Work and Family Conflict, Gender and Low Fertility in Brazil

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ABSTRACT

This study uses a multilevel logistic analysis to measure in what extent work and family conflict and gender relations at the municipality level are associated with the odds to have a child at the individual level in different parities, controlled by age and socio-economic characteristics. We analyze only married or cohabiting women (in an attempt to capture only intended fertility) from 15 to 49 years old. We observe that the work and family conflict variable affects negatively the first birth order, and positively the second and third in 2010 when Brazil had below replacement fertility. It has no effect in births of fourth order. In 2000 this variable was mostly not significant in any birth order. An interesting relation was found between the work and family variable and type of labor contract. The variable used to measure gender relations in the county level had no effect in 2000 and 2010.

1. INTRODUCTION

In the 2000s, estimated period total fertility rates in Brazil declined from 2.38 in 2000 to 1.86 in 2010 (Census Data - IBGE). The recently available 2010 Census microdata provides a unique opportunity to study some social factors behind the decline. In this article we drive from the bibliography that relates fertility decisions with work and family relations and gender conflict (Folbre, 1983; Oppenheimer, 1994; Mason 1997; Mason and Oppenheimer, 1997; McDonald, 2000; Del Bocca 2002; Catalbiano 2009; Esping-Andersen 2009; Luci and Thévenon 2010; Rindfuss et al. 2007; Kravdal and Rindfuss 2008; Myrskylä, Kohler and Billari 2011; Thévenon 2011; Mills 2011; among others). Specifically, the goal is to test using a multilevel analysis in what extent work and family conflict and gender relations at the municipality level are associated with the odds to have a child at the individual level in different parities, controlled by age and socio-economic characteristics.

There are evidences that Brazilian work and family policies (Sorj et al. 2007) are not helpful in harmonizing work and childrearing after the 120 days of maternity leave in the Brazilian Labor Legislation. The limited access to child care in Brazil, especially low-cost child care, is also considered an issue. Most of the women with children from 1 to five years old are in informal jobs, self-employed or not working (Castanheira and Rios-Neto 2011). In relation to the gender issue, Brazil is in the 85th position of 134 countries in the Global Gender Gap Index in 2010 (Hausmann et al. 2010). The index considers economic participation and opportunity, educational attainment, health and survival and political empowerment. This is not a good country position for the 6th highest GDP in the world in 2010 (in current US$, International Monetary Fund 2012 and World Bank 2012). Therefore, we have reasons to test if work and family and gender relations have influence in the odds to have a child in Brazil.

2. BACKGROUND

2.1 Basic Determinants of the Fertility Decline in Brazil

Brazil is a highly heterogeneous country; it has the fifth largest territory in the world, diverse biomes across regions and substantial cultural and socio-economic diversity. Alongside socio-economic inequalities coexists different demographic regimes (Carvalho 1973, Carvalho and Wood 1994, among others). The fertility decline onset was in the South and Southeast in the 1960s. Around fifteen

years later it started in the North and Northeast (Potter et al., 2010). The transition from high to low levels of fertility appears to be strongly related to changes in socio-economic circumstances (Potter et al. 2002). On the macro level the Federal Government had an important role in the decline, despite the absence of a targeted public policy to reduce fertility[1]. In the last fifty years, public administration promoted changes in the economy (incentives to industrialization and technology development), in the infra-structure (sanitary reform and electrification), health system (access and coverage), improved medication accessibility and subsides, and a solidification of the social security system.

The expansion of the primary and afterwards secondary public education system also had a decisive role in the fertility decline (Carvalho et al. 1981, Faria 1989, Martine 1996, Faria and Potter 1999, Perpétuo and Wong 2006). Another factor that is frequently discussed in the literature is the role of the expansion of mass communication (Faria 1994; Martine 1996; Ferrara et al 2008; Westoff and Koffman 2011). Mass communication would affect fertility through change in perception of social roles and the content favors nontraditional social norms (Martine 1996). The structural changes outlined occurred differently across regions. Urbanization was uneven in Brazilian territory and so was the spread of mass education, industrialization, electricity and sewage. At the individual level, studies have emphasized the role of education (Lam et al. 1993, Potter et al. 2002, Yazaki 2003), income (Berquó and Cavenaghi 2004) and religion (McKinnon et al. 2008). The relation between education and income with fertility was negative; therefore, higher education leads to lower fertility.

Finally, Brazil was outlined by the literature, like other South American countries, as an atypical pattern of fertility in which low levels were attained with young age at marriage, young fertility schedules and high prevalence of stopping behavior. However, scholars have been reconsidering this notion. Rosero-Brixby et al. (2009), for example, has shown an increase in fertility postponement and foregone fertility in South America. The postponement behavior is mainly attributable to recent massive expansion of secondary and college education in the continent. Nonetheless in some countries the effect of delaying fertility is higher than the shift in the education distribution of the population.

[1] Only in 1996 that it was approved in Brazil a Law of Family Planning (Law number 9263) (Wong and Perpétuo 2006, page 260). It has legalized voluntary sterilization and allowed it to be done by the Public Health System. It also implements regulations to sterilization, for example, it forbids sterilization right after a delivery.

2.2 Work and Family Perceived Conflict and Gender Inequality

Four studies, so far, have explored the issue of below replacement fertility in Brazil (Yazaki 2003, Wong and Bonifácio 2008, Alves and Cavenaghi 2009, Goldani 2002). The first three papers are mostly descriptive, presenting fertility levels and how the proximate determinants of fertility have changed (specifically type of contraception and age at marriage). Yazaki (2003) focus in the state of São Paulo and Wong and Bonifácio (2008) in metropolitan areas. Alves and Cavenaghi (2009) compare age specific fertility rates of Brazil with Portugal, Italy and France in the 2000s. Goldani (2002) is a qualitative compilation of Brazilian expert opinions presented to the UN about what the fertility level of Brazil in 30 years will be.

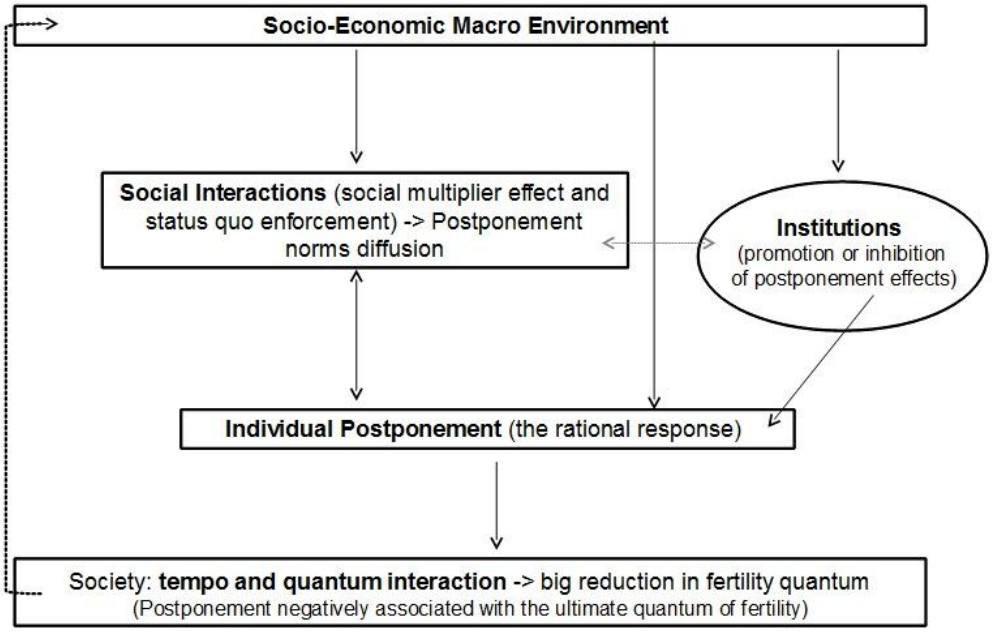
This paper will test the association of work-family conflict and gender symmetry with the odds of having a child in 2000 and 2010, controlling for socio economic characteristics. Therefore, it is important to briefly explain the evidences from the literature and the general theoretical framework that justifies the use of those variables. A growing body of research emphasizes the relation of gender with fertility (Folbre, 1983; Oppenheimer, 1994; Mason 1997; Mason and Oppenheimer, 1997; McDonald, 2000; Myrskylä, Kohler and Billari 2011; Esping-Andersen 2009). Gender equity is composed of two components of the gender system: an institutionalized inequality in the society and a within household inequality based on the division of labor between men and women (McDonald 2000; Mason 1997).

McDonald (2000) proposes that the transition from high to replacement fertility levels accompanies an increase in women's empowerment in the household with a decrease of patriarchal values. Sustained low fertility is driven by high levels of equity in individual-oriented institutions and moderate levels of gender equity within the family. Full gender equity is attained only when being male or female is not a determinant of who will generate income, do the caring and nurturing, and perform household maintenance (McDonald 2000, p. 436). Mills et al. (2006) has found a positive correlation of the total fertility rate of European countries with a gender-related development index. A cross-country comparison estimation among developed countries found that at similar Human Development levels, gender equality (measured by the Global Gender Gap from Hausmann et al. 2010) is essential for higher fertility levels (Myrskylä et al. 2011).

Work and family conflict is related to the previous argument in the sense that higher gender inequality would produce more caring and labor work for the women, restricting their demand for children. With the work and family conflict variable, however, we will measure how institutional arrangements in the society (public, private and even the family) harmonize with labor supply of a mother with children from 1 to 5 years old. The hypothesis is that the decision to have children would be restricted to observable environment characteristics. The higher the perception of childrearing incompatibility with work in addition to higher educational and occupational aspirations, the more the fertility will be postponed. Because of the relation with educational and work aspirations, work and family environment affects more frequently the transition from childless to motherhood (Rindfuss et al. 2007).

A useful framework is Kohler et al. (2002) in which low fertility levels are intrinsically related to postponement effects. Delaying childbearing is a response to economic and social circumstances in a society. Work and family conflict and gender inequality are just one of the factors of the socio-economic macro environment. The postponement norm is diffused in the society by interactions (social diffusion), and affects the individual. The individual also affects those interactions. Institutions have roles of promoting or inhibiting postponement effects. For instance, absence of work and family conciliation policies would intensify the postponement effect.

CHART 1: Macro Environment and Social Interactions influencing individuals' postponement rational response



Source: Kohler, Billari and Ortega 2002

3. DATA AND MODEL SPECIFICATIONS

In order to satisfy the aim of this research that is to measure work and family conflict and gender at the community level we have to use Census Data. It is the national representative database with the smaller geographic disaggregation. The Census Survey (long form) is the one that contains fertility information and the smaller statistically significant disaggregation is at the municipality level. To have results in two points in time and compare the fertility above and below replacement we use the 2000 and 2010 Census Survey database. In 2000 the Census Survey had 1,520 Minimally Comparable Areas (MCAs). Minimally Comparable Areas are equivalent to municipalities; however small municipalities had been aggregated to form representative comparable areas. In 2010 the sample has changed and higher fractions of the population of smaller municipalities have been interviewed. So, the survey sample is larger and we have bigger disaggregation and the actual municipality at the minimal disaggregation level. The number of municipalities in the 2010 Census is 5,565. The MCA and the Municipality are statically representative of the county population.

The statistical method used is a two-level logit regression that controls for correlation among individuals within the municipality; therefore, the variance of the estimators will not be biased due to the inclusion in the model of municipalities' variables. The model with two levels is preferred above a simple logit model with "average" variables at the municipality level because the ultimate locus of the fertility decision is at the individual level. Institutional and Community features have a role as stakeholders of the process, but individual characteristics (as education, religion, race, household income, among others) are the ultimate influences in the process. Therefore, it is essential to consider individuals' heterogeneity in the analysis (Smith 1989).

The response of *i*th women in the *k*th MCA (or municipality in 2010) is

$$\mathbf{ln(Y)_{ik} = \beta_{0,k} + \beta_1 x_{i,k} + \beta_2 z_k + \alpha_k + \varepsilon_{ik}}$$

Y is 1 if the woman had a birth in 1999.5 - 2000.5 that was parity þ (1, 2, 3 or Any parity) and 0 if women had no birth in 1999.5 - 2000.5 and is in parity þ-1 (0,1, 2 or Any parity). Table 2 show the mean, standard deviation and sample size for model one (þ=1), model 2 (þ=2), model 3 (þ=3) and model 4 (þ=any parity). We can observe also all variables $\mathbf{x_{i,k}}$ (level=individuals) and $\mathbf{z_k}$ (level= MCA).

The variables measuring gender equity in the MCA level are: total female legislators, officers and managers in the MCA divided by the total male legislators, officers and managers ("Fem/Male Legisl,

Officers, Managers"), total female professional and technical workers in the MCA divided by the total male professional and technical workers ("Fem/Male Profess. And Tech.") and total female literate ages 15 to 39 in the MCA divided by the total male literate ages 15 to 39 ("Fem/Male Literate (15-39 years)").

These variables were inspired by the Gender Equity Gap Index (Hausmann et al 2010) and the World Bank Gender Index compile, for further information about global Gender Indexes see Mills (2010). Those sources have more than 20 indicators that measure gender equality, I have selected the ones that are possible to measure with the Census and are plausible with Brazilian reality and that are representative at MCA level. The hypothesis is that the higher the gender equality in institutions the lower the fertility, if there is no gender equality within household (this is what we would expect in Brazil).

The variable that measures how institutional arrangements in the society (public, private and even the family) harmonize with the labor supply of mothers with children from 1 to 5 years old is the total working mothers in which the youngest child has 1 to 5 years old over total mothers of child from 1 to 5 years old ("Working mothers (youngest child 1-5) /Total mothers (youngest child 1-5)"). The other variable used to estimate work and family conciliation is total children 1 to 5 years in child care centers or schools in relation to total children from 1 to 5 years. The hypothesis drawn from the literature is that the higher the perception of childrearing incompatibility with work the lower the fertility. It is expected to find a stronger relation with first parity child.

The assumption behind the use of those community variables is that the community context hasn't changed abruptly in the two years before the survey. The ideal would be to use time lagged variables that would really reflect the context in which the child was produced (birth month of the child – 9 months); but unfortunately the Census is decennial and those variables are not available in 1998-1999. Anyhow, I believe that this is not a strong assumption and no law or abrupt change happened in the two years previous the research.

The analysis is limited to married or cohabiting women ages 15 to 49 (the main reproductive ages). We have used married or cohabiting women because we want to capture intended fertility. According to the 2006 Brazilian DHS, 93% of intended pregnancies in Brazil occurred among married or cohabiting women (Brazilian DHS 2006)**.** Since fertility motivation varies by birth order we estimate

five different models. The first one compares childless women with women that had a child in the last year (progression from childless to 1 child). The second compares women with a child not borne in the last year with women that had the second child in the last year (progression from 1 child to 2 children). The third model compares women with two children not borne in the last year with women that had the third child in the last year (progression from 2 to 3 children). The fourth model compares women with three children not borne in the last year with women that had the fourth child in the last year (progression from 3 to 4 children). Finally, the last model doesn't account for birth order and compares all women that didn't have a child in the last year with women that had a child in the last year. To estimate the results, I have used the *xtlogit* command in STATA 11

4. RESULTS

Table 1 summarizes the results to the first model (progression from childless to first birth). In 2000, the work and family variable (working mothers with child 1-5 over total mothers with child 1-5 in the muncipality) and the gender variable (total female managers over total managers in the municipality) had no effect. In 2010 the effect is weak for the gender variable and is negative (the higher the number of working women in the municipality the smaller the chance of having a child in 2010. However, when we control for the variable "Formal Labor Contract" (1 if the woman has a formal labor contract and 0 otherwise) we can see that the effect of working and family variable changes from negative to positive.

The reverse of the sign will be explored further by including an interaction of the two variables in the model. We suspect that controlling for the effect of formal labor participation, we can capture better the influence of the work and family environment. Women in formal labor force have less flexibility of hours and more difficulty to conciliate work and family. Therefore, when we control for that we have the expected signal (positive) which inform that Municipalities with good work and family environment (higher number of 1-5 mothers working) leads to higher chances of first birth. An additional control that will be inserted in the model for the next paper version is occupation type (private, public, self-employed, among others).

Table 1: Odds Ratio of two levels logit regression model predicting the first live birth in Brazil for married or cohabiting women 15 to 49 years old in 2000 and 2010

Level		2000	2010	2010 with Formal
Individual	Black or Brown	0.87***	1.01†	0.958***
	Educ Attain (ref: Less than Primary)			
	Primary Completed	1.16***	1.01†	1.080***
	High School or College Completed	1.37***	1.33***	1.574***
	Not Declared	2.43***	0.74***	0.800**
	Sewage in HH	1.13***	0.99†	1.047***
	Income or Log Income per capita (HH)	0.51***	0.9999**	0.809***
	Rural Area	0.84***	1.02†	0.932***
	Formal Labor Contract	-	-	0.872***
County	Fem/Total Managers	0.93†	1.07**	1.05*
	Working mothers w y child 1-5/ Total mothers with youngest child 1-5 years	0.998†	0.88***	1.16***
	Resident Physicians (per thousand pop)	1.07***	1.02***	1.04***
	rho	0.008***	0.004***	0.004***
	Wald Chi2 (14)	14113.16***	50212.83***	50373.09***
	Number of obs	199118	691935	691935
	Number of groups	1447	5480	5480
Obs per group	min	4	9	9
	avg	137.6	126.3	126.3
	max	13280	17452	17452
	Convergence	Achieved (Total Iterations: 7)	Achieved (Total Iterations: 8)	Achieved (Total Iterations: 8)

Data Source: Brazil Census 2000 and 2010.

Notes: 1. Women from 15 to 49 years old in households with total income missing or zero has been deleted to the data in this sample. They represent 3.51% of total married women aged 15 to 49 in the 2010 Census database and 8.99% in the 2000 Census.

2. Aditional control: Dummy variable for each age (15 to 49) with the median age in each model as the reference age.

†$p<.10$; *$p<.05$; **$p<.01$; ***$p<.001$

Table 2: Odds Ratio of two levels logit regression model predicting the second order live birth in Brazil for married or cohabiting women 15 to 49 years old in 2000 and 2010

Level		2000	2010	2010 with Formal
Individual	Black or Brown	1.01†	0.99†	0.99†
	Educ Attain (ref: Less than Primary)			
	Primary Completed	0.92***	0.90***	0.91***
	High School or College Completed	0.94***	0.99†	1.01†
	Not Declared	1.97***	0.54***	0.54***
	Sewage in HH	0.98†	1.01†	1.01†
	Income or Log Income per capita (HH)	0.56***	0.64***	0.65***
	Rural Area	0.92***	0.86***	0.86***
	Formal Labor Contract	-	-	0.82***
County	Fem/Total Managers	0.90†	0.96†	0.96†
	Working mothers w y child 1-5/ Total mothers with youngest child 1-5 years old	0.57***	1.25***	1.34***
	Resident Physicians (per thousand pop)	1.03**	1.05***	1.05***
	rho	0.012***	0.014***	0.014***
	Wald Chi2 (14)	11357.11***	20348.27***	20411.42***
	Number of obs	349416	1071757	1071757
	Number of groups	1447	5480	5480
Obs per group	min	5	18	18
	avg	241.5	195.6	195.6
	max	21298	25794	25794
	Convergence	Achieved (Total Iterations: 7)	Achieved (Total Iterations: 7)	Achieved (Total Iterations: 7)

Data Source: Brazil Census 2000 and 2010.

Notes: 1. Women from 15 to 49 years old in households with total income missing or zero has been deleted to the data in this sample. They represent 3.51% of total married women aged 15 to 49 in the 2010 Census database and 8.99% in the 2000 Census.

2. Aditional control: Dummy variable for each age (15 to 49) with the median age in each model as the reference age.

†$p<.10$; *$p<.05$; **$p<.01$; ***$p<.001$

In Table 2 we can observe the results for second order births. The gender variable has no effect in 2000 or 2010. The work and family variable have a negative effect in 2000 and a positive effect in 2010 independent of the inclusion of type of labor contract. In third order births (table 3) gender variable have no effect again and work and family variable had a considerable positive effect. The effect increases with the introduction of the control variable (Formal). In first, second and third order births we can observe that being in a Formal labor contract have a negative effect in the probability to have a child in 2010. For fourth order births we can observe that this effect is no longer existent (Table 4). The work and family variables is not significant anymore. It seems that socio economic characteristics are more important in this model. For instance, black or brown individuals with less than primary degree have higher chances to a fourth child.

Table 3: Odds Ratio of two levels logit regression model predicting the third order live birth in Brazil for married or cohabiting women 15 to 49 years old in 2000 and 2010

Level		2000	2010	2010 with Formal
Individual	Black or Brown	1.02†	1.05*	1.05*
	Educ Attain (ref: Less than Primary)			
	Primary Completed	0.90***	0.85***	0.857***
	High School or College Completed	0.95†	0.85***	0.878***
	Not Declared	1.50***	0.52*	0.53*
	Sewage in HH	0.99†	1.01†	1.017†
	Income or Log Income per capita (HH)	0.56***	0.60***	0.61***
	Rural Area	0.95**	0.90***	0.90***
	Formal Labor Contract	-	-	0.79***
County	Fem/Total Managers	1.07†	1.01†	1.01†
	Working mothers w y child 1-5/ Total mothers with youngest child 1-5 years old	1.02†	1.56***	1.66***
	Resident Physicians (per thousand pop)	1.08***	1.06***	1.06***
	rho	0.022***	0.030***	0.030***
	Wald Chi2 (14)	13056.83***	9588.06***	9579.96***
	Number of obs	434391	530154	530154
	Number of groups	1447	5480	5480
s per group	min	9	8	8
	avg	300.2	96.7	96.7
	max	25345	10577	10577
	Convergence	Achieved (Total Iterations: 7)	Achieved (Total Iterations: 8)	Achieved (Total Iterations: 8)

Data Source: Brazil Census 2000 and 2010.

Notes: 1. Women from 15 to 49 years old in households with total income missing or zero has been deleted to the data in this sample. They represent 3.51% of total married women aged 15 to 49 in the 2010 Census database and 8.99% in the 2000 Census.

2. Aditional control: Dummy variable for each age (15 to 49) with the median age in each model as the reference age.

†p <.10; *p <.05; **p <.01; ***p <.001

Table 4: Odds Ratio of two levels logit regression model predicting the fourth order live birth in Brazil for married or cohabiting women 15 to 49 years old in 2000 and 2010

Level			2000	2010	2010 with Formal
Individual	Black or Brown		1.08**	1.11**	1.11**
	Educ Attain (ref: Less than Primary)				
	Primary Completed		0.85***	0.88*	0.89*
	High School or College Completed		0.77***	0.72***	0.73***
	Not Declared		1.00†	0.55†	0.55†
	Sewage in HH		0.96†	0.95†	0.96†
	Income or Log Income per capita (HH)		0.56***	0.61***	0.61***
	Rural Area		1.06*	1.00†	1.00†
	Formal Labor Contract		-	-	0.89†
County	Fem/Total Managers		1.19†	0.92†	0.92†
	Working mothers w y child 1-5/ Total mothers with youngest child 1-5 years old		1.04†	1.29†	1.33†
	Resident Physicians (per thousand pop)		1.08***	1.07**	1.07**
	rho		0.036***	0.039***	0.039***
	Wald Chi2 (14)		7750.99***	3166.79***	3162.52***
	Number of obs		279890	172555	172555
	Number of groups		1447	5479	5479
)s per group		min	12	1	1
		avg	193.4	31.5	31.5
		max	13971	2690	2690
	Convergence		Achieved (Total Iterations: 7)	Achieved (Total Iterations: 17)	Achieved (Total Iterations: 15)

Data Source: Brazil Census 2000 and 2010.

Notes: 1. Women from 15 to 49 years old in households with total income missing or zero has been deleted to the data in this sample. They represent 3.51% of total married women aged 15 to 49 in the 2010 Census database and 8.99% in the 2000 Census.

2. Aditional control: Dummy variable for each age (15 to 49) with the median age in each model as the reference a

†$p<.10$; *$p<.05$; **$p<.01$; ***$p<.001$

In the model predicting a live birth in any birth order (Table 5), we can observe that the gender variable have no effect at all and the work and family variable has a positive effect. The inclusion of the control "Formal" increased the odds ratio of this variable from 1.30 to 1.39 . The effect of having a formal labor contract is negative as in the other models. All individuals' variables in the model have a significant effect on the odds to have a child in 2010. The coefficients are similar from 2000 except for sewage in household, living in rural area and not declared education.

Finally, the coefficients of the variable number of resident physicians in the county are significant in 2000 and 2010 in all the models. This is the closest variable of general health attendance supply in the county that we could think about. Therefore, higher levels of "physicians supply" are associated with higher chances to have a live birth in 2000 and in 2010.

Table 5: Odds Ratio of two levels logit regression model predicting a live birth (of any birth order) in Brazil for married or cohabiting women 15 to 49 years old in 2000 and 2010

Level			2000	2010	2010 with Formal
Individual	Black or Brown		0.98**	0.95***	0.95***
	Educ Attain (ref: Less than Primary)				
	Primary Completed		1.09***	1.08***	1.08***
	High School or College Completed		1.48***	1.42***	1.45***
	Not Declared		2.94***	0.74***	0.75***
	Sewage in HH		1.01†	1.05***	1.05***
	Income or Log Income per capita (HH)		0.63***	0.69***	0.71***
	Rural Area		1.02*	0.90***	0.89***
	Formal Labor Contract		-	-	0.83***
County	Fem/Total Managers		1.01†	1.01†	1.01 †
	Working mothers w y child 1-5/ Total mothers with youngest child 1-5 years old		1.08†	1.30***	1.39***
	Resident Physicians (per thousand pop)		1.05***	1.05***	1.05***
	rho		0.007***	0.006***	0.006***
	Wald Chi2 (14)		82260.8***	117079.77***	117774.55***
	Number of obs		1422865	3072441	3072441
	Number of groups		1447	5480	5480
Obs per group		min	86	59	59
		avg	983.3	560.7	560.7
		max	76527	75084	75084
	Convergence		Achieved (Total Iterations: 7)	Achieved (Total Iterations: 7)	Achieved (Total Iterations: 7)

Data Source: Brazil Census 2000 and 2010.

Notes: 1. Women from 15 to 49 years old in households with total income missing or zero has been deleted to the data in this sample. They represent 3.51% of total married women aged 15 to 49 in the 2010 Census database and 8.99% in the 2000 Census.

2. Aditional control: Dummy variable for each age (15 to 49) with the median age in each model as the reference age.

†p <.10; *p <.05; **p <.01; ***p <.001

5. DISCUSSION

This paper is the first attempt to access how county level variables can affect fertility in Brazil in different birth orders. We have noticed that perceived work and family conflict and gender inequality do have an effect on fertility, especially to the first, second and third order child. This result is in consonance with Rindfuss et al. (2007). The number of physicians in the county also had an effect on the transition to motherhood. It used as a proxy to health care supply in the municipality. Therefore, other variables constants, an additional resident physician per 1000 people in the county will increase the chances to a live birth.

It is important to highlight the importance of separating the analysis by parities. If we had used only Model 5 we wouldn't be able to observe how the variables have different effects in each birth order. For future estimations, the model can be improved by the inclusion of some characteristics of previous child as, for example, age of the 1st child in Model 2 and age of the 1st and 2nd child in Model 3. It would helpful to see also if the previous child is in school or not or the sex of the second child in

Model 3 (based on Mills and Begall 2010). These variables can be estimated with the database used in this study (Brazilian Census). It would be a problem only if the woman doesn't live with her child.

The models will be improved also by including interactions of the variable "Informal". With that we will be able to understand better the mechanism that formal labor force status plays in the effect of having a child for married or cohabiting women ages 15 to 49. We will also, until PAA 2013, improve the model by making multiple imputations to the 3.51% in 2010 and 8.99% in 2000 of the observations that were deleted from the data due to missing income information.

Appendix. A descriptive piece of Brazilian Fertility - 1980 to 2000

TABLE A1 – TFR by Education Attainment and Region – Brazil 1980 to 2000

Educational Attainment	1980	1991	2000	Educational attainment	1980	1991	2000
North Urban				***Northeast Urban***			
Less than primary	5.42	3.45	3.04	Less than primary	4.55	2.89	2.57
Primary	3.53	2.37	2.17	Primary	2.91	2.01	1.82
Secondary	2.67	1.80	1.76	Secondary	2.44	1.72	1.45
University	2.59	1.83	1.31	University	2.49	1.74	1.18
Total	4.54	2.80	2.36	Total	3.90	2.40	2.01
North Rural				***North Rural***			
Less than primary	6.98	4.87	4.15	Less than primary	6.16	4.41	3.41
Primary	4.52	3.18	2.66	Primary	3.77	2.71	2.14
Secondary	3.85	2.31	2.20	Secondary	2.99	2.16	1.95
University	-	2.68	2.36	University	3.43	1.75	1.65
Total	6.75	4.54	3.80	Total	6.03	4.18	3.09

Source: IBGE/Census Microdata 1980, 1991 and 2000.

TABLE A1 – TFR by Education Attainment and Region – Brazil 1980 to 2000 (cont.)

Educational Attainment	1980	1991	2000	Educational attainment	1980	1991	2000
South Urban				***Southeast Urban***			
Less than primary	3.30	2.76	2.68	Less than primary	3.40	2.48	2.49
Primary	2.46	2.10	2.00	Primary	2.41	1.95	1.92
Secondary	2.32	1.78	1.39	Secondary	2.09	1.57	1.39
University	2.53	1.55	1.14	University	2.10	1.43	1.10
Total	2.87	2.26	1.91	Total	2.89	2.05	1.81
South Rural				***Southeast Rural***			
Less than primary	3.92	2.87	2.64	Less than primary	4.66	3.20	2.80
Primary	2.51	2.34	2.02	Primary	3.37	2.33	2.13
Secondary	2.98	2.14	1.62	Secondary	2.27	2.07	1.75
University	1.68	2.29	1.30	University	1.78	2.25	1.58
Total	3.78	2.74	2.23	Total	4.49	3.03	2.42

Source: IBGE/Census Microdata 1980, 1991 and 2000.

TABLE A1 – TFR by Education Attainment and Region – Brazil 1980 to 2000 (cont.)

Educational attainment	1980	1991	2000
Midwest Urban			
Less than primary	3.87	2.59	2.38
Primary	2.86	2.11	1.84
Secondary	2.49	1.89	1.41
University	2.77	1.59	1.25
Total	3.38	2.28	1.84
Midwest Rural			
Less than primary	5.09	3.24	2.75
Primary	3.98	2.85	1.96
Secondary	5.48	2.96	2.05
University	1.79	2.50	1.57
Total	4.98	3.16	2.39

Source: IBGE/Census Microdata 1980, 1991 and 2000.

TABLE A2 – TFR and Parity Adjusted TFR (PATFR) by Region – Brazil 1980 to 2000

regnbr	year	PATFR	TFR
North	1980	2.811	5.449
	1991	2.692	3.393
	2000	2.534	2.679
Northeast	1980	2.634	4.833
	1991	2.521	2.978
	2000	2.370	2.264
Southeast	1980	2.637	3.100
	1991	2.436	2.132
	2000	2.210	1.844
South	1980	2.688	3.157
	1991	2.543	2.358
	2000	2.298	1.950
Midwest	1980	2.725	3.802
	1991	2.605	2.398
	2000	2.342	1.876
Brazil	1980		3.712
	1991		2.487
	2000		2.042

Source: Brazil Census 2000.

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