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**Number and spacing of children and women's  
employment in Africa**

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## **Abstract**

We analyze the effects of the number of recent births and the spacing between the last two children on women's labour force participation in non-agricultural employment in Africa. Our data comprise over 200,000 married women with at least one child below six from 242 districts in 26 African countries. In order to account for endogeneity of the fertility and employment decisions, we instrument the number and spacing of recent births by unmet need for family planning. Both the number of recent births and short birth spacing have substantial negative effects on women's employment. An interaction analysis indicates that more highly educated women and urban women suffer most from these negative effects. Our findings indicate that investments in family planning are likely to enhance the opportunities for women to work for pay. In addition, policies should help the higher educated, urban women to relieve their task of rearing young children

## **Keywords**

Number of births, birth spacing, women's employment, endogeneity, unmet need

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## **Introduction**

Promotion of family planning and ensuring access to preferred contraceptive methods is essential to secure the well-being and autonomy of women and to support the health and development of communities. Family planning benefits are related to health issues such as the prevention of pregnancy-related health risks for women, the reduction of infant mortality, and the prevention of HIV/AIDS. Additional advantages are that family planning might enhance women's empowerment, children's education, and reduce adolescent pregnancies and population growth (Cleland et al., 2006; Longwe and Smits, 2012; Singh and Darroch, 2012). Family planning provides an opportunity for women to go to school longer and participate more in paid employment. Despite these positive effects, about 222 million women in developing countries who would like to delay or stop childbearing are not using contraception (Singh and Darroch, 2012) and some 53% of African women of reproductive age have an unmet need for modern contraception (WHO, 2012).

Women's labour force participation (WLFP) signals the extent of women's involvement in economic activities. Ever since the pioneering works of Mincer (1962), WLFP has been studied extensively in both developed and developing countries (Bloom et al., 2009; Mammen and Paxson, 2000). According to these studies, women in developing countries were mostly involved in non-market activities, at home, in the family business, or in other informal sector work, although a pronounced increase in the contribution of women to modern sector employment activities has also been noticed (Beneria, 2001; Chen, 2001; Gunduz-Hosgor & Smits, 2008). The latter is partly due to the advances made in females' educational attainment and the expansion of the market economy (Tandrayen-Ragoobur et al., 2011).

Women's decisions about participation in the labour force are of critical importance for gender equality, as well as for determining the living standard, dependency burden, and saving patterns of households (Fallon and Lucas, 2002; Amoateng et al., 2003). In Sub-Saharan Africa, a woman's possibility to work, especially in non-family employment, is constrained by many social and economic forces (Benefo and Pillai, 2003). Determinants of female labor force participation range from prevailing wage rates, levels of occupational segregation and male-female earnings differentials,

household demographics, individual human capital characteristics, and in the case of self-employment: availability of land, credit and productive technology (Morrison et al, 2007).

The presence and number of young children in the household is one of the major explanatory variables of the lack of women's engagement in formal work. In most cultures, women are considered the prime suppliers of household care needs, which increases with the presence of children (Maume, 2006; Moghadam, 2004; Piras and Ripani, 2005). Empirical studies in developed countries generally find a negative and significant relationship between fertility and women's labour force participation (Smits, Ultee and Lammers, 1996; Boushey, 2008). In developing countries, there is less consistent evidence of a negative effect of the number of children on women's labor force participation (Aguero and Marks, 2005; Benefo and Pillai, 2003; Cruces and Galiani 2007; Ejaz, 2007; Porter and King, 2009). One possible explanation is that the physical separation between market related work and household labour is not as rigid in developing as in developed countries, which makes it easier for women to combine labor market and childcare activities (Brewster and Rindfuss, 2000). Within developing countries this separation between formal and informal labour markets is likely to be more clear in urban than in rural areas (Spierings, 2012).

In sum, the effects of family planning outcomes on labour market participation of women in developing countries are unclear. Moreover, it might be that within these countries the effects differ between rural and urban areas. These issues are addressed in this paper, where we study the questions: (1) Does the number of young children a woman has negatively influence her ability to participate in non-farm work in Africa? (2) Does short spacing of the two youngest children negatively influence a woman's labour force participation? (3) Do the effects of these family planning outcomes on women labour force participation vary with characteristics of the woman and of the context?

Finding the causal direction of the relationship between family planning outcomes and women's employment is hampered by the fact that the causal relationship is not known a priori. On the one hand, one may argue that women with more young children will be less willing to work outside the home in order to spend more time with their children. On the other hand, women with more children may have to work more to

maintain family income, because children are expensive. Similarly, a woman might choose to have children which are closely spaced and stop going to work in order to take care of them for a restricted number of years, or have them not too close to allow her to work and raise children simultaneously. In order to determine the causal direction of the effect, previous studies in the USA and Latin America control for endogeneity in fertility decisions using instrumental variable (IV) estimation (Angrist and Evans, 1998; Cruces and Galiani 2007). In this paper we follow these authors and use an instrumental variables approach to estimate the causal effect of family planning outcomes on women's labour force participation. This technique relies on finding a variable which is correlated with the woman's family planning outcomes, but not with her likelihood of working outside home. In the present study, unmet need for family planning is used as an instrument for family planning outcomes. A substantial part of African women (24 percent on average, ranging from 16% in the South until 23% in the West) report having "unmet need for family planning", meaning that they would prefer to use family planning measures to stop having children or delay their next birth, but have no access to contraceptives (Sedgh et al. 2007). Using unmet need as instrument, we aim to assess whether and to what extent a woman's engagement in employment outside the home is influenced by the number of young children and the length of the birth spacing between the last two children.

The rest of the paper is outlined as follows. Section 2 provides the theoretical background. Section 3 discusses data and methodology used, and is followed by the empirical results in section 4. Finally, we discuss conclusions and policy implications.

### **Theoretical Background**

Figure 1 shows the different groups of factors that are included in our analytical model and their expected direction of influence. The explanatory factors belong to one of three groups: family planning factors, household and context factors and interactions with the context.

Insert Figure 1 here.

### *Family planning factors*

The effect of the family planning factors on women's labour force participation are indicated by arrow A in Figure 1. The family planning factors we are interested in are the number of children requiring extensive care (say below age six) and the birth spacing between the last two youngest children. The relationship between these two fertility outcomes and employment is complex because the presence of young children who demand significant child care may deter the mother from working outside the home. Various country-specific studies have shown that women's labour force participation in either informal or formal sector is negatively related with having young children (Ejaz, 2007; Vlasblom and Schippers, 2004). Short spacing between the youngest two children, may further increase the care load and at the same time negatively affect the women's health which may restrict her work opportunities even more (Norton, 2005; Troske and Voicu, 2009).

### *Household and context factors*

Our model contains a number of control factors which are expected to influence female labor market participation (Arrows B in Figure1). At the household level, age, education, marital status, husband's education and occupation, have been known for long to be important determinants of women's employment. Age is an important factor and the age distribution of female participation varies considerably. The WLFP rate reaches a peak before the onset of childbearing, declines during the child-rearing period and increases again a few years after the childbearing (Brewster and Rindfuss, 2000; Smits et al., 1996). Many empirical studies have found that better educational attainment of women leads to greater labour force participation and increases their productivity. Although in some cases there is only a small or non-linear relationship between the level of education and the WLFP rate, in general education has a positive effect on the labor force participation of married and single women (Gunduz-Hosgor and Smits, 2008; Spierings et al., 2010).

The sign of the influence of marital status on female labour market participation is ambiguous (Angrist, 2001). Some studies have shown that married women are less likely to participate in the labour force than those who are single, divorced/separated or widowed (Benefo and Pillai, 2003; Ntuli and Wittenberg, 2013). The sexual division of

labor within the unit of a married couple predicts that a man with higher earnings through a higher level of education and occupation will allow his wife to reduce her market work and to focus more on housework (Devereux, 2004; Kalenkoski et al., 2009). Empirical evidence of the opposite has also been found (Mon, 2000; Sackey, 2005).

Finally, as mentioned in the Introduction, WLFP is also shaped by the context in which people live. People living in rural and less developed areas are less likely to be active in the labor market compared to those living in urban and developed areas (Benefo and Pillai, 2003; Gündüz-Hosgör and Smits, 2008; Moundir and Nacer-eddine, 2011; Ntuli and Wittenberg, 2013). In this study, we will therefore control for living in an urban or rural area. Besides urbanization, many other context factors may play a role, some of which are available in our data but many of them are unknown. Fixed effects dummies at the district level are included to account for these measured and unmeasured context factors.

#### *Interactions with the context*

The effects of family planning outcomes on women's labour force participation need not be everywhere the same. We perform an interaction analysis in which we study to what extent these effects depend on characteristics of the household and of the context in which the household lives (as shown by arrows C in Figure 1). Two opposite hypotheses are tested. First, it is possible that the women who suffer most from negative family planning outcomes are those in the weakest situations, hence women with poor education and those who live in the rural areas, where there are less job opportunities. Having several and/or closely spaced young children might give these women less possibilities to work for pay than if they would have few and longer-spaced children. According to this viewpoint, for women under better circumstances the number of children and spacing would matter less, as they have more resources at hand to solve child care problems. On the other hand, it is also possible that the more highly educated and urban women suffer most, as they tend to have more demanding jobs and may miss the extended kinship network that might take care of the children. By including interactions between the family planning outcomes (number of young children and spacing) and education and

urbanization in our model, we aim to find out which alternative is mostly in line with the situation of African women.

A related question is whether the possible problems related to the number and spacing of young children are growing bigger or becoming smaller over time. As we have data for two points in time, we will be able to answer this question empirically.

## **Data**

The data used in this study are from the Demographic and Health Surveys (DHS). These are large representative household surveys held since the 1980s in many developing countries (see [www.measuredhs.com](http://www.measuredhs.com)). The DHS programme is sponsored by USAID and executed by MEASUREDHS, in collaboration with national statistical agencies. DHS surveys consist of a household survey in which basic information on all household members is obtained and a women's survey in which all usual resident women aged 16-49 obtain an extensive oral interview. For the purpose of our study we select women who are 18-45 years old, married and have at least one child below the age of six. We selected this group of women because they are in the age group most likely having young children at home. We included all countries for which two waves of the Standard DHS survey were available that contained the necessary variables. Countries with two waves were selected in order to be able to study changes over time. For countries for which more than two standard DHS surveys were available, the two most recent ones were used. Our database contains data for 205,996 women from 242 districts of 26 African countries as shown in the appendix Table A1.

The dependent variable, women's labour force participation, is measured by a dummy variable indicating whether (1) or not (0) the woman was engaged in non-farm paid work at the time of the interview. The category "not working" includes non-employed women and women employed in farm work. We focus on participation in the non-farm work, because for African women, entering the non-farm labour force is a major step towards economic independence. Moreover, the boundary between not working and (family) farm work is difficult to draw for rural women in Africa.

Independent variables include family planning outcomes, other household-level factors and context factors. The presence of young children is measured by the number of

children below age six living in the household. Spacing of children is measured as the time in years (with two decimal places) between the last two children under age six. Unmet need for family planning was measured by a dummy with categories (1) for women reporting unmet need for modern contraception and (0) for all other women. The current age of the woman is in years. Pregnancy prevalence is a dummy variable indicating whether (1) or not (0) the woman was pregnant during the time of the interview. Of the other household-level factors, husband's occupation is measured as (1) farm, (2) lower non-farm and (3) upper non-farm. The presence of other adult (older than 18) women in the household is a dummy indicating whether (1) or not (0) there were other adult women living in the household. Education of women and their husbands is measured by years of schooling. The level of urbanization is measured by a dummy indicating whether (1) or not (0) the household lived in a rural area. The time dimension is measured by a dummy called wave, indicating whether the respondent was interviewed in the first (0) or in the second (1) DHS wave of the country. Fixed effects dummies at district level are included to control for variation in the context.

Insert Table1 about here

Table 1 shows that the average participation rate of women in a non agricultural job is 27 percent and that the average number of children below six is 1.7. The average spacing between the last two children under 6 is 3.3 years. The descriptive statistics further show that 30 percent of the women had unmet need for family planning. The average education level for women is 2.6 years while that of their husbands is 4.5 years. The mean age of the women is 30 years. We see that on average about 50% of the husbands have farming as their occupation. At the time of the interview 13 percent of the women were pregnant and 73 percent lived in rural areas. The households have an average of 1.3 adult women.

## **Method and results**

The central aim of the analysis is to establish whether there is a causal effect of the presence of young children and their spacing on WLFP. In order to do so, we estimate an

instrumental variables model in order to address the endogeneity of family planning outcomes with regard to WLFP. We specify our general model as follows:

$$WP_i = \beta_0 + \beta_1 FD_i + \beta_2 X_i + \varepsilon_i \quad (1)$$

Where WP is an indicator of a woman's labour force participation taking value 1 if she works in non-agricultural job and 0 if not; FD is the endogenous fertility decisions which can be the number of young children or the spacing of last two young children; X is a vector of individual and household characteristics assumed exogenous and  $\varepsilon$  is the residual. The vector X includes all other explanatory variables mentioned in the previous paragraph and the district fixed effects.

The number of children below six years and the spacing between the last two children are likely to be endogenous, so that merely estimating relation (1) will not inform us about the causality. We assume that  $Cov(X_i, \varepsilon_i) = 0$  and  $Cov(FD_i, \varepsilon_i) \neq 0$ . Two different specifications of the model are considered, one with the number of young children included as a fertility decision indicator and another with spacing between the last two children as a fertility decision indicator. In both specifications, unmet need for family planning is used as the source of exogenous variation in the number of children and their spacing. The assumption is that unmet need for family planning affects a woman's possibilities to influence the number and spacing of her pregnancies, but has no independent effect on her labour supply. The first stage equation of the two-step regression (2SR) estimation is given as follows:

$$FD_i = \alpha_0 + \alpha_1 UN_i + \alpha_2 X_i + v_i \quad (2)$$

Where UN is the instrumental variable Unmet Need, v is the residual and X is as discussed above. For each specification, the basic coefficients obtained by the probit model without the fertility decision instrumented (equation (1)) are compared with those obtained using the model where the fertility outcomes are instrumented by unmet need for family planning. Exogeneity of the fertility variables in both specifications is tested using the Hausman test. This involves inserting the residuals from the first stage

regressions into the original regressions. The t-statistic of the coefficient for the residual constitutes a test for exogeneity of the variable in question. In both cases we rejected the null hypothesis of no endogeneity. The t-statistic for the residual coefficient from the first stage regression predicting number of young children is 5.14 and its p-value is 0.023. The residual coefficient from the first stage regression predicting spacing of the last two children has a t-static of 10.07 and the p-value is 0.002. The test thus indicates that our fertility variables were indeed endogenous. We also tested whether unmet need for family planning has an effect on WLFP and found that the effect was not significant.

#### *First step regressions*

Table 2 shows the full results for the first stage OLS regressions of the number of young children and spacing of the two last young children in the household on unmet need for family planning. In order for the instrument to be valid, it needs in addition to its exogeneity with respect to labour force participation, also to have a strong relationship with the endogenous fertility variables. The effects of unmet need for family planning on the number of young children and their spacing are highly significant. Coefficients are statistically significant at 1% and have an F-statistic higher than 10 in each case (see bottom of Table 2). This indicates that the effect of unmet need is strong enough to use this factor as an instrumental variable. The regressions control for age, square of age, education, husband's education, husband's occupation, number of adult women in the family, whether the respondent is pregnant, urbanization and wave effects. Context level effects are controlled for by including the district fixed effect dummies in all estimated regressions.

Insert Table 2 here.

#### *Second step models*

The standard probit models and two-stage probit models are presented in Table 3. The standard model results suggest that the number of young children reduces the chances of a woman to participate in non agricultural work. A better spacing of the last two children increases a woman's employment chances. The regression controls for age, age square,

education, husband's education and occupation, pregnancy of the woman, number of adult women in the family and urbanization.

Insert Table 3 here

The two-stage outcomes confirm the standard outcomes for both family planning variables. The coefficients remain strongly significant and of the same sign: having more children under six and having the last two children more closely spaced is negatively associated with women's non-farm employment. From these results we may conclude that (1) African women work less than they wish in the non agricultural sector, (2) due to the fact that they have got more or more closely spaced children, although (3) they would have liked to plan these births better. In this situation, the women respond by working less or by opting for an agricultural job that keeps them near their home.

Looking briefly at the control variables in the models, the labour participation function is concave in age, implying that both having children at a very young age and at a relatively old age decreases a woman's ability to engage in non-farm work. The education coefficients for the respondents and their spouses are positive, indicating that more highly educated women and women of more highly educated men tend to work outside agriculture more. Women with husbands in non-farm occupations are also more likely to be involved in non-farm jobs. Pregnant women work less, although this effect is not always significant. Women in rural areas participate less in non-agricultural jobs than their urban counterparts. We also controlled for the presence of other adult women in a household which consistently shows a negative association with women's employment in both specifications. This might be due to the fact that extended families are often more traditional households. As shown by the wave variable, women's participation in the labour force tends to increase over time.

#### *Interactions effects*

The coefficients of the interaction analysis are presented at the bottom of Table 3. This analysis is important, because it gives an impression of the degree to which and the way in which the associations of family planning outcomes with WLFP vary across situations.

The coefficients of the instruments do not change much when the interaction terms are included in the models; they remain strongly significant and of the original sign. In addition, the control factors keep their significance and direction compared to the IV models without interactions.

Table 3 shows that there are significant interactions of urbanization, education and wave with both fertility outcomes. Hence the coefficients of the number and spacing of children vary between women living in urban and rural areas, according to the women's educational levels, and over time. The interaction effect with living in a rural area shows that in these areas having more young children is less detrimental for women's labour force participation than in urban areas. A shorter period between the two last born children reduces women's labour force participation in rural areas less than in urban areas. The interaction coefficients of education show that women with more young children and shorter spacing of the last two children can profit less from the advantage of being educated. The interaction effects with the wave dummy indicate that over time a higher number of young children and a shorter period between subsequent births have less negative effects on the WLFP.

#### *Robustness check*

We have performed several tests on the robustness of the previously presented results. Specifically, we tested whether and in what way our choice to focus on women who have at least one child below six and on married women have influenced our findings. The results of our robustness checks are reported in appendix Table A2. The sign and direction of the effects of number and spacing of children are unaffected if we perform the analyses with a sample including also women without a child below six. The size of the coefficient for number of children remained about the same, whereas the size of the spacing variable increased substantially. An analysis with all women regardless of marital status does not change the level of significance and sign of the variables. This time the coefficient of both variables increases compared to the baseline model. The results are also robust for including unmarried women and women without children at the same time. Both effects become even substantially stronger. In each of all these relations the first stage regression was re-estimated.

## ***Conclusion***

In this paper, we study the causal relationship between family planning outcomes and women's labour force participation in non-agricultural work. The number of children below six years and the spacing between the last two children are used as indicators of family planning outcomes. An instrumental variables method is used to address the endogeneity problem that exists between family planning outcomes and women's labour force participation. Unmet need for family planning of the women is used as an instrumental variable. We also performed an interaction analysis in order to understand to what extent the effects depend on characteristics of the household and of the context in which the women live. Finally we conducted robustness tests for different selections of women. The study is based on over 200,000 married women with at least one child below the age of six in 26 African countries.

The number of children below age six that a woman has and a shorter birth space between the last two children has a significantly negative effect on the woman's ability to work in the non-farm sector. Given that unmet need for family planning was used as instrument, we can conclude that if a woman has more children under the age of six or short birth spacing between the last two children because of an unmet need for family planning, her possibilities to work outside agriculture and in this way contribute economically to the family are significantly reduced. The interaction analysis revealed that the effects of the number of young children on women's non-farm work are more problematic for women with more years of education and living in urban areas. Similar trends are observed with the spacing of the children. We can thus conclude that the negative effects of poor family planning outcomes on WLFP are mostly a problem for educated women and those living in cities.

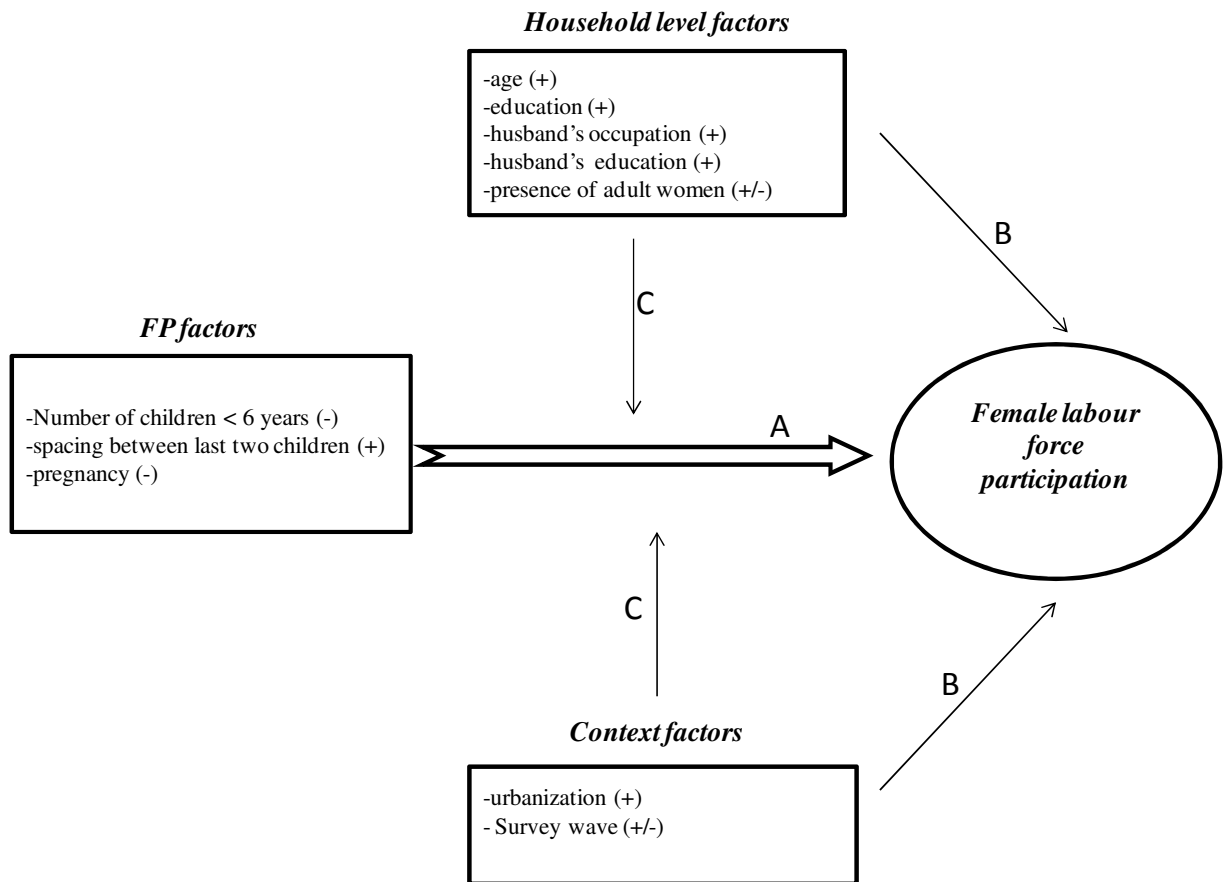
Consequently, if policy makers want to improve the socio-economic development of a country through the contribution of increased women participation in the formal labour force, then they should direct their policies at improving the possibilities of women to better plan their births through access to family planning services. In addition policies should be in place for helping the higher educated urban women to share their task of rearing young children

## References

- Agüero, J.M., Marks, M.S., 2008. Motherhood and female labor force participation: Evidence from Infertility Shocks. *Am. Econ. Rev.* 98:2, 500–504.
- Amoateng, Y., Lucas, D., Kalule-Sabiti, I., 2003. South Africa's Human Capital in the 1990s. African Studies Association and the Pacific 2003 Conference on "Africa on the Global Stage."
- Angrist, J., 2001. How do Sex Ratios affect Marriage and Labour Markets? Evidence from America's 2<sup>nd</sup> Generation. NBER working paper 8042.
- Angrist, J., Evans, W., 1998. Children and their Parents' Labor Supply: Evidence from Exogenous Variation in Family Size. *Am. Econ. Rev.* 88(3), 450-77.
- Benefo, K. D., Pillai, V.K., 2003. Determinants of women non- family work in Ghana and Zimbabwe. *Can Stud Popul.* 30(2):389-406.
- Benería, L., 2001. Shifting the risk: New employment patterns, informalization, and women's work. *Int J Pol Cult Soc.* 15(1), 27-53.
- Bloom, D. E., Canning, D., Fink, G., Finlay, J. E., 2009. Fertility, female labor force participation, and the demographic dividend. *J Econ Growth.* 14: 79-101.
- Boushey, H., 2008. 'Opting out?' The effect of children on women's employment in the United States. *Fem Econ.* 14(1): 1-36.
- Brewster, K., Rindfuss, R., 2000. Fertility and women's employment in industrialized nations. *Annu Rev Sociol.* 26:271-296
- Chen, M. A., 2001. Women and informality: A global picture, the global movement. *SAIS Review.* 21(1), 71-82.
- Cleland, John, Stan Bernstein, Alex Ezech, Anibal Faundes, Anna Glasier, and Jolene Innis. 2006. Family Planning: The unfinished agenda. *The Lancet: Sexual and Reproductive Health* 368(9549): 1810-1827.
- Cruces, G., Galiani, S. 2007. Fertility and Female Labor Supply in Latin America: New Causal Evidence. *Labour Econ.* 14(3), 565-573.
- Devereux, P., 2004. Changes in relative wages and family labor supply. *J. Hum. Resour.* 39(3), 696-722.

- Ejaz, M., 2007. Determinants of female labor force participation in Pakistan: an empirical analysis of PSLM micro data. *The Lahore J.Econ. Special Edition* (September 2007), 203-235.
- Fallon, P.R., Lucas, R.E.B., 2002. The Impact of Crises on Labor Markets, Household Incomes, and Poverty: A Review of Evidence. *World Bank Research Observer* 17(1), 21–45.
- Gundüz-Hosgör, A., Smits, J., 2008. Variation in labor market participation of married women in Turkey. *Women Stud. Int. Forum.* 31, 104–117.
- Kalenkoski, S., Ribar, D. S., Stratton, L. S., 2009. The influence of wages on parents' allocation of time to child care and market work in the United Kingdom", *J. Popul. Econ.* 22 (2), 399-419.
- Mammen, K., Paxson, C., 2000. Women's work and economic development. *J. Econ. Perspect.* 14(4), 141–164.
- Maume, D. J., 2006. Gender difference in restricting work efforts because of family responsibilities. *J. Marriage Fam.* 68, 859-869.
- Mincer, J., 1962. Labor Force Participation of Married Women: a Study of Labour Supply, in: Lewis, H.G. (Ed.), *Aspects of Labor Economics*. Princeton University Press, pp. 63-101.
- Longwe, A and Smits, J. 2012. Family Planning Outcomes and Primary School Attendance in Sub-Saharan Africa. *Studies in Family Planning*, 43(2), 127-134.
- Moghadam, V. M., 2004. Towards gender equality in the Arab/Middle East region: Islam, culture, and feminist activism. New York: Human Development Report.
- Mon, M., 2000. Determinants of Female Labour Force Participation in Burma: An Empirical Analysis of Socio-Economic Survey Data. *ABAC J.* 21 No.1.
- Morrison, A., Raju, D., Sinha, N., 2007. Gender equality, poverty and economic growth. Policy research working paper 4349. World Bank, Washington, DC.
- Moundir, L., Nacer-eddine, H., 2011. Micro econometric analysis of determinants of occupational choice in Algeria. *Almalaurea Working Papers* no. 5.
- Norton, M., 2005. New evidence on birth spacing: promising findings for improving newborn, infant, child, and maternal health. *Int J Gynecol Obstet.* 89:S1-6.

- Ntuli, M., Wittenberg, M., 2013. Determinants of black women's labour force participation in post-apartheid South Africa. *J.Afr. Econ.* 0(0), 1-28.  
doi:10.1093/jae/ejs039.
- Piras, C., Ripani, L., 2005. The Effects of motherhood on wages and labor force participation: Evidence from Bolivia, Brazil, Ecuador and Peru. Sustainable Development Department Technical Papers Series WID-109.
- Porter, M., King, E.M., 2009. Fertility and women's labor force participation in developing countries." mimeo prepared for PAA 2009.
- Sackey, H.A., 2005. Female Labour Force Participation in Ghana: The Effects of education. Research Paper, No. 150, African Economic Research Consortium (AERC), Nairobi, Kenya.
- Sedgh, G., Hussain, R., Bankole, A., & Singh S., 2007. Women with an unmet need for contraception in developing countries and their reasons for not using a method, Occasional Report, New York: Guttmacher Institute, 2007, No. 37.
- Singh, S., Darroch, J.E., 2012. Adding It Up: Costs and Benefits of Contraceptive Services-Estimates for 2012, New York: Guttmacher Institute and UNFPA.
- Smits, J., Ultee, W., Lammers, J., 1996. Effects of occupational status differences between spouses on the wife's labor force participation and occupational achievement: findings from 12 European countries. *J. Marriage Fam.* 58, 101-115.
- Spierings, N., Smits, J., Verloo, M., 2010. Micro and macro-level determinants of women's employment in six Arab countries. *J. Marriage Fam.* 72, 1391-1407.
- Spierings, N., 2012, *Khadija's Legacy: Women's employment in Muslim countries*, Nijmegen: Radboud University Nijmegen.
- Tandrayen-Ragoobur, V., Ummersingh, S., Bundhoo, Y., 2011. The Power to Choose: Women and Labour Market Decisions in Mauritius. *J. Emerging Trends in Economics and Management Sciences (JETEMS)* 2 (3), 193-205.
- Troske, K. R. and Voicu, A. (2009) 'The Effect of the Timing and Spacing of Births on the Level of Labor Market Involvement of Married Women', IZA DP, 4417
- Vlasblom, J. D., Schippers, J.J., 2004. Increases in female labour force participation in Europe: Similarities and differences. *Eur. J. Popul.* 20, 375-392.
- World Health Organization (WHO), 2012. Family Planning. Factsheet No. 351.



**FIGURE 1 Household and context-level determinants of women labour force participation studied in this paper**

**Table1. Descriptive statistics of the variables included in the analysis.**

<b>Variable</b>	<b>Mean</b>	<b>Std Dev.</b>
Proportion WLFP	0.272	0.445
Number of children < 6 years	1.723	0.670
Percent women reporting unmet need	0.304	0.460
Years of spacing between last 2 children	3.313	1.691
Age	30.356	6.369
Years of education	2.624	4.639
Years of husband's education	4.523	4.833
Occupation husband		
<i>Proportion in farming</i>	0.481	0.500
<i>Proportion in lower non farm</i>	0.351	0.477
<i>Proportion in upper non farm</i>	0.094	0.292
Proportion of women currently pregnant	0.125	0.331
number of adult women in the family	1.281	0.746
Proportion of women living in rural area	0.734	0.442

**Table 2: First stage OLS regression results**

<b>Predicting:</b>	<b>Children&lt;6years</b>	<b>Spacing (years)</b>
Unmet need	0.129*** (0.003)	-0.234*** (0.008)
Age	0.028*** (0.002)	0.107*** (0.005)
Age square	-0.001*** (0.000)	-0.001*** (0.000)
Education	-0.008*** (0.001)	0.019*** (0.001)
Husband's education	-0.002*** (0.000)	0.006*** (0.001)
Occupation husband		
<i>Lower non farm</i>	-0.037*** (0.004)	0.099*** (0.009)
<i>Upper non farm</i>	-0.041*** (0.006)	0.128*** (0.015)
Currently pregnant	-0.263*** (0.004)	-0.350*** (0.011)
Number of adult women in the family	-0.008*** (0.002)	0.006 (0.005)
Rural	0.063*** (0.004)	-0.210*** (0.010)
Wave	-0.025*** (0.003)	0.087*** (0.008)
<i>Observations</i>	<i>205996</i>	<i>205996</i>
<i>R-square</i>	<i>0.096</i>	<i>0.115</i>
Test for strength of instrumental variable		
<i>t-statistic</i>	<i>41.078</i>	<i>-29.898</i>
<i>F-statistic</i>	<i>1687</i>	<i>893</i>

\*\*\**P value*<0.01; \*\* *P value*<0.05; \**P value*<0.1

Notes: standard errors are shown in parentheses; fixed effects are controlled for at district level in all models.

**Table3. Original and 2<sup>nd</sup> stage probit regressions of women's labour force participation on fertility**

	<b>Model with children&lt;6years</b>			<b>Model with spacing</b>		
	<i>Original Model</i>	<i>2nd Stage model</i>	<i>with interactions</i>	<i>original model</i>	<i>2nd stage model</i>	<i>with interactions</i>
Children <6years	-0.079*** (0.005)	-0.203*** (0.057)	-0.263*** (0.060)	-	-	-
Spacing last 2 children	-	-	-	0.013*** (0.002)	0.112*** (0.031)	0.082*** (0.031)
Age	0.072*** (0.005)	0.075*** (0.005)	0.074*** (0.005)	0.069*** (0.005)	0.058*** (0.006)	0.060*** (0.006)
Age square	-0.001*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)
Education	0.042*** (0.001)	0.041*** (0.001)	0.038*** (0.001)	0.043*** (0.001)	0.041*** (0.001)	0.036*** (0.001)
Husband's education	0.002** (0.001)	0.002** (0.001)	0.002** (0.001)	0.003** (0.001)	0.002* (0.001)	0.002** (0.001)
Occupation husband						
<i>Lower non farm</i>	0.0546*** (0.009)	0.540*** (0.009)	0.546*** (0.009)	0.547*** (0.009)	0.537*** (0.009)	0.548*** (0.009)
<i>Upper non farm</i>	0.579*** (0.013)	0.573*** (0.013)	0.567*** (0.013)	0.580*** (0.013)	0.567*** (0.014)	0.562*** (0.014)
Currently pregnant	-0.065*** (0.010)	-0.097*** (0.018)	-0.089*** (0.018)	-0.040*** (0.010)	-0.004 (0.015)	-0.013 (0.015)
Number of adult women in the family	-0.024*** (0.005)	-0.024*** (0.005)	-0.024*** (0.005)	-0.023*** (0.005)	-0.024*** (0.005)	-0.023*** (0.005)
Rural	-0.384*** (0.008)	-0.376*** (0.009)	-0.360*** (0.009)	-0.386*** (0.008)	-0.365*** (0.011)	-0.337*** (0.011)
Wave	0.058*** (0.007)	0.053*** (0.008)	0.050*** (0.008)	0.058*** (0.007)	0.049*** (0.008)	0.048*** (0.008)
<b>Interactions</b>						
Children*rural			0.386*** (0.037)			
Children*education			-0.028*** (0.004)			
Children*wave			0.147*** (0.033)			
Spacing*rural						-0.190*** (0.014)
Spacing*education						0.011*** (0.001)
Spacing*wave						-0.053*** (0.012)

\*\*\**P value*<0.01; \*\* *P value*<0.05; *P value*<0.10

Notes: standard errors are shown in parentheses; dependent variable is women's labour force participation; fixed effects are controlled for at district level in all models.

## Appendix

**Table A1: List of countries and years of the DHS waves included in the study**

<i>Country</i>	<i>Wave 1</i>	<i>Wave 2</i>
Benin	2001	2006
Burkina Faso	1998	2003
Cameroon	2004	2011
Chad	1997	2004
Cotedivoire	1994	1999
Egypt	2005	2008
Eritrea	1995	2002
Ethiopia	2005	2011
Ghana	2003	2008
Guinea	1999	2005
Kenya	2003	2008
Lesotho	2004	2010
Madagascar	2004	2009
Malawi	2004	2010
Mali	2001	2006
Morocco	1992	2003
Mozambique	1997	2003
Namibia	2000	2006
Niger	1998	2006
Nigeria	2003	2008
Rwanda	2005	2010
Senegal	2005	2011
Tanzania	2004	2010
Uganda	2006	2011
Zambia	2002	2007
Zimbabwe	2006	2011

**Table A2. Robustness checks for women labour force participation: 2<sup>nd</sup> Stage model estimations**

	<b>Estimate</b>	<b>Std. Error</b>	<b>Sig.</b>
<i>Married women with or without children&lt;6years</i>			
Children<6years	-0.200	0.033	0.000
Spacing	0.212	0.035	0.000
<i>All women with at least one child&lt;6years</i>			
children<6years	-0.340	0.055	0.000
Spacing	0.188	0.030	0.000
<i>All women with or without children&lt;6years</i>			
children<6years	-0.299	0.032	0.000
Spacing	0.328	0.035	0.000

*Notes: the first stage regressions were re estimated before estimating the models in the table.*