marginal effects generally declines as more covariates are added regardless of the variable of interest, with the exception of the marginal effect of being employed year-round for men which remains relatively constant. The largest declines in the magnitude of the marginal effects occur between Model 1 and Model 2 (i.e., when adding only the basic covariates: desired fertility and the vector of demographic characteristics). Introducing state indicators in Model 3 does not substantively affect the estimates. Therefore, although the decentralized Brazilian HIV-prevention policy is determined at the state level, introducing state indicators into the model does not over-control for differences in the availability of condoms. Model 4 introduces the vector of covariates indicating risky sexual health behaviors and sexual education. Again, the addition of these covariates does not reduce the magnitude of the marginal effects greatly. That said, while the marginal effects remain virtually unchanged between the latter three models with either variable of interest using the male analysis sample, the marginal effects do decrease by about 0.5 percentage points in each step between Models 2, 3, and 4 with all three measures

of employment when analyzing the female analysis sample, indicating potential over-control from addition of state indicators or a lack of robustness in the effect of these measures of employment on condom use at last intercourse when faced with other possible mechanisms that modify sexual health behavior.

Two of the five variables of interest maintain statistical significance through each of the model iterations: employed year-round (B) for men and working outside of the home (E) for women. Both remain significant at the 1% level across all four models. Current employment (A) for the male sample is not statistically significant in any of the models. In the analysis of the female sample, current employment (C) and earning income (D) are statistically significant at the 1% level in Model 1 without covariates; however, both diminish in significance falling to the 5% level after the basic covariates are added in Model 2. Thus, the effects of employment and earning income in Model 1 were potentially confounded by the effects of wealth and education, which both have a significant positive relationship with condom use at last intercourse correlate positively with employment measures in the female analysis sample. Both C current employment and D earning income lose statistical significance above the 10% level after adding the risky sexual behavior indicators in Model 4.

Examining employed year-round (B) and working outside the home (E) specifically, the sizes of the estimated effects are quite large. In the most adjusted model, Model 4, holding year-round employment (B) decreases the probability of a man using a condom at last intercourse by 11.3 percentage points. From the relevant sample means presented in Table 1, 36% of men in the analysis sample used a condom at last intercourse. Therefore, an 11.3 percentage point decrease represents a 31% reduction in the probability of a man reporting condom use at last intercourse. Working outside the home (E) increases the probability of a woman using a condom at last intercourse by 4.9 percentage points. 22% of women in the sample used a condom at last intercourse. A 4.9 percentage point increase represents a 22% increase in the likelihood of a woman reporting condom use at last intercourse.

The remaining discussion of the results will focus on Models 3 and 4, using employed year-round (B) and working outside the home (E) as the variables of interest for the male sample and

the female sample, respectively. The results of Model 3 and Model 4 are similar to each other in terms of maintained levels of statistical significance of covariates across both models, consistent direction of the estimated effect of each covariate, and similar magnitude of the marginal effects of each covariate. Therefore, variation between the models when considering the analysis of either subgroup is not an issue.

Statistically significant positive demographic predictors of condom usage at last intercourse for both men and women are higher levels of education (specifically, the completion of secondary school and pursuing higher education) and greater levels of wealth. The only significant negative demographic predictor in common for both men and women is being married. The only demographic covariate that is significant for both populations with diverging directional effects is age. In the models of the male sample, each 5-year age group under 35 years of age is a statistically significant positive predictor of condom use at last intercourse using the group Age 15–19 as the baseline reference category. The direction on the effect of age changes to negative in each of the groups above 40 years of age, and becomes significant with the groups Age 50–54 and Age 55–59. Models based on the female sample estimate the effect of age as consistently negative and generally significant, again using the group Age 15–19 as the baseline.

Certain covariates are significant for only one of the samples. When using the female analysis sample, desired fertility is a significant predictor of condom use at last intercourse at the 1% level. Wanting children after 2+ years, wanting children but being unsure of desired timing, and wanting no more children all increase the likelihood of a woman using a condom at last intercourse by between 35.4% and 57.3% compared to the relevant sample mean when using those women who want children within the next 2 years as the baseline. None of these categories are significant predictors of condom use at last intercourse for men. Using the male subgroup, identifying as Roman Catholic is a positive predictor of condom use, significant at the 10% level compared to a baseline of respondents who are not religious.

The directions of the estimated effects in these models are largely consistent with those in the relevant literature, on variables where prior results converge. Higher levels of education are generally reported as a positive predictor of condom use in the literature reviewed previously,

whereas being married has a negative association with condom use at last intercourse. Increasing age in our models is a positive predictor of condom use for young men, as found Juarez and Martin (2006) who restrict the target population to males under age 20, but negative for women as seen in the findings of Miranda *et al* (2011) and Silveira *et al* (2005). Being Catholic has typically been reported as a positive predictor of condom use for both men and women; however, Gupta (2000) is the only study that finds a highly significant positive relationship between being Catholic and condom use through an indicator variable that signals whether an individual is Catholic and groups respondents who are practitioners of other religions with respondents who are not religious in the category non-Catholic. In our data, 7% of respondents in the male subset and 12% of those in the female subset report practicing Evangelism. These are large portions of the sample population and being Evangelist has a negative association with condom use at last intercourse in the regression models. Therefore, grouping them with respondents who are not religious likely distorts the estimated effect of being Catholic, explaining the disparity in the findings with those of Gupta (2000).

For the male sample, being married has the largest marginal effect of any of the demographic covariates, reducing the probability of condom use at last intercourse by 23.8 percentage points, or 34% compared to the relevant sample mean. For the female sample, desired fertility has the largest marginal effect, with women who desire no more children being 12.6 percentage points, or 57.3% compared to the relevant sample means, more likely to use a condom at last intercourse.

Although adding the vector of covariates related to risky sexual behavior and sexual education into Model 4 does not alter the estimated effects of the demographic covariates, most of the additional covariates are statistically significant themselves. Both of the risky behavior indicators included in the model (having casual sex at last intercourse and having multiple sexual partners in the 12 months preceding the administration of the survey) are positive indicators of condom use at last intercourse. The two variables are correlated and therefore problems with collinearity may arise. However, this does not reduce the predictive power of the model or bias the estimates of individual coefficients, but does increase the standard errors on the correlated variables.

Being able to correctly identify that condoms prevented the transmission of HIV—a covariate

related to the individual's level of sexual education—increases the likelihood of both men and women using condoms at last intercourse, and is significant at the 1% level for both groups. Finally, a covariate which indicates whether the respondent had been diagnosed with a sexually transmitted infection in the 12 months preceding the survey has a negative association with condom use at last intercourse in the male sample, probably due to reverse causality. The variable is not statistically significant. The STI indicator variable is a significant positive predictor of condom use at last intercourse for women; however, as mentioned previously, an unrealistic proportion of women report having an STI in the 12 months preceding the survey. Therefore, we ought to be cautious in interpreting the estimated effect of the variable when using the female subgroup; however, it may serve as a useful proxy for recent medical attention and sexual health counseling.

7 Conclusion

Using nationally representative data from the 1996 Demographic and Health Survey, I find robust evidence that certain measures of employment are strongly associated with condom use at last intercourse. The directional effects of employment diverge between men and women, with men experiencing negative associations between employment and condom usage while women experience positive associations between the two.

The effects of the study have interesting implications for the two theoretical frameworks considered. Although my probit models do not fully test whether the desired fertility model or the family planning gap model better predicts health behavior related to contraceptives, the inclusion of the controls indicating a respondent's desired fertility do suggest that women act as rational economic agents, increasing their use of contraceptives when they have no desire for more children, or only want more after two or more years. In contrast, desired fertility was not a significant predictor of male behavior. The desired fertility framework may better predict women's actions because they have more agency over their pregnancy or the actions of married men who desire a child at the same time as their partner.

Future research is needed complement the findings of this study by continuing to investigate the

effects of other measures of employment such as working part-time on condom usage. Additionally, more rigorous economic theory to account for the implications of sexually transmitted infections via the risky sexual behavior mechanism I briefly introduce to check for robustness ought to be considered due to the high level of significance and magnitude of the results.

References

- [1] Amaral, Ernesto & Daniel Hamermesh (2007). “Macroeconomic and Policy Implications of Population Aging in Brazil.” NBER Working Paper, No. 13533. Cambridge, MA.
- [2] Becker GS (1960). “An Economic Analysis of Fertility, Demographic and Economic Change in Developed Countries.” National Bureau Committee for Economic Research Conference Paper, 209–231.
- [3] Becker, Gary S (1991). *A Treatise on the Family*. Cambridge, MA: Harvard University Press.
- [4] Bongaarts, J. (1997). “The Role of Family Planning Programmes in Contemporary Fertility Transitions: The Continuing Demographic Transition.” Oxford: Clarendon Press, 422–444.
- [5] Bongaarts, John & Steven Sindling (2009). “A Response to Critics of Family Planning Programs.” *International Perspectives on Sexual and Reproductive Health*: 35(1).
- [6] Calazans, Gabriela, Teo Araujo, Gustavo Venturi, & Ivan Franca (2005). “Factors Associated with Condom Use among Youth Aged 15-24 Years in Brazil in 2003.” *AIDS* 19(4): 42–50.
- [7] Carvalho, J. & L. Wong (1999). “Demographic and Socioeconomic Implications of the Rapid Fertility Decline in Brazil: a Window of Opportunity.” *Reproductive Change in India and Brazil*: 208–239
- [8] Flrez, C.E. & J. Nez (2003). “Teenage Childbearing in Latin American Countries.” *Critical Decisions at a Critical Age*: 47–92.

- [9] Gmez, Eduardo (2010). “What the United States Can Learn From Brazil in Response to HIV/AIDS: International Reputation and Strategic Centralization in a Context of Health Policy Devolution.”
- [10] Gupta, Neeru (2000). “Sexual Initiation and Contraceptive Use among Adolescent Women in Northeast Brazil.” *Studies in Family Planning* 31(3): 228–238.
- [11] Jorgensen, O.H. (2011). “Macroeconomic and Policy Implications of Population Aging in Brazil.” World Bank Policy Research Working Paper, No. 5519
- [12] Juarez, Fatima & Thomas LeGrand (2005). “Factors Influencing Boys’ Age at First Sexual Intercourse and Condom Use in the Shantytowns of Recife, Brazil.” *Studies in Family Planning* 36(1): 57–70.
- [13] Juarez, Fatima & Teresa Martin (2006). “Safe Sex Versus Safe Love? Relationship Context and Condom Use Among Male Adolescents in the Favelas of Recife, Brazil.” *Archives of Sexual Behavior* (35)1: 25–35.
- [14] Lam, D. & S. Duryea (1999). “Effects of Schooling on Fertility, Labor Supply, and Investments in Children, with Evidence from Brazil.” *Journal of Human Resources* 34(1): 160–90.
- [15] Lam, D., & L. Marteleto (2005). Small Families and Large Cohorts: The Impact of the Demographic Transition on Schooling in Brazil. *Growing Up Global: The Changing Transitions to Adulthood in Developing Countries*, Washington, D.C., United States: National Academies Press.
- [16] Martine, George (1996). “Brazil’s Fertility Decline, 1965-95: A Fresh Look at Key Factors.” *Population and Development Review* 22(1): 47–75.
- [17] Martine, George, Monica Das Gupta, and Lincoln C. Chen (1998). *Reproductive Change in India and Brazil*. Delhi: Oxford University Press.

- [18] Mason, A. (1995), "Demographic Transition and Demographic Dividends in Developed and Developing Countries." Department of Economics, University of Hawaii at Manoa and Population and Health Studies.
- [19] Merchan-Hamann, Edgar, Maria Ekstrand, Esther Hudes, & Norman Hearst (2002). "Prevalence and Correlates of HIV-Related Risk Behaviors among Adolescents at Public Schools in Brasilia." *AIDS and Behavior* 6(3): 283–293.
- [20] Merrick, T. & E. Berqu (1983). *The Determinants of Brazil's Recent Rapid Decline in Fertility*. Washington, DC, United States: National Academies Press.
- [21] Ministerio da Saude, Brasil (2002). "Acesso ao preservativo faz a diferenca: Prevention access to condoms makes all the difference." Resposta positiva experiencia do programa brasileiro de AIDS: 28–36
- [22] Miranda, AE, NC Figueiredo, W McFarland, R Schmidt, & K Page (2011). "Predicting Condom Use in Young Women: Demographics, Behaviors, and Knowledge from a Population-Based Sample in Brazil." *International Journal of STD & AIDS* 22(1): 590–595.
- [23] Okie, Susan (2006). "Fighting HIV - Lessons from Brazil." *New England Journal of Medicine*.
- [24] Pritchett L (1994). "Desired Fertility and the Impact of Population Policies." *Population and Development Review*, 20(1): 1–55.
- [25] Rutenberg, N., L.H. Ochoa & J.M. Arruda (1987) "The Proximate Determinants of Low Fertility in Brazil." *International Family Planning Perspectives* 13(3): 75–80
- [26] Silveira, Mariangela, Ina dos Santos, Jorge Beria, Bernardo Horta, Elaine Tomasi, & Cesar Victora (2005). "Factors Associated with Condom Use in Women from an Urban Areas in Southern Brazil." *Cadeirno Saude Publica* 21(5): 1557–1564.

8 Appendix

Table 1: Relevant Sample Characteristics

	Male Analysis Sample	Female Analysis Sample
Condom Used at Last Intercourse	.36	.22
Currently Employed	.82	.49
Employed Year-Round	.82	–
Earns Income	–	.57
Works Outside of Home	–	.44
Sample Size	1,096	2,494

Notes: Means are reported as proportions given the large number of dichotomous variables, unless otherwise indicate. Standard errors are presented below the means of continuous variables parenthetically.

**Table 2: Effects of 5 Measures of Employment on Condom Use at Last Intercourse
Using Male and Female Analysis Samples**

	No Covariates (1)	Basic (2)	+ State Indicator (3)	+ Risk Behavior (4)
	<i>Coefficient</i> (<i>SE</i>) [<i>ME</i>]			
Male Sample, N=1096				
Currently Employed, (A)	-.141 (.088) [-.052]	-.114 (.109) [-.033]	-.125 (.110) [-.034]	-.120 (.121) [-.032]
Employed Year-Round, (B)	-.336** (.147) [-.129]	-.396*** (.129) [-.116]	-.384*** (.129) [-.107]	-.417*** (.134) [-.113]
Female Sample, N=2494				
Currently Employed, (C)	.267*** (.046) [.078]	.135** (.053) [.036]	.116* (.060) [.030]	.087 (.065) [.023]
Earns Income, (D)	.336*** (.098) [.098]	.132** (.059) [.035]	.109** (.060) [.028]	.077 (.065) [.020]
Works Out of Home, (E)	.391*** (.051) [.113]	.226*** (.054) [.061]	.211*** (.054) [.055]	.192*** (.052) [.049]

Notes: *** p<0.01; ** p<0.05; * p<0.10. SE = Standard Error. ME = Marginal Effect. Basic Covariates include all Demographic Characteristics and Desired Fertility from Table 2. Risky Behavior Mechanism includes all Risky Sexual Behaviors and Understanding of Risk covariates from Table 2.