

FERTILITY AND WOMEN'S LABOR FORCE PARTICIPATION IN DEVELOPING COUNTRIES

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Abstract To estimate the causal impact of fertility on women's labor supply, we use the occurrence of twins and the sex in first births as measures of exogenous shocks to fertility. Since twins at first birth occur relatively rarely in one country, we use all available Demographic and Health Surveys. We find women in developing countries have more children if they had twins in the first birth, if the first two births were the same sex, or if the first two births were girls. Women in sub-Saharan Africa, Latin America and the Caribbean, and East Asia also have more children if they had one or two boys in their first two births. However, women in South Asia and the Middle East and North Africa (MENA) have fewer children as a result. Findings on labor force participation differ by age and geographic area. Women in sub-Saharan Africa, Central America, and the Caribbean are more likely to participate in the labor force when they have twins in the first birth. With the exception of Asia, women whose first one or two births are boys are less likely to participate in the labor force. In Asia, the effects differ by age.

Introduction

Birth rates are falling in many countries: families are smaller and dependency ratios are lower than among previous generations. As fertility declines, childbearing patterns change in three ways: women may delay their first birth, space their births, or stop having children at an earlier age than previous cohorts. Indeed, the pattern of fertility change differs considerably around the world. In some countries, such as India, women are stopping childbearing at an earlier age than previous cohorts. In some African countries, such as Chad, however, young women can expect to have six children or more during their lifetime. In Ghana, and in the Philippines, women are increasing the interval between births. Each of these changes is likely to have a different impact on the ability of women to work outside the home and on the decisions they make regarding work and child-bearing.

A woman's capacity to perform physical labor is diminished during the period surrounding childbirth. The need to care for a child restricts the time that a mother can devote to paid labor, inside or outside the home. A study of urban households in India concluded that the presence of children increases mothers' time in home production, with the effect of younger children (aged 0-6 years) being six times the effect of older children (Malathy 1994). As a lower bound, the cost of this time is the wage that would be paid to a substitute caregiver. The need to provide care diminishes as the child grows, permitting the mother to return to work (alternately, the utility of working exceeds the utility of remaining at home).

What motivates families to have fewer children? In poor societies, with high mortality, having many children provides both income and insurance. Children provide labor for current consumption and a means of support in old age. As mortality declines and markets for both human and financial capital develop, fewer children are required to obtain these benefits for the household. Also, as families – and especially women – develop their human capital, and as

demand for skilled labor increases with development, wages rise and so does the opportunity cost of time, including the time required to raise children. Fertility falls as women's education and independence increase. This suggests that the primary determinant of fertility change is change in desired family size – that is, the demand side.

Thus, when examining the effects of fertility on women's labor market behavior, one must address the simultaneous endogeneity of women's fertility and employment decisions. Engelhardt, Kögel and Prskawetz (2004) finds significant causality in both directions using European data; and Kögel (2003) finds that the negative correlation between fertility and employment has become significantly smaller (though not positive) in Europe since the mid-1980s. On the other hand, McNown and Rajbhandary (2001), using cointegration methods, find that female labor force participation responds significantly to fertility shocks, but the effects from work to fertility are insignificant.

Carrasco (2001) applies a binary switching model to the U.S. Panel Study on Income Dynamics, accounting for both endogeneity and unobserved heterogeneity, using sex composition as an instrument for changes in fertility. Carrasco also finds a larger impact in the IV; on the other hand, the failure to account for unobserved heterogeneity biases the estimate upwards.

Using Markov chain Monte Carlo (MCMC) methods, Troske and Voicu (2004) find that children have a strong effect on women's labor market behavior, and that differences in expected (future) fertility also have a strong effect on labor market behavior prior to the birth. They also find that the effects are largest immediately after the birth, but decline over time.

Korenman and Neumark (1992) proposed a method to study the effects of marriage and fertility on women's wages in the U.S. that is supposed to eliminate possible bias related to

unobserved fixed variables that affect wages, fertility, and marriage by focusing on *changes* in the labor and fertility outcomes.

Rosenzweig and Wolpin (1980, 2000), use cross-sectional data and the occurrence of twins in the first pregnancy to look at the impact of fertility on participation, and show significant negative effects of additional children on mother's labor force participation. Using a two-stage estimation strategy, Angrist and Evans (1998) first estimate the probability of childbearing as a function of the sex of the first two children. Hotz and others (2004) exploit the occurrence of spontaneous abortion (miscarriage) as the instrument for childbearing.

While there has been a great deal of study on this issue in the U.S. and Europe, there has been very little study in developing countries. One exception is a study by Chun and Oh (2002), which instrumented fertility decisions in Korea with the sex of the first child. They find that having an additional child reduces labor force participation by almost 40%, on average; but there is considerable heterogeneity across families. The results obtained under the assumption of exogeneity significantly underestimate the true impact of childbearing on labor force participation.

In this paper, we use a set of household survey data from 55 developing countries (92 Demographic and Health Surveys) to estimate the relationship between women's labor market behaviors and fertility. We are able to take advantage of the availability of similar information across these countries (a number of which were surveyed several times) to obtain a large enough sample of women of childbearing age who had a multiple birth in their first birth. In using this to instrument for fertility, we adopt the strategy employed by Rosenzweig and Wolpin (1980). Our study differs from the aforementioned authors and previous studies on this issue in that we are studying this question in a very different context from that addressed previously. The

Demographic and Health Surveys target poor rural women across the developing world, many of which work in agriculture and are self-employed. Of those who are working at the time of being surveyed, 26% are self-employed in the agriculture sector. We find this population's labor supply decisions are affected quite differently by multiple births than are those in industrialized countries. In contrast to women in the U.S., women in developing countries are generally not less likely to participate in the labor force when they have a multiple birth in their first birth.

In the following section, we describe the data and empirical methods used in the analysis. Then in section 3, we will discuss our preliminary findings. Finally, in the conclusion, we will discuss the next steps we plan to take with this study.

Data and Empirical Strategy

The Demographic and Health Surveys are nationally representative and have been widely used in studying developing countries both individually and in comparative studies. In our analysis, we use all 92 publicly accessible DHS datasets available for 55 different countries (see the Appendix for a complete list).

We adopt the approaches used by Rosenzweig and Wolpin (1980) and Angrist and Evans (1998) in their analysis of the U.S. Following Rosenzweig and Wolpin (1980), we divide the population into three age groups representing three different stages in a woman's life-cycle. The average age at first birth is around 19. To estimate the causal impact of fertility on women's labor supply, we use the occurrence of twins and the sex in first births as measures of exogenous shocks to fertility. A multiple birth in the first birth is used as opposed to any multiple birth during a woman's lifetime, because women who have a greater preference or demand for more children are also more likely to have a multiple birth. In addition to examining the effects of a twin in the first birth, we also examine whether the sex of the twins matters.

Labor force participation is defined as having worked in the past twelve months. The greatest percentage of women (33%) is self-employed and/or working in agriculture.

In the following section, we discuss the results of our estimation of the following regressions:

$$Y_{ijt} = \beta_0 + \beta_1 \text{Twins Girl}_{ijt} + \beta_2 \text{Twins Boys}_{ijt} + \beta_3 \text{Twins Boy/Girl}_{ijt} + \beta_4 A_{ijt} + \beta_5 U_{ijt} + \mu_{jt} + \varepsilon_{ijt} \quad (1)$$

$$Y_{ijt} = \beta_0 + \beta_1 \text{Twins}_{ijt} + \beta_3 A_{ijt} + \beta_4 U_{ijt} + \mu_{jt} + \varepsilon_{ijt} \quad (2)$$

$$Y_{ijt} = \beta_0 + \beta_1 \text{Same Sex}_{ijt} + \beta_2 \text{First is Boy}_{ijt} + \beta_3 \text{Second is Boy}_{ijt} + \beta_4 A_{ijt} + \beta_5 U_{ijt} + \mu_{jt} + \varepsilon_{ijt} \quad (3)$$

$$Y_{ijt} = \beta_0 + \beta_1 \text{1st is Boy}_{ijt} + \beta_2 \text{1st Two Boys}_{ijt} + \beta_3 \text{1st Two Girls}_{ijt} + \beta_4 A_{ijt} + \beta_5 U_{ijt} + \mu_{jt} + \varepsilon_{ijt} \quad (4)$$

where Y_{ijt} is the outcome variable (number of children ever born and a dichotomous variable equal to one if respondent i worked in the past twelve months and zero otherwise); A_{ijt} is the age at first birth of respondent i ; U_{ijt} is an urban/rural dummy; and μ_{jt} are the country and survey year fixed effects. We estimate effects on fertility using ordinary least-squares regressions, and the labor supply decisions are estimated by logit regressions.

Results

Results of the above regressions have been summarized in Table 1. Women all over the developing world tend to have more children if they have a multiple birth in the first birth, no matter whether they have twin boys, twin girls, or a boy and a girl. In general, women whose first two children are of the same sex also have more children, particularly when they have two daughters in the first two births. However, the effect of having a son in the first and/or second birth is more varied and depends on the geographic region. In MENA and South Asia, unlike in other parts of the world, women will have fewer children if they have a son in the first one or two births. This may point to the possibility that women in MENA and South Asia place a higher

premium on boys, which is why they have fewer children. In addition, having children of both sexes, and having at least one son is highly valued across the developing world.

In sub-Saharan Africa, Central America and the Caribbean, women who have a twin in first birth are more likely to participate in the labor force; they seem to be more income constrained, as the income effect dominates any substitution effects. The twins arrive at the same time, and require twice the amount of resources from the day they are born. This unexpected turn of events may necessitate women to work more in order to provide for their children.

However, when births are spaced further apart, and women have more children because they are trying for a boy and a girl, or they are trying for a boy because they already have girls, the substitution effect dominates, especially when women have boys in the first one or two births, as sons can contribute to household income. It is interesting to note that having girls only raises the probability a mother works in South Asia. Since daughters can substitute for a mother's time in home production, one would expect that having daughters may raise the likelihood that mothers go out to work in the marketplace. However, this effect seems to be dominant only in South Asian countries.

On the other hand, in South America the substitution effect dominates in all cases in which women are having more children. Women in South America may be working less to provide more care at home for their children. This may indicate the possibility that women in South America are less budget-constrained, or that they have fewer family members to rely on in helping to care for their children.

In East Asia, increased fertility does not influence labor force participation, except in the case in which women have sons in the first one or two births. In this case, the results depend on the age of the mother at the time of the survey. Women under 25 are less likely to work if the

first child was a boy, but they are more likely to work if the second child was a boy, or if the first two children were both boys. Women 25 and older are less likely to work when they have one or two sons in the first births. This may be possible if the income effect dominates once a young mother has two sons to take care of as she becomes more income constrained, while the substitution effect dominates when a mother has one son to care for, and no daughter to help her at home.

Similarly, in MENA labor force participation is not affected by increased fertility due to having twins or children of the same sex in the first birth. However, the income effect seems to dominate in the case of having a son in the first one or two births. Women have fewer children as a result of having son(s), and they are less likely to work as a result.

In South Asia, the effect of fertility on labor force participation depends on the gender of the first births and the woman's age. Women who have daughters in the first two births are more likely to participate in the labor force, as do women 25 and older who have had twin girls in their first birth. In contrast, women under 25 with twin daughters in their first birth are less likely to participate in the labor force. This may be because the daughters of older women can substitute for their mothers' time and help them to take care of their younger siblings, while younger women with twin girls do not have anyone to help them at home. In addition, South Asian women 25 and older whose first one or two births were boys are less likely to participate in the labor force, and the income effect is dominant for them. However, women under 25 are more likely to work, perhaps because they are more income-constrained than their older counterparts, or because they are able to work more because they decide to have fewer children.

Below, we examine the empirical results for each region more closely.

I. Fertility

I.a. Sub-Saharan Africa

Women who have a multiple birth in the first birth living in this part of the developing world do not seem to adjust their fertility behavior as a result of this shock. They have an additional child as a result of the multiple birth. However, the effect is greater for women who have twin girls, and lowest for women who have twin boys. These differences are most pronounced for women 35 and older.

While this may point to some possibility of son preference, women whose first or second child is a boy do not have fewer children. But there is a premium for having children of both sexes, because women who have children of the same sex in the first two births, whether they are boys or girls have around 0.04 more children as a result if they are 25 and older. For younger women, the effects are lower, because these women are still towards the beginning of their fertility cycles.

I.b. Central America & the Caribbean

We see similar effects in this region to those we saw in sub-Saharan Africa in terms of the direction of the effect. However, the magnitudes are considerably lower in this case. This is particularly evident of the result that women 35 and older have only 0.5 more children when they have twin boys, while women generally have between 0.7 and 0.9 additional children when they have twin girls or a twin boy and girl.

Having children of the same sex also has a considerably positive impact on women's fertility, but the effect is greater for women who have sons in the first two births, especially women ages 35 to 44. Women in this age group whose second child is a son also have more children. Thus, in this part of the developing world, it seems that there is no son preference, but rather, women would prefer to have children of both sexes.

I.c. South America

Women in South America who have a twin at first birth do seem to make some adjustments to their fertility, although they still generally have more children as a result of having the multiple birth. Younger women who have not completed their fertility cycles have at least one additional child, but women 35-44 who completed or are near completion of their fertility cycles have between 0.55 and 0.83 more children. It is interesting to note that women ages 35 to 44 have only 0.55 more children when they have twin girls, but 0.81 more children when they have twin boys. This may indicate that women are more apt to have additional children when they have boys. Indeed, we see this effect on the coefficients for women whose first two children are boys. While women ages 35 to 44 have 0.06 more children when they have two sons, they only have 0.02 additional children when they have two girls, and the coefficients of the latter are not statistically significant.

I.d. East Asia

As we have seen in the other regions of the developing world, women in East Asia have more children when they have a multiple birth in the first birth, but this effect is generally greater when women have twin boys as opposed to twin girls. Although having two children of the same sex in the first births also raises the number of children a woman has, having a twin boy and girl has the greatest effect of having additional children. This may be due to differences in the sample, since in the first two regressions, women with only one child are also included in the sample, whereas in the third regression, only women with more than one child were included. It may be somewhat surprising that in East Asia, having a boy does not necessarily result in fewer children. Moreover, women who have two sons in the first births have more children, as do women who have two daughters. However, among women 35 to 44, the effect is slightly greater

for women with sons. Again, these results may likely have to do with the fact that only women with more than one child were included in the third and fourth regressions. One must also keep in mind that the most populous East Asian country, China, was not included in the sample.

I.e. Middle East & North Africa (MENA)

In MENA, women who have a multiple birth in the first birth also have more children. However, the effect is greatest for those with twin girls, especially for those ages 15-24 and 35-44. Women who have two girls in the first two births also have more children and the effects are statistically significant at the 1% level. While women have more children when their first two are of the same sex, the effect is stronger when women have two daughters. Having two sons has a somewhat negative effect on fertility, although the magnitudes are low and the coefficient estimates are not statistically significant. Son preference clearly plays a role here, and this is also evident from the negative coefficients on the dummies for having a boy in the first or second birth. Thus, women in MENA seem to adjust their fertility choices by trying for a boy if they first have girls, and by having fewer children when they have a son.

I.f. South Asia

This form of son preference also seems to be prevalent in South Asia. Here, women also have more children when they have a twin in the first birth, and the effects are also greatest for women with twin girls. The evidence of son preference is stronger in this part of the world, as women have more children when their first two are daughters, and fewer when their first two are sons. The effect is stronger when women have girls, but all the coefficient estimates are statistically significant at the 1% level. Having a boy in the first or second birth also negatively impacts a woman's fertility, especially for women nearing the completion of their fertility cycle at the ages of 35 to 44.

II. Labor Force Participation

II.a. Sub-Saharan Africa

Having a twin in the first birth has a positive impact on the probability that women (especially those ages 35-44) participate in the labor force. However, the effects are not statistically significant, except in the case when women of all ages are grouped together, and women have a twin boy and girl. Nonetheless, the magnitudes of the coefficients indicate an overall positive effect. In contrast, women who have a son in the first birth, or two sons in the first two births, are less likely to work. These effects are strongest for women ages 35 to 44.

II.b. Central America & the Caribbean

In this region, having twins generally has a positive impact on the likelihood that women participate in the labor force. However, women under 35 who have twin girls, women 25 to 34 with twin boys, and women 15-24 with a twin boy and girl, are less likely to work. However, these estimates are relatively imprecise and may be due to too few twins in first birth in the sample. In contrast, there is a considerable effect of having one or two sons in the first boys for women ages 25 and older. These women are less likely to work even though they had more children when they had sons in the first birth(s). This may be explained if women in this region have fewer people to rely on for help in caring for children, and if older daughters provide help in caring for children, allowing more women to work.

II.c. South America

South American women under the age of 35 are less likely to participate in the labor force if their first birth is a multiple birth. This effect is strongest for women 15 to 34 who have twin girls, and women 25 to 34 who have twin boys. Women ages 35 to 44 whose first child was a boy are also considerable less likely to work. This may be because they have more children,

and need to care for them, since they don't have older daughters to help in this regard. Thus the substitution effect is dominated by the income effect.

II.d. East Asia

Results for this region are considerably mixed. Older women near the completion of their fertility cycles who have had twins in the first birth are generally less likely to participate in the labor force. However, younger women, especially those in the middle age range of 25 to 34, are more likely to work when they have a twin in the first birth, particularly if it is a twin boy and girl. In considering the sex of the first birth, women ages 15 to 24 are most severely affected by these shocks. In this age group, having a son in the second birth or two sons in the first two births raises the likelihood that a woman will participate in the labor force. In contrast, having a son in the first birth or two girls in the first births reduces the probability of doing so. These findings need to be studied further.

II.e. Middle East & North Africa (MENA)

Women in this region who are ages 25 and older and had a multiple birth in the first birth are less likely to work, although the estimates are not statistically significant. When the first child is a son, or the first two births are boys, women ages 35 to 44 are also less likely to work. In addition, women in this age group who have children of the same sex in the first two births are also less likely to work. The focus of the effects on the eldest age group may be due to this being the age group with the greatest variability in terms of labor force participation decisions. These women may be less budget-constrained, so that they can work less to take care of their children; or their sons may be able to provide income.

II.f. South Asia

The effects of fertility shocks on labor force participation are quite mixed for women in this region. Women ages 15 to 24 are less likely to work if they have a twin in first birth, particularly if it is twin girls or a twin boy and girl. However, women ages 35 to 44 who have a twin in first birth, and those who have twin girls in the first birth are more likely to work. This may be because by the time women reach this age, their twin daughters are old enough to help in household production, allowing more of these mothers to spend time in the labor force. This can also explain why women in this age group work more if their first two births were girls, and work less when their first one or two births were boys.

Conclusion

In this paper, we have studied how the impact of fertility shocks on labor force participation varies for women in different countries, given that there are pronounced differences in overall fertility rates and gender roles. We have examined the effects of variations in the sex composition of women's first births, both in the case of having twins and a sequence of single births. In doing so, we have seen how variations in sex preferences across countries differentially affect fertility behavior, and also labor force participation decisions.

This analysis has provided an important initial step in addressing how in developing countries, women's labor force participation decisions are affected by fertility. However, much remains to be done. We plan to examine the heterogeneity of the impact of fertility on women's labor supply, that is, whether the labor-market consequences of child bearing is more or less likely to be severe for poor and less educated women, for example.

The life-cycle decisions of women in developing countries regarding their fertility and labor force participation choices are quite different from those of women in wealthier countries, since their budget constraints are often much more severely restrictive than are those of women

in industrialized countries. In fact, in contrast to what was found in the U.S., we find evidence that women in many developing countries who had a twin in the first birth were more likely to participate in the labor force as a result. Moreover, the pattern of the effect on women's labor supply in different stages of the life-cycle is quite different from the U.S. for the developing world.

References

- Angrist, J. and W. Evans (1998) "Children and their Parents' Labor Supply: Evidence from Exogenous Variation in Family Size," *American Economic Review* 88(3), 450-477.
- Carrasco, Raquel, 2001. "Binary Choice with Binary Endogenous Regressors in Panel Data: Estimating the Effect of Fertility on Female Labor Participation," *Journal of Business & Economic Statistics* 19:4:385-94.
- Chun, H. and J. Oh, 2002. "An instrumental variable estimate of the effect of fertility on the labour force participation of married women", *Applied Economics Letters*, 9, 631-34.
- Engelhardt, Kögel and Prskawetz 2004. Fertility and women's employment reconsidered: a macro-level time series analysis for developed countries, 1960-2000. Mimeo, Max Planck Institute.
- Hotz and others 2004. "Teenage Childbearing and Its Life Cycle Consequences: Exploiting a Natural Experiment." Mimeo, UCLA.
- Kögel, T. 2003 . Did the Association Between Fertility and Female Employment Within OECD Countries Really Change its Sign? Mimeo, Max Planck Institute.
- Korenman and Neumark (1992)
- Malathy. 2004. "Education and Women's Time Allocation to Nonmarket Work in an Urban Setting in India," *Economic Development and Cultural Change* 42(4, July): 743-760.
- McNown, R. and S. Rajbhandary 2001 Time series analysis of fertility and female labor market behavior. *J Pop Econ* 16:501-523.
- Rosenzweig, M. and K. Wolpin, 1980. "Life-cycle labor supply and fertility: causal inferences from household models. *J Pol Econ*. 88:2:328-348.
- Rosenzweig, Mark and Wolpin, Kenneth. 1980. "Testing the Quantity-Quality Fertility Model: the Use of Twins as a Natural Experiment." *Econometrica*, 48:227-240.
- Troske and Voicu 2004. "Joint estimation of sequential labor force participation and fertility decisions using Markov chain Monte Carlo techniques." Working Paper 0412, IZA, Bonn.

Table 1. Summary of Results				
	Twins	Same Sex	Girls	Boy(s)
Sub-Saharan Africa				
No. Children	+	+	+	+
LFP	+			-
Central America & the Carribean				
No. Children	+	+	+	+
LFP	+	-		-
South America				
No. Children	+	+	+	+
LFP	-	-		-
East Asia				
No. Children	+	+	+	+
LFP				mixed
MENA				
No. Children	+	+	+	-
LFP				-
South Asia				
No. Children	+	+	+	-
LFP	mixed		+	mixed

Table 2. Fertility Results for Sub-Saharan Africa

	Women Ages:			
	15-44	15-24	25-34	35-44
	<i>Regression 1</i>			
1st birth: twin girls	1.066*** (0.059)	1.101*** (0.057)	1.037*** (0.074)	1.184*** (0.142)
1st birth: twin boys	1.010*** (0.056)	1.075*** (0.055)	0.964*** (0.074)	0.966*** (0.126)
1st birth: a twin boy & girl	0.986*** (0.055)	1.047*** (0.057)	1.021*** (0.071)	1.002*** (0.125)
	<i>Regression 2</i>			
1st birth: twins	1.019*** (0.033)	1.074*** (0.033)	1.008*** (0.042)	1.040*** (0.076)
	<i>Regression 3</i>			
1st 2 children: same sex	0.038*** (0.007)	0.019*** (0.007)	0.043*** (0.008)	0.040*** (0.014)
1st child: boy	-0.010 (0.007)	0.011 (0.007)	-0.014* (0.008)	-0.023 (0.014)
2nd child: boy	0.002 (0.007)	0.008 (0.007)	-0.003 (0.008)	0.003 (0.014)
	<i>Regression 4</i>			
1st child: boy	-0.013 (0.010)	0.003 (0.010)	-0.011 (0.012)	-0.027 (0.020)
1st 2 children: both boys	0.041*** (0.010)	0.027*** (0.010)	0.040*** (0.012)	0.043** (0.020)
1st 2 children: both girls	0.036*** (0.010)	0.012 (0.010)	0.047*** (0.012)	0.036* (0.020)

Table 3. Fertility Results for Central America & the Caribbean

	Women Ages:			
	15-44	15-24	25-34	35-44
<i>Regression 1</i>				
1st birth: twin girls	0.833*** (0.113)	0.826*** (0.121)	0.900*** (0.144)	0.761*** (0.239)
1st birth: twin boys	0.685*** (0.112)	0.941*** (0.119)	0.746*** (0.149)	0.495** (0.226)
1st birth: a twin boy & girl	0.943*** (0.118)	0.823*** (0.142)	0.964*** (0.165)	0.927*** (0.221)
<i>Regression 2</i>				
1st birth: twins	0.815*** (0.066)	0.868*** (0.073)	0.865*** (0.088)	0.730*** (0.132)
<i>Regression 3</i>				
1st 2 children: same sex	0.065*** (0.012)	0.024* (0.014)	0.040*** (0.015)	0.098*** (0.024)
1st child: boy	0.018 (0.012)	0.027* (0.014)	0.034** (0.015)	-0.001 (0.024)
2nd child: boy	0.024** (0.012)	0.005 (0.014)	-0.004 (0.015)	0.052** (0.024)
<i>Regression 4</i>				
1st child: boy	-0.006 (0.018)	0.022 (0.020)	0.037* (0.021)	-0.053 (0.034)
1st 2 children: both boys	0.090*** (0.017)	0.029 (0.020)	0.037* (0.021)	0.150*** (0.033)
1st 2 children: both girls	0.041** (0.018)	0.019 (0.020)	0.044** (0.022)	0.047 (0.034)

Table 4. Fertility Results for South America

	Women Ages:			
	15-44	15-24	25-34	35-44
<i>Regression 1</i>				
1st birth: twin girls	0.862*** (0.108)	1.061*** (0.133)	0.828*** (0.142)	0.545** (0.215)
1st birth: twin boys	0.881*** (0.109)	1.093*** (0.150)	0.877*** (0.137)	0.814*** (0.211)
1st birth: a twin boy & girl	0.797*** (0.126)	1.246*** (0.202)	0.708*** (0.154)	0.834*** (0.232)
<i>Regression 2</i>				
1st birth: twins	0.852*** (0.066)	1.108*** (0.089)	0.811*** (0.083)	0.727*** (0.126)
<i>Regression 3</i>				
1st 2 children: same sex	0.034*** (0.011)	0.039*** (0.015)	0.019 (0.014)	0.040** (0.020)
1st child: boy	-0.004 (0.011)	0.004 (0.015)	0.009 (0.014)	-0.024 (0.020)
2nd child: boy	0.002 (0.011)	0.019 (0.015)	-0.008 (0.014)	0.020 (0.020)
<i>Regression 4</i>				
1st child: boy	-0.007 (0.016)	-0.015 (0.021)	0.017 (0.020)	-0.045 (0.029)
1st 2 children: both boys	0.037** (0.016)	0.058*** (0.021)	0.011 (0.019)	0.060** (0.028)
1st 2 children: both girls	0.032** (0.016)	0.021 (0.021)	0.028 (0.020)	0.019 (0.029)

Table 5. Fertility Results for East Asia

	Women Ages:			
	15-44	15-24	25-34	35-44
<i>Regression 1</i>				
1st birth: twin girls	0.711*** (0.101)	0.871*** (0.119)	0.796*** (0.118)	0.527*** (0.202)
1st birth: twin boys	0.835*** (0.102)	1.062*** (0.116)	0.712*** (0.122)	0.843*** (0.200)
1st birth: a twin boy & girl	0.986*** (0.164)	1.098*** (0.220)	0.991*** (0.213)	0.944*** (0.287)
<i>Regression 2</i>				
1st birth: twins	0.806*** (0.066)	0.984*** (0.078)	0.788*** (0.079)	0.737*** (0.127)
<i>Regression 3</i>				
1st 2 children: same sex	0.096*** (0.011)	0.012 (0.016)	0.082*** (0.012)	0.120*** (0.018)
1st child: boy	0.002 (0.011)	0.029* (0.016)	0.006 (0.012)	-0.012 (0.018)
2nd child: boy	-0.008 (0.011)	0.003 (0.016)	-0.030** (0.012)	0.018 (0.018)
<i>Regression 4</i>				
1st child: boy	0.009 (0.015)	0.026 (0.022)	0.037** (0.017)	-0.031 (0.026)
1st 2 children: both boys	0.088*** (0.015)	0.015 (0.022)	0.052*** (0.017)	0.138*** (0.026)
1st 2 children: both girls	0.103*** (0.015)	0.010 (0.022)	0.113*** (0.018)	0.102*** (0.027)

Table 6. Fertility Results for Middle East & North Africa (MENA)

	Women Ages:			
	15-44	15-24	25-34	35-44
<i>Regression 1</i>				
1st birth: twin girls	0.972*** (0.092)	1.017*** (0.118)	0.890*** (0.107)	1.061*** (0.193)
1st birth: twin boys	0.656*** (0.090)	0.970*** (0.118)	0.663*** (0.107)	0.634*** (0.171)
1st birth: a twin boy & girl	0.780*** (0.083)	0.964*** (0.118)	0.894*** (0.099)	0.483*** (0.153)
<i>Regression 2</i>				
1st birth: twins	0.799*** (0.051)	0.984*** (0.068)	0.820*** (0.060)	0.682*** (0.099)
<i>Regression 3</i>				
1st 2 children: same sex	0.125*** (0.012)	0.017 (0.017)	0.116*** (0.014)	0.162*** (0.021)
1st child: boy	-0.152*** (0.012)	-0.010 (0.017)	-0.146*** (0.014)	-0.189*** (0.021)
2nd child: boy	-0.144*** (0.012)	-0.042** (0.017)	-0.135*** (0.014)	-0.167*** (0.021)
<i>Regression 4</i>				
1st child: boy	-0.007 (0.017)	0.033 (0.024)	-0.010 (0.021)	-0.022 (0.030)
1st 2 children: both boys	-0.019 (0.017)	-0.025 (0.024)	-0.019 (0.020)	-0.005 (0.029)
1st 2 children: both girls	0.269*** (0.017)	0.060** (0.025)	0.251*** (0.021)	0.328*** (0.030)

Table 7. Fertility Results for South Asia

	Women Ages:			
	15-44	15-24	25-34	35-44
	<i>Regression 1</i>			
1st birth: twin girls	0.968*** (0.078)	1.056*** (0.081)	1.103*** (0.102)	0.897*** (0.186)
1st birth: twin boys	0.708*** (0.076)	0.826*** (0.087)	0.808*** (0.103)	0.571*** (0.156)
1st birth: a twin boy & girl	0.798*** (0.088)	0.913*** (0.104)	0.777*** (0.113)	0.843*** (0.199)
	<i>Regression 2</i>			
1st birth: twins	0.824*** (0.046)	0.941*** (0.052)	0.905*** (0.061)	0.741*** (0.103)
	<i>Regression 3</i>			
1st 2 children: same sex	0.118*** (0.007)	0.019** (0.009)	0.109*** (0.009)	0.164*** (0.014)
1st child: boy	-0.224*** (0.007)	-0.052*** (0.009)	-0.212*** (0.009)	-0.304*** (0.014)
2nd child: boy	-0.235*** (0.007)	-0.052*** (0.009)	-0.215*** (0.009)	-0.316*** (0.014)
	<i>Regression 4</i>			
1st child: boy	0.011 (0.010)	-0.000 (0.013)	0.003 (0.013)	0.012 (0.020)
1st 2 children: both boys	-0.117*** (0.010)	-0.033** (0.013)	-0.106*** (0.013)	-0.152*** (0.020)
1st 2 children: both girls	0.353*** (0.010)	0.071*** (0.013)	0.324*** (0.013)	0.479*** (0.021)

Table 8. Labor Force Participation Results for Sub-Saharan Africa

	Women Ages:			
	15-44	15-24	25-34	35-44
<i>Regression 1</i>				
1st birth: twin girls	0.002 (0.015)	0.023 (0.035)	-0.019 (0.023)	0.018 (0.027)
1st birth: twin boys	0.004 (0.014)	-0.004 (0.033)	0.007 (0.022)	0.018 (0.024)
1st birth: a twin boy & girl	0.028** (0.014)	0.026 (0.035)	0.030 (0.021)	0.032 (0.024)
<i>Regression 2</i>				
1st birth: twins	0.012 (0.008)	0.015 (0.020)	0.007 (0.013)	0.023 (0.014)
<i>Regression 3</i>				
1st 2 children: same sex	-0.003* (0.002)	-0.002 (0.005)	-0.002 (0.003)	-0.004 (0.003)
1st child: boy	-0.005*** (0.002)	0.006 (0.005)	-0.007*** (0.003)	-0.008*** (0.003)
2nd child: boy	-0.003* (0.002)	0.002 (0.005)	-0.002 (0.003)	-0.005* (0.003)
<i>Regression 4</i>				
1st child: boy	-0.002 (0.002)	0.005 (0.007)	-0.006 (0.004)	-0.003 (0.004)
1st 2 children: both boys	-0.006*** (0.002)	-0.001 (0.007)	-0.004 (0.004)	-0.009** (0.004)
1st 2 children: both girls	0.000 (0.003)	-0.004 (0.007)	-0.001 (0.004)	0.001 (0.004)

Table 9. Labor Force Participation Results for Central America & the Caribbean

	Women Ages:			
	15-44	15-24	25-34	35-44
<i>Regression 1</i>				
1st birth: twin girls	-0.016 (0.034)	-0.012 (0.073)	-0.004 (0.054)	0.008 (0.058)
1st birth: twin boys	0.012 (0.034)	0.119 (0.073)	-0.034 (0.056)	-0.011 (0.055)
1st birth: a twin boy & girl	0.044 (0.036)	-0.051 (0.089)	0.118* (0.062)	0.027 (0.054)
<i>Regression 2</i>				
1st birth: twins	0.012 (0.020)	0.027 (0.045)	0.019 (0.033)	0.008 (0.032)
<i>Regression 3</i>				
1st 2 children: same sex	-0.007* (0.004)	0.006 (0.010)	-0.012** (0.006)	-0.006 (0.006)
1st child: boy	-0.011*** (0.004)	0.008 (0.010)	-0.013** (0.006)	-0.013** (0.006)
2nd child: boy	-0.005 (0.004)	0.005 (0.010)	-0.005 (0.006)	-0.010* (0.006)
<i>Regression 4</i>				
1st child: boy	-0.006 (0.005)	0.003 (0.014)	-0.008 (0.008)	-0.003 (0.008)
1st 2 children: both boys	-0.012** (0.005)	0.012 (0.014)	-0.017** (0.008)	-0.016** (0.008)
1st 2 children: both girls	-0.002 (0.005)	0.001 (0.014)	-0.007 (0.008)	0.003 (0.008)

Table 10. Labor Force Participation Results for South America

	Women Ages:			
	15-44	15-24	25-34	35-44
<i>Regression 1</i>				
1st birth: twin girls	-0.028 (0.032)	-0.154 (0.094)	-0.102* (0.053)	0.061 (0.051)
1st birth: twin boys	-0.066** (0.033)	-0.031 (0.111)	-0.089* (0.052)	-0.039 (0.050)
1st birth: a twin boy & girl	-0.026 (0.038)	-0.203 (0.144)	-0.009 (0.058)	-0.013 (0.055)
<i>Regression 2</i>				
1st birth: twins	-0.041** (0.020)	-0.123* (0.064)	-0.070** (0.031)	0.003 (0.030)
<i>Regression 3</i>				
1st 2 children: same sex	-0.005 (0.003)	-0.014 (0.012)	-0.006 (0.005)	-0.001 (0.005)
1st child: boy	-0.010*** (0.003)	-0.006 (0.012)	-0.003 (0.005)	-0.014*** (0.005)
2nd child: boy	-0.004 (0.003)	-0.010 (0.012)	-0.004 (0.005)	-0.003 (0.005)
<i>Regression 4</i>				
1st child: boy	-0.006 (0.005)	0.004 (0.017)	0.002 (0.008)	-0.012* (0.007)
1st 2 children: both boys	-0.009* (0.005)	-0.024 (0.017)	-0.010 (0.008)	-0.004 (0.007)
1st 2 children: both girls	-0.001 (0.005)	-0.004 (0.018)	-0.001 (0.008)	0.001 (0.007)

Table 11. Labor Force Participation Results for East Asia

	Women Ages:			
	15-44	15-24	25-34	35-44
<i>Regression 1</i>				
1st birth: twin girls	-0.013 (0.031)	-0.042 (0.094)	0.027 (0.047)	-0.081* (0.048)
1st birth: twin boys	0.043 (0.031)	0.115 (0.092)	0.035 (0.049)	0.011 (0.048)
1st birth: a twin boy & girl	0.021 (0.050)	-0.026 (0.174)	0.182** (0.085)	-0.061 (0.069)
<i>Regression 2</i>				
1st birth: twins	0.015 (0.020)	0.030 (0.062)	0.051 (0.032)	-0.040 (0.030)
<i>Regression 3</i>				
1st 2 children: same sex	-0.005 (0.003)	0.006 (0.014)	-0.006 (0.005)	-0.006 (0.005)
1st child: boy	-0.001 (0.003)	0.000 (0.014)	-0.002 (0.005)	0.000 (0.005)
2nd child: boy	-0.003 (0.003)	0.041*** (0.014)	-0.003 (0.005)	-0.004 (0.005)
<i>Regression 4</i>				
1st child: boy	0.002 (0.005)	-0.040** (0.020)	0.000 (0.007)	0.005 (0.006)
1st 2 children: both boys	-0.008* (0.004)	0.047** (0.020)	-0.008 (0.007)	-0.011* (0.006)
1st 2 children: both girls	-0.002 (0.005)	-0.034* (0.020)	-0.003 (0.007)	-0.002 (0.007)

Table 12. Labor Force Participation Results for Middle East & North Africa (MENA)

	Women Ages:			
	15-44	15-24	25-34	35-44
<i>Regression 1</i>				
1st birth: twin girls	-0.029 (0.024)	0.033 (0.053)	-0.024 (0.036)	-0.038 (0.047)
1st birth: twin boys	-0.006 (0.024)	0.029 (0.053)	-0.026 (0.036)	-0.008 (0.044)
1st birth: a twin boy & girl	-0.005 (0.023)	0.039 (0.054)	0.005 (0.034)	-0.023 (0.040)
<i>Regression 2</i>				
1st birth: twins	-0.013 (0.014)	0.034 (0.031)	-0.014 (0.020)	-0.022 (0.025)
<i>Regression 3</i>				
1st 2 children: same sex	-0.002 (0.003)	0.005 (0.009)	0.006 (0.005)	-0.012** (0.005)
1st child: boy	-0.003 (0.003)	0.006 (0.009)	-0.001 (0.005)	-0.008 (0.005)
2nd child: boy	0.002 (0.003)	0.010 (0.009)	0.001 (0.005)	-0.000 (0.005)
<i>Regression 4</i>				
1st child: boy	-0.005 (0.005)	-0.003 (0.013)	-0.002 (0.007)	-0.008 (0.008)
1st 2 children: both boys	0.000 (0.005)	0.014 (0.013)	0.007 (0.007)	-0.013* (0.007)
1st 2 children: both girls	-0.004 (0.005)	-0.005 (0.013)	0.005 (0.007)	-0.012 (0.008)

Table 13. Labor Force Participation Results for South Asia

	Women Ages:			
	15-44	15-24	25-34	35-44
<i>Regression 1</i>				
1st birth: twin girls	0.038 (0.025)	-0.086* (0.047)	0.024 (0.038)	0.180*** (0.049)
1st birth: twin boys	0.017 (0.024)	0.060 (0.052)	-0.004 (0.038)	0.007 (0.040)
1st birth: a twin boy & girl	-0.036 (0.027)	-0.151** (0.062)	-0.009 (0.041)	-0.040 (0.051)
<i>Regression 2</i>				
1st birth: twins	0.009 (0.015)	-0.052* (0.031)	0.004 (0.022)	0.045* (0.027)
<i>Regression 3</i>				
1st 2 children: same sex	0.001 (0.002)	0.011* (0.007)	-0.001 (0.003)	0.002 (0.004)
1st child: boy	-0.011*** (0.002)	0.015** (0.007)	-0.005 (0.003)	-0.025*** (0.004)
2nd child: boy	-0.008*** (0.002)	0.004 (0.007)	-0.004 (0.003)	-0.015*** (0.004)
<i>Regression 4</i>				
1st child: boy	-0.002 (0.003)	0.011 (0.009)	-0.001 (0.005)	-0.010* (0.005)
1st 2 children: both boys	-0.007** (0.003)	0.015 (0.009)	-0.005 (0.005)	-0.013** (0.005)
1st 2 children: both girls	0.009*** (0.003)	0.008 (0.010)	0.003 (0.005)	0.017*** (0.006)

Appendix Table 1. Descriptive statistics

	1 kid or less	Over 1 kid	Total	1 kid or less	Over 1 kid	Total
	%			No.		
Currently working or past year	51.71	57.09	55.93	97403	392264	489667
All-year employment	31.71	34.43	33.85	57049	229576	286625
1st birth: twins	0	0.93	0.73	2	6681	6683
1st birth twin: both girls	0	0.31	0.24	1	2206	2207
1st birth twin: both boys	0	0.33	0.26	1	2352	2353
1st birth twin: a boy & a girl	0	0.29	0.23	0	2123	2123
1st 2 children: same sex	48.18	49.58	49.28	94854	358058	452912
1st child: boy	51.82	51.22	51.35	102009	366478	468487
2nd child: boy	0	51.42	40.24	0	364299	364299
1st 2 children: both boys	0	26.09	20.5	1	188430	188431
1st 2 children: both girls	48.18	23.49	28.78	94853	169628	264481
Has over 2 kids	0	70.99	55.79	0	512680	512680
2nd birth: twins	0	0.96	0.75	0	6934	6934
Ages 15-24	52.22	10.72	19.61	102801	77415	180216
Ages 25-34	31.36	42.79	40.34	61738	308986	370724
Ages 35-44	9.44	39.37	32.96	18589	284293	302882
Highest educational level						
Pre-primary	21.65	37.15	33.83	42614	268230	310844
Primary	30.13	33.17	32.52	59315	239510	298825
Secondary	37.48	24.49	27.27	73777	176809	250586
Higher	10.74	5.2	6.39	21146	37559	58705
Occupation						
Not working	49.54	44.59	45.65	96012	317489	413501
Prof., tech., managers	5.49	3.97	4.29	10633	28250	38883
Clerical	2.99	1.52	1.84	5792	10849	16641
Sales	11.07	11.94	11.75	21449	84997	106446
Agric-self employed	13.26	18.85	17.65	25709	134210	159919
Agric-employee	3.77	6.3	5.76	7306	44840	52146
Household & domestic	1.75	1.39	1.47	3388	9923	13311
Services	4.6	3.67	3.87	8924	26151	35075
Skilled manual	4.48	4.52	4.51	8679	32164	40843
Unskilled manual	2.75	2.82	2.8	5329	20069	25398
Other	0.31	0.44	0.41	601	3127	3728
Urban						
Rural	52.28	61.66	59.65	102923	445294	548217
Urban	47.72	38.34	40.35	93940	276850	370790
Continent						
Asia	37.09	39.9	39.3	73012	288147	361159
Africa	37.61	39.4	39.02	74032	284520	358552
America	24.57	20.4	21.29	48367	147294	195661
Region						
North Africa	4.59	5.85	5.58	9045	42248	51293
Sub-Saharan Africa	33.01	33.55	33.43	64987	242272	307259
South Asia	19.74	22.77	22.12	38854	164445	203299
East Asia	12.54	11.05	11.37	24695	79794	104489
Middle East	2.95	4.28	4	5803	30917	36720
South America	14.11	10.66	11.4	27786	77006	104792
Central America & the Caribbean	10.45	9.73	9.89	20581	70288	90869
	Mean			sd		
Total children ever born	1	4	3.3	0	2.1	2.2
Births in the last 5 years	0.7	1	1	0.4	0.9	0.8
Age	25.1	32.5	31	6.2	6.4	7.1
Age at first birth	20.8	19.1	19.5	4.3	3.6	3.8

Appendix Table 2.

Country	Survey Years	No. Obs.	Percent
Bangladesh	2004 2004	11,440	0.82
Bangladesh	1993 2000	28,266	2.04
Benin	2006 2006	17,794	1.28
Benin	2001 2001	6,219	0.45
Benin	1996 1996	5,491	0.40
Bolivia	2003 2004	17,654	1.27
Bolivia	1993 1998	19,790	1.43
Brazil	1996 1996	12,612	0.91
Burkina Faso	2003 2003	12,477	0.90
Burkina Faso	1998 1999	6,445	0.46
Cambodia	2005 2006	16,823	1.21
Cambodia	2000 2000	15,351	1.11
Cameroon	2004 2004	10,656	0.77
Cameroon	1998 1998	5,501	0.40
CAR	1994 1995	5,884	0.42
Chad	1996 1997	7,454	0.54
Colombia	2000 2005	52,929	3.82
Colombia	1995 1995	11,140	0.80
Comoros	1996 1996	3,050	0.22
Congo (Brazzaville)	2005 2005	7,051	0.51
Cote d'Ivoire	1994 1999	10,372	0.75
Dominican Republic	2007 2007	28,676	2.07
Dominican Republic	2002 2002	23,384	1.69
Dominican Republic	1996 1999	9,708	0.70
Egypt	2000 2005	44,165	3.18
Egypt	1995 1996	14,779	1.07
Eritrea	1995 1996	5,054	0.36
Ethiopia	1992 1997	29,241	2.11
Gabon	2000 2001	6,183	0.45
Ghana	2003 2003	5,691	0.41
Ghana	1998 1999	4,843	0.35
Guatemala	1995 1999	16,801	1.21
Guinea	2005 2005	7,954	0.57
Guinea	1999 1999	6,753	0.49
Haiti	2005 2006	10,757	0.78
Haiti	2000 2000	10,159	0.73
Haiti	1994 1995	5,356	0.39
Honduras	2005 2006	19,948	1.44
India	2005 2006	124,385	8.97
India	1998 2000	90,303	6.51
Indonesia	2002 2003	29,483	2.13
Indonesia	1994 1997	51,998	3.75
Jordan	2007 2007	10,876	0.78
Jordan	2002 2002	6,006	0.43
Jordan	1997 1997	5,548	0.40
Kenya	2003 2003	8,195	0.59
Kenya	1998 1998	7,881	0.57
Lesotho	2004 2005	7,095	0.51

Appendix Table 2.

Country	Survey Years		No. Obs.	Percent
Liberia	2006	2007	7,092	0.51
Madagascar	2003	2004	7,949	0.57
Madagascar	1997	1997	7,060	0.51
Malawi	2000	2005	24,918	1.80
Mali	2006	2006	14,583	1.05
Mali	2001	2001	12,849	0.93
Mali	1995	1996	9,704	0.70
Mauritania	2000	2001	7,728	0.56
Moldova	2005	2005	7,440	0.54
Morocco	2003	2004	16,798	1.21
Mozambique	2003	2004	12,418	0.90
Mozambique	1997	1997	8,779	0.63
Namibia	2006	2007	9,804	0.71
Namibia	2000	2000	6,755	0.49
Nepal	2006	2006	10,793	0.78
Nepal	2001	2001	8,726	0.63
Nepal	1996	1996	8,429	0.61
Nicaragua	2001	2001	13,060	0.94
Nicaragua	1997	1998	13,634	0.98
Niger	2006	2006	9,223	0.66
Niger	1998	1998	7,577	0.55
Nigeria	2003	2003	7,620	0.55
Nigeria	1999	1999	9,810	0.71
Pakistan	2006	2007	10,023	0.72
Peru	2000	2005	40,308	2.91
Peru	1996	1996	28,951	2.09
Philippines	2003	2003	13,633	0.98
Philippines	1998	1998	13,983	1.01
Rwanda	2000	2005	21,705	1.56
Senegal	2005	2005	14,602	1.05
South Africa	1998	1998	11,735	0.85
Tanzania	2004	2005	10,329	0.74
Tanzania	1996	1999	11,972	0.86
Togo	1998	1998	8,569	0.62
Turkey	2003	2004	8,075	0.58
Turkey	1998	1998	8,576	0.62
Uganda	2006	2006	8,531	0.61
Uganda	2000	2001	7,246	0.52
Uganda	1995	1995	7,070	0.51
Vietnam	1997	2002	11,321	0.82
Yemen	1997	1997	10,414	0.75
Zambia	2001	2002	7,658	0.55
Zambia	1996	1997	8,021	0.58
Zimbabwe	1994	1994	6,128	0.44
Total			1,387,220	