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FEMALE SCHOOLING, NON-MARKET PRODUCTIVITY, AND LABOR MARKET PARTICIPATION IN NIGERIA

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Female Schooling, Non-Market Productivity, and Labor Market Participation in Nigeria

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ABSTRACT

Economists have argued that increasing female schooling positively influences the labor supply of married women by inducing a faster rise in market productivity relative to non-market productivity. I use the Nigerian Labor Force Survey to investigate how own and husband's schooling affect women's labor market participation. I find that additional years of postsecondary education increases wage market participation probability by as much as 15.2%. A marginal increase in primary schooling has no effect on probability of wage employment, but could enhance participation rates in self-employment by about 5.40%. These effects are likely to be stronger when a woman is married to a more educated spouse. The results suggest that primary education is more productive in non-wage work relative to wage work, while postsecondary education is more productive in wage work. Finally, I find evidence suggesting that non-market work may not be a normal good for married women in Nigeria.

Keywords: Nigeria, Female Schooling, Women's Labor Market Participation, Non-Market Productivity

JEL Classifications: I21, J22, J24, O15

1. INTRODUCTION

In many developed countries, sharp declines in population growth rates and increases in per capita income in recent times have been associated with observed increases in female labor supply**.** A striking feature of the labor market in many of these countries, in the past few decades, is the substantial increase in labor market participation among women and the secular decline in male participation (Killingsworth and Heckman, 1986).[1] Empirical evidence show that increases in women's participation in market activities are associated with declines in fertility due to the implied substitution of market work hours for non-market work hours (e.g. Lam and Duryea, 1999).[2] Also, increased women's participation in market activities increase their control over their own labor income, and augment their relative power in the allocation of household economic resources (Schultz, 1990b). This may translate to an increase in the proportion of household resources allocated to the enhancement of child quality (Schultz, 2001; Thomas 1990).[3] In addition, increasing women participation in the wage labor market could increase the available public resources for development by increasing tax revenues to government.[4] Schultz (1990b) reports that economic development among Thai women

[1] Empirical evidence show that increases in female labor supply in the US have been mainly a result of increases in labor force participation rather than increases in hours worked. Owen constructed a measure of total weekly labor supply, 'labor input per capita', which is computed as the product of the employment/population ratio and weekly hours worked by employed workers. (Owen, 1985, cited from Killingsworth and Heckman, 1986)

[2] Willis (1971, 1973), as quoted in Schultz (1973), argues that increases in women's education affect the demand for children only if the woman engages in market work. This suggests that understanding the nature of relationship between women's education and labor market participation is a major step in understanding the effect of education on population growth through reductions in fertility rates at the household level. This linkage is an important consideration for Nigeria which is presently confronted with a high and steady population growth rate.

[3] Thomas (1990) found that unearned income in the hands of a mother relative to the father has almost twenty times larger effect on child survival probabilities.

[4] This is particularly important given that women constitute half the population of work age adults in Nigeria. However, this tax income gains from increased labor market participation could only be

is associated more with women's participation in wage employment than in non-wage employment.

Thus, the possibility of reduced population growth rate, increased intergeneration resource transfer through improved child quality outcomes, and increased government tax revenue base[5], may be a good justification for governments in developing countries, such as Nigeria, to encourage married women to participate more in the labor market. [6]

Even though statistics on the trend in labor force participation in Nigeria have not been consistent, there are indications that the labor force participation of women aged between 25 and 64 years increased substantially across age groups between 1970 and 1992 (See Table 1). Female labor force participation increased by as much as 20-30 percentage points for women aged 40-59 years and between 4-8 percentage points for others. Since we observe these increases in female labor force participation in a period when GDP per capita[7], real wages, male labor market participation rates are on the decline and unemployment rates are on the increase[8], it is possible that these increases may have resulted from changes in supply side factors such as rising average levels of female schooling.

We observe that female primary school enrollment in Nigeria increased from 32 percent in 1970 to 87 percent in 1994 (see Table 2a). Furthermore, between 1990 and 1999, primary schooling attainment rates increased by 5-10 percentage points for women

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substantial in impacting growth in public revenue if there is a general increase in the demand for female labor in the formal sector of the economy.

[5] In Nigeria however, this consideration is not of strong policy importance at present because taxes on income, profits and capital gains amounted to a meager 4.3 % of government revenue in 1972 and 3.99% in 1987

[6] Paul Schultz noted that there is no consensus in the development literature on the trends associated with increases in women's labor force participation (Schultz, 1990).

[7] GDP per capita declined from $264 to $253 during the period (World Bank Development Indicator, 2001)

[8] All these are indications that labor market demand would have been on the decline during the period.

aged 15-29 years and 15-25 percentage points for women aged 30-49 years. Attainment rates in the first 3 years of secondary education increased by 15-20 percentage points for women aged 15-29 years and 8-18 percentage points for women aged 30-49 years (see Table 2b). We also observe from Table 2b that attainment rates at the level of "primary school completed" is about 40 percentage points higher for the younger age cohort 15-19 compared with the older age cohort 40-49 years in both 1990 and 1999, implying that school attainment is higher among the younger generation. This observed increasing trend in female schooling is consistent with the trend shown in figure 1 which depicts the trend in average years of schooling across age groupings as obtained from the Nigerian GHS survey data used for the analysis reported in this paper.

Thus, in spite of consistent decline in measures of macro-economic performance over the past 3 decades, female labor force participation in Nigeria has increased. The primary goal of this study is to investigate the extent to which increasing exposure of women to formal education may have contributed to this observed increases in female labor force participation.

The study uses the static family labor supply framework to address a number of important empirical questions. First, "how responsive is the probability of women working for income outside the home to the number of years of her schooling?" Second, "how does the responsiveness vary within and across different levels of education?" Third, "what effect does the education of the husband have on the labor market participation decisions of the wife? That is, are wives of more educated husbands less likely to work outside the home?"[9]

[9] According to Schultz (1991), many studies of labor force participation of married women in high income countries have found that the own-wage elasticity of participation among married women is positive and

Specifically, I investigate the contributions of primary, secondary, post-secondary and total years of schooling to cross sectional variations in women's participation rates in total, wage and self-employment. In addition, I analyze the relative effects of female schooling at different levels of education on market and non-market/home productivity of married women[10] and make deductions on the time allocation behavior of couples.

This investigation is important for a number of reasons. First, most labor supply studies in the past have relied on data from the United States and other developed countries. Even though increasing study of this phenomenon has occurred in Asia, few studies are in Sub-Saharan Africa. Secondly, for a country such as Nigeria where the annual percentage population growth rate has remained above 2.65 in the past 3 decades, a high response of women's labor supply to increased schooling would indirectly identify increased investment in women's education as a potential policy strategy for reducing the national population growth rate through reductions in fertility.[11] Thirdly, finding evidence that female schooling exerts a sizeable effect on labor market participation of women would provide some support for the economist's explanation of low labor market

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husband cross-wage elasticity is negative. Thus, conditional the own-wage opportunities, married women with more educated husbands are less likely to work outside the home. However, the positive own-wage elasticity is found in most cases to be larger than the negative cross-wage elasticity, implying that participation rates of women could increase even when the wage opportunities of women are increasing at equal rates with wage opportunities of their husbands.

[10] For example, an estimated primary schooling coefficient that is statistically not different from zero would suggest that an additional year of primary school exerts equal effects on market and home productivity. Likewise, a positive and statistically significant estimate of postsecondary schooling coefficient would imply that an additional year of post-secondary schooling is more productive in the labor market than in home production.

[11] A Women Education Program was established in Nigeria with the objective of promoting women's access to education. At the inception of the program in 1986, the Federal government launched the blueprint on "Women Education in Nigeria" and immediately established "Women Education Units" in the Federal and State Ministries (see Okojie 2002). Even though there is some evidence that the average number of years of schooling among working age women in Nigeria has increased continuously over the past 2 decades (see Aromolaran, 2002), it is not known to what extent this increase is associated with the Women Education Program.

participation of married women in developing countries.[12] Finally, most analyses on returns to schooling have examined the relationship between schooling on one hand and either wage rates or labor market earnings on the other hand [13], yet individuals obtain returns to human capital investment not only by achieving increased prices for the rental of their labor/human capital services, but also by increasing productivity in home or non-market work. The results of this study will give some insights into the effects of female schooling on non-market productivity of married women.

The results show that an additional year of primary, secondary and postsecondary education would increase the likelihood of wage market employment by 0.00%, 2.86% and 15.2%, change the likelihood of self-employment by 5.40%, -1.23% and -10.8% and increase the likelihood of overall labor market participation by 5.50%, 1.71% and 5.19%. The results for wage employment suggest that within the first six years of formal education, marginal productivity of schooling in non-wage work is at least equal to marginal productivity of schooling in wage work. After this, additional years of schooling seem to increase wage market productivity faster than productivity in non-wage work. The result for overall labor market participation is an indication that marginal productivity of schooling is higher in market work than home work for all three levels of education[14]. However, the ratio of market to home productivity follows a V-shape pattern with increasing education. The cross schooling effect of husband's education on wife's labor market participation was found to be positive (0.273%, 1.16% and 1.47% for wage

[12] While economists argue that observed low levels of female labor market participation in developing countries is the result of an underlying choice process based on utility maximization, (see Becker, 1965), non-economists have argued that this low level of participation is attributable more to the powerful norms of female seclusion due to patriarchy which severely restricts women from working outside the family (see Cain et al , 1979)

[13] For a recent paper on Nigeria, see Aromolaran 2002.

[14] See section 5.22 for explanation on the basis for these deductions.

employment, self-employment and overall labor market participation).[15] This result may be an indication that the home time of couples are complements or that non-market/home work is not a normal good or both.[16] The effect of own-schooling on married women's wage market participation is about 9.5 times as large as the cross-schooling effect of the husband, while own-schooling effect on self employment probability is about 2.5 percent times that of the cross-schooling effect of the husband**.**

The remaining part of this paper is organized as follows: The second and third sections of the paper examine the empirical literature and set up the theoretical framework of analysis, while the fourth section explores the data. The empirical models to be estimated and hypotheses to be tested are outlined and discussed in section 5, while section 6 presents and discusses the results of analysis. Section 7 summarizes the findings of the study and concludes the paper.

2. LITERATURE REVIEW

Even though the decision of married women to seek employment outside the home is a function of a variety of factors such as economic considerations, family composition and personal factors[17], education is regarded as the corner stone of women's

[15] This result is at variance with what we have for most existing empirical investigation of this relationship, which has found a negative relationship between husband's schooling and wife's wage market participation. (see Schultz 1991)

[16] In developing countries of Africa such as Nigeria, a reasonably large proportion of women's time out of market is spent in home work. If home work is income inelastic or is not a normal good, income effect of increasing wage opportunities of husband may enhance labor market participation especially in self employment jobs that are carried out in or near the home. This could also be true for wage jobs when there are other members of the household that with lower opportunity cost of time whose time can be substituted for the woman's time in home work.

[17] Economic considerations include family income (excluding earnings of wife), family net worth (asset minus debts), family expenditures, and unemployment of husband. Family considerations include size of family, family cycle, and husband's occupation, while personal considerations include age of wife, employment experience, vocational training, formal education, and attitude towards employment (as defined by religious and cultural background). Factors that have been found in empirical studies to be correlated with the probability of a women entering into the labor market include: observed family income net of earnings of wife, variance of family income net of wife's, potential market wage indicator (

empowerment. It is widely thought that education enables women to respond to opportunities, to challenge their traditional roles and to change their lives (UNDP 1997).[18] Thus economic theory of the household postulates a positive causal relationship between the level of formal education attained by married women and the probability of engaging in market work .This hypothesis has been supported by results from numerous empirical investigations using different methodologies and data sets from different countries. (Mincer 1962, Spencer, 1973, Bloch and Sharon, 1977, Jones and Long, 1979, Smith 1980, Killingsworth 1983, Killingsworth & Heckman 1986, Khandker, 1987, Schultz 1990, Schultz, 1991, Lam and Duryea, 1999, Schultz 2002).

Of particular relevance to this study are the papers by Bloch and Smith (1977), Jones and Long (1979), Rosenzweig and Schultz (1989), Schultz (1990b, 1991) and Lam and (Duryea 1999).

Bloch and Smith (1977) analyzed the May 1973 current population survey (CPS) and found the relationship between education and women's labor force participation to be positive and non-linear[19] for both white and black females in the United States. Their

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education level or realized market wages of wife), home wage of wife, taste (or a shift variable indicating influence of socio-affiliation), family background, and religion (Spencer, 1973); women's age, women's education, husband's education, husband's premarital asset, landholding, schooling distance, market distance, community male wage, community female wage, community child wage, (Khandker, 1987); marital status, income other than own earnings, and presence of children under 6 (Killingsworth & Heckman 1986); family size, presence of children under 6, and family income.(Mahoney, 1961). However Schultz (1980) argue that including many of these variables will introduce simultaneous equation bias into the estimate of schooling effect. Since the values of many of these variables are as a result of past or current decisions of the family, their observed correlation with labor force participation may not be causal or behavioral.

[18]Education is a way to increase the access of Nigerian women to higher paying and higher status jobs, as well as a good way of making more effective use of half of the nation's productive work force, thereby enhancing economic growth (Okojie 2002). A more educated woman finds more attractive employment opportunities available to her, particularly since higher wage offers come with more schooling. Since education level may indicate a woman's earning potential, an increase in education level conditional on wages can increase the probability of her participation in producing cash income due to higher opportunity cost for not producing cash income. (Khandker, 1987)

[19] The coefficient of the interaction term between potential working experience and education was negative, implying that the effect of education on employment probability declines as experience increases. In other

estimates show that the marginal effect of an additional year of schooling on the probability of market employment is 6.56% for white females and 3.00 % for black females. However the inclusion of marital status in the set of explanatory variables may have biased the estimates of the schooling effects since marital status is endogenous to the labor market participation model.

Using the national longitudinal survey (NLS), Jones and Long (1979) extended the Bloch and Smith model to include correlates of educations such as certification in a trade or profession, health and migration. They found a 50% reduction in the linear positive marginal effect of education on employment probability of women. However the inclusion of another possibly endogenous variable - presence of a child of less than 6 years in the household - may have biased the estimate of the education coefficient.

Schultz (1990b) and Schultz (1991) explicitly addressed the problem posed by the endogeneity of marital status in the estimation of schooling effect on female labor force participation in two different ways. In the former, the quadratic terms of own wages and non-earned income were used as exclusions restriction to identify marital status equation from the labor force participation equation. Unlike the socio-economic survey of Thailand (1980-81) analyzed in Shultz (1990b) [20], the cross country data analyzed in

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words, the more experienced the worker is, the lower the marginal effect of education on his likelihood of getting employed. Education is thus a more effective motivation for the less experienced.

[20] Evidence from a group of 61 countries, analyzed by Schultz (1990), show that the share of women in wage employment is positively associated with increase in per capita income across countries and with literacy for both male and female, within countries. So there are two kinds of stories behind the observed increases in women participation in the wage market overtime. First, increases in per-capita income of countries overtime may result in changing inter-sectoral composition of employment for women. Second, changes in literacy level of women may affect both the inter- and intra-sectoral composition of employment independently of income effect. Paul Schultz found that the effect of literacy on the fraction of female wage earners was independent of per capita income effect. His addition of literacy or years of education to the sector and job-composition changes equation did not change appreciably the partial association with income. The results show that increases in the fraction of women in wage employment in Africa and Asia are due mainly to intra-sectoral changes in employment composition. That is, more women have moved into wage employment in each sector.

Schultz (1991) did not contain information on non-earned income[21], making it difficult to specify an exclusion restriction that would statistically identify the marriage and labor participation equations Consequently, the author constructed a theoretical participation equation which served as a reduced form specification for both marriage and labor supply.[22] This approach arrives at a representative estimate of wage effects on female labor participation by mathematical derivation rather than the econometric method of sample selection bias correction used in Schultz (1990b). The results of his cross-country regressions showed that increasing women's education (schooling was used as proxy for women's wage market opportunities) will increase women's participation in wage employment and that this positive effect is substantially larger than the estimated negative cross-effect of husband's schooling on wife's labor force participation.

Findings from a number of empirical investigations in developing countries suggest that the marginal effect of schooling on women's labor force participation is very low at the primary education level and rises very sharply at post-secondary education level (Schultz 1990b, Lam and Duryea 1999)[23]. Lam and Duryea (1999) explained this

[21] Or any other variable that could exclusively identify the marital status equation from the labor force participation equation

[22] The theoretical construction of participation rates for all women in Schultz (1991) was based on the formula: $P_f = P_f^m M_f + P_f^s(1-M_f)$, where P_f is labor force participation rate for all women , P_f^m is participation rate for married women, and P_f^s is participation rate for single women, while M_f is probability that a woman is currently married. That is the labor force participation probability of the average woman is calculated as the weighted average of the participation rates of married and single women, the weights being the probability that a woman is currently married or not married. From this equation, the derivatives of total female labor market participation with respect to female and male wages is given as: $dP_f/dW_f = dM_f/dW_f(P_f^m - P_f^s) + (dP_f^m/dW_f - dP_f^s/dWf) M_f + dP_f^s/ dW_f > 0$;

$dP_f/dW_m = dM_f/dW_m (P_f^m - P_f^s) + (dP_f^m/dW_m) M_f < 0$;

[23] The estimated female participation equation from the Thailand data in Schultz (1990b) showed that an additional year of primary, secondary and higher education raises the probability of wage employment by 0.41%, 9.81% and 16.5% respectively for females and 5.98, -3.75, and 5.21% for males. Lam and Duryea (1999) showed from a simple bi-variate analysis of data obtained from the Brazilian 1985 PNAD survey data that women aged 30-34 years with 8 years of education had 3.3 times more wages than women of same age with no formal education, while labor force participation rate increased only from 32 to 37

observed small responses of female labor force participation to increases in schooling at low levels of education as evidence that market wage offers and home/reservation wages are equalized at low levels of schooling. They argued that at higher levels of education market wage offers rises faster than reservation wages with additional years of schooling[24]

The theoretical construct upon which most of these analyses were based is the time allocation theory formalized in Becker (1965). He postulated that the woman allocates her time resources between home and market production in such a way as to maximize her preference function, given the market wage offer and the shadow price of home production time (home wage). That is, women acting rationally will allocate more time away from home production into market production as their market earning capacities relative to shadow price of home production increase, or as the opportunity cost of time spent in home production increases[25]. However, women's education has been noted to generate both market and non-market benefits. A more educated woman is likely to have a taste for higher levels of child quality outcomes such as improvements in childbirth, child nutrition, child health, child education, and child survival outcomes. While market benefits consist mainly of increased earnings capacity and market wage offer, non-market benefits of female education cuts across a wide terrain of private and social benefits through increased efficiency in home production activities.

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percent between the two categories. On the other hand labor participation rate rises 77% for women with 15 years of schooling while wages was 3.6 times that of women with 8 years of schooling.

[24] According to the standard model of labor allocation, productivity is equalized between home and market production at equilibrium. This implies that the woman may earn the returns from schooling in terms of increased home productivity. It is argued that there are large returns to child quality at low levels of schooling.

[25] According to Cain et al (1979), the low level of labor market participation by married women in many developing countries is attributable more to the powerful norms of female seclusion due to patriarchy which severely restricts women from working outside the family, than a utility maximization based choice process which is dependent on relative price movements as argued by economists.

Rosenzweig and Schultz (1989), examined the association between schooling and productivity in household activities. They found that more educated couples have increased abilities to seek out information on household inputs about which information is relatively scarce and which require careful use, suggesting that increased non-market efficiency/productivity is associated with increased schooling. Consequently, female labor market participation might not respond substantially to increased investment in female education, particularly at the primary level if the market benefits of education do not sufficiently outweigh the non-market benefits.[26]

3. THEORETICAL FRAMEWORK

3.1 The Family Labor Supply Model

This study adopts the static[27] micro-economic framework for family labor supply, which is well documented in the literature on female labor supply (Mincer 1962, Becker 1965, Smith, 1980, Killingsworth, 1983). The study is focused on married couples whose labor supply behavior is assumed to jointly depend on each other's productive opportunities and family pooled non-earned income. The model analyses female labor supply from the standpoint of the role of the family and explicitly allows for the influence of family membership on decisions about labor supply.[28] It is particularly useful for the

[26] Aromolaran (2002) estimates private wage returns to an additional year of primary education for females to be as low as 2-4%.

[27] The static aspect of the framework used in this analysis assumes that an individual lives only in the present and ignores the possibility of accumulation of human and non-human capital over the lifetime.

[28] In demand analysis using household models such as married women's labor supply, family composition characteristics such as marital status and gender of spouse modifies an individual's set of alternatives. It has therefore become a standard practice to disaggregate analysis by gender and marital status. (Schultz,1991; Mincer 1963). However, the estimates of labor supply parameters in such partitioned models may be biased (and unrepresentative of the whole sample of women) if marital status in the population under study is a choice variable and is itself driven by the same exogenous factors that determine labor supply (Schultz 1990b)

analysis of female labor supply issues in Nigeria were cohabitation of man and woman[29], as well as gender-based specialization between market and home production activities are prominent features of family organization.

Assume that the husband (m) and the wife (f) are the only two members of the family, who coordinate decisions regarding consumption, home production, and market production, and that the family organizes its production and consumption activities to maximize a joint household utility function[30]

$$U_h = U_h (U_f, U_m) . \quad (1)$$

If we assume that U_h is additively separable in its arguments, then the utility function of the wife, U_f, and the husband, U_m, can be written as:

$$U_f = U_f (X, L_f, P_f, P_m Z, \gamma), \quad (2a)$$

$$U_m = U_m (X, L_m, P_f, P_m Z, \gamma). \quad (2b)$$

The supply of labor is determined within the framework of maximization of expression (2) subject to the full income constraint of the family:

$$Y_h = pX + w_f L_f + w_m L_m = w_f H_f + w_m H_m + V_h + w_f L_f + w_m L_m . \quad (3)$$

Given a set of observable household characteristics, (Z) , personal characteristics, (P_f, P_m), and unobservable characteristics, (γ) , the woman chooses the optimal set of market purchased commodities (X), and leisure (L_f), subject to full income (Y_h).[31] Full income is the sum of total expenditure on market purchased commodities (pX), the shadow value of leisure for the wife ($w_f L_f$) and the shadow value of leisure for the husband ($w_m L_m$). Total market expenditure (pX) equals the sum of labor earnings of wife

[29] Given that about 58% of women aged from 30-54 are presently living with a spouse and 31% are married even though are not presently living with a spouse.
[30] Thus the labor market participation of married women is assumed to depend on the productive opportunities of the husband and the family's pooled non-labor income (Becker, 1965).
[31] The framework adopted here does not make any explicit assumption regarding income pooling. A major reason for this is that the data used for the analysis in this paper does not contain information on the non-labor income of the household either as an aggregate or by individuals.

($w_f H_f$), the labor earnings of husband ($w_m H_m$), and the non-earned income of household (V_h). The price vector for X is represented by p, while w_m and w_f represent the shadow prices of wife's leisure time (L_f) and husband's leisure time (L_m), and are equated to market wage rate. H_f and H_m are the hours of work of the wife and the husband respectively. Total available time, $T_j=H_j + L_j$, j= m, f. Maximizing utility implies a reduced form expression for labor supply or leisure demand[32]:

$$L_s= L_s (w_f/p, w_m/p\ V/p, P_f, P_m, Z, \gamma) \quad . \qquad (4)$$

In cross-sectional surveys, it is commonly assumed that prices are the same for all individuals, and are normalized by setting p = 1, so that expression (4) becomes expression (5).

$$L_s= L_s (w_f, w_m\ V_h, P_f, P_m, Z, \gamma) \qquad (5)$$

L_s can take any of two forms. It can represent the exact number of labor hours supplied by the women or can be defined as a dichotomous variable taking value of "1" when a woman is working in the market and the value of 0 when she is not working in the market. If we were to take the first definition, we would be making an implicit assumption that market wage offer (w^m) is at least as large as the reservation wage of the

[32] The major difference between the family labor supply model and the standard model of consumer behavior is that in the former labor supply or leisure is treated as choice variable, since the individual both sells and consumes time (in form of work and leisure). Labor income thus becomes endogenous to the household decision process. The comparative static of this model includes compensated own and cross-price effects, income effects, and total effects. While own-wage substitution effects are generally positive and empirically found to be higher for married women than men, income effects on labor supply are assumed negative if leisure is normal, and positive if leisure is inferior. Total effects for men turn negative at a point if negative income effect more than offset positive own-wage substitution effect. Compensated cross-wage effects on labor supply is positive if the time of husband and wife are complements and negative if substitutes. A major weakness in the derivations of this model of female labor supply is that it does not specify definite signs for income and cross wage effects, though it gives the relative magnitudes. The empirical contents of this constrained family utility maximization model are the properties of homogeneity, symmetry, negativity, and negative definiteness. That is the family's leisure and consumption demand functions are homogenous of degree zero. Since the utility function is twice differentiable, then symmetry holds. That is the cross-substitution effects between the same two family members are equal. All own substitution effects of wages on leisure demand are negative- negativity.

woman (w^r)[33], which in this case would imply a left side censoring of the data on labor supply at zero.[34] In the latter case, L_s is simply interpreted as labor market participation. We will adopt this latter form of the simple-static labor supply model, which assumes perfect information. Under this condition, the decision to participate in the labor market is same as the decision on how many hours to work.[35] No distinction is made between them since both decisions are to be taken simultaneously[36]. So, according to expression 5, labor market participation of the woman is dependent on the real value of household non-earned/non-labor income (V_h) and the real market wage of the wife (w_f^m) and the husband ($w_m{}^m$), given the set of observed and unobserved household and personal characteristics[37].

Conceptually, a woman will only supply labor to the market if the market wage offer, w^m is at least as high as a particular reservation wage, w^r. Otherwise she does not participate in the labor market. Whenever $w^r > w^m$, no labor is supplied to the market by the particular individual.

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[33] A reservation wage is the wage level below which a married woman will not enter the labor market. It is the value which the household assigns to a marginal unit of the woman's time in home production and consumption. w^r varies from individual to individual based on their other lifetime choices and is therefore not exogenous to the labor supply model. It is determined by such factors as : unearned income of household, hours of work, number of children below 6 years, education of the family members, wage of husband, and state of household technology (see Heckman, 1974).

[34] In the Nigerian Labor Force Survey data, which is analyzed in this paper, many women do not report a wage because they were not employed in the labor market. This would create a problem for the estimation of the structural equation in expression 4. For such observations the, market offer wage is presumably lower than the reservation wage.

[35] According to (Schultz 1991, pp. 8), most of the labor market response of married women occurs in their participation rate, and not in the hours worked among participants.

[36] In an imperfect world, the individual will have to search for a job first after his decision to work so that he can get a wage offer. Based on the wage offer he receives, decisions are made on number of hours to work.

[37] This reduced form specification is a way of overcoming the problem of sample selection bias that may arise in estimating labor supply parameters from data disaggregated by marital status. The equation implicitly embodies the marriage status equation and thereby avoids the need to identify the structural model or the sample selection problem (Schultz, 1991). This is because theories of marriage link the propensity to marry to the wage-gap between men and women, resulting from gains to specialization in market and non-market work (Becker, 1981).

The market wage offer w^m received by an individual depends on the education, S, and potential post-schooling experience, A, as in expressions (6 &7)[38], thus explaining within the model the wages, w_f and w_m, that may influence labor force participation in expression (5).[39]

$$W_f = W_f(S_f, A_f)\,, \tag{6}$$

$$W_m = W_m\,(S_m, A_m). \tag{7}$$

With wages now endogenized, we obtain a reduced form for expression 5, by combining information from expression (5), (6) and (7), given by expression (8).

$$L_f = L\,(S_f, S_m, A_f, A_m, V_h, P_f, P_m, Z, \gamma) \tag{8}$$

So in the framework adopted in this paper, schooling of women exerts an indirect influence on women labor market participation through its relative effect on w^m and w^r.

Theoretically, increased schooling is expected to increase the market wage rate and thus influence the allocation of women's time away from home production into market production[40]. However, because more schooling, especially at lower levels of education, can also increase reservation wages, the response of women's participation rates to schooling is diminished. This response will approach zero as the effect of schooling on reservation wages approaches the effect on market wage rate or in other words, as the productivity of schooling in non-market work approaches the productivity of schooling in market work.

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[38] Actual work experience also affects market wage offer, but since this factor represents endogenous past labor supply, it is omitted from the reduced from specification of market wage offer presented in expressions 6 &7. It is possible to include this variable if we had dynamic panel data to work with.

[39] Women schooling can affect labor market participation through two channels. First is the direct effect that is obtained by conditioning the effect of schooling on wages. Since education level indicates a woman's earnings/market productivity potential, an increase conditional on wages can increase the probability of her participation in producing cash. Second is the indirect effect when education affects labor force participation through its direct effect on wages, especially since higher wage offers comes with higher schooling.

[40] Apart from its effect on market earning potentials, education may also have a systematic effect on tastes, efficacy of fertility, or efficiency in household production. (see Willis 1973, pp S51)

Formally, we can write:

$w^m = w^m(S)$ and $w^r = w^r(S)$ (9)

where:

$\partial w^m / \partial S \geq 0$ (marginal productivity of schooling in market work is positive), (10a)

and

$\partial w^r / \partial S \geq 0$ (marginal productivity of schooling in home work is positive). (10b)

Thus, labor market participation will respond positively to increasing years of schooling if the inequality condition in expression 11 is satisfied. That is when the marginal productivity of schooling in market work is greater than the marginal productivity of schooling in non-market work or marginal productivity of schooling in wage work is greater than in non-wage work.

$\partial w^m/\partial S > \partial w^r/\partial S$, evaluated at $L_s=0$. (11)

Thus, the coefficient of schooling in the estimated labor market participation function is not different from zero if the marginal productivity of schooling in non-market work is equal to the marginal productivity of schooling in market work.

3.2 Analyzing Cross Schooling Effects using Slutsky Decomposition

A major objective of this study is to investigate the cross schooling effects of husband's education on wife's labor market participation in order to get some understanding of the time allocation behavior of married couples in Nigeria. Following Slutsky, the total effect of a wage change for men on labor supply of women is the sum of pure substitution and income effects of wage change. Formally, the Slutsky decomposition is expressed as:

$$\partial L_f / \partial w_f^m = \partial L_f / \partial w_f^m \mid_{\partial u=0} + H_f \partial L_f / \partial y \quad (12)$$

$$\partial L_f / \partial w_m^m = \partial L_f / \partial w_m^m \mid_{\partial u=0} + H_m \partial L_f / \partial y \quad (13)$$

Where H_f and H_m are the hours of work by wife and husband, while $\partial L_f \backslash \partial y$, is the marginal response of women's labor supply to changes in income. Expression 12 is the Slutsky decomposition of the total effect of a change in woman's own-price of time (own-wage) on labor market participation, while expression 13 is the decomposition of the total effect of changes in husband's price of time on wife's labor supply behavior. The first term on the right hand side (RHS) of expression 13 (income compensated wage effect of husband's wage change) is negative if couple's home time are substitutes in home production and positive if couple's home time are complements. [41] The second term on the RHS (income effect of husband's wage change) is negative if leisure is a normal good.[42] If the income effect is positive then it could imply that home work is not a normal good, since leisure is usually assumed to be a normal good. In this case, women are willing to reduce their demand for home work as income increases and reallocate the home time to market work.

In this study, wages are not included explicitly in the empirical specification.[43] In order to make some valid inferences on couple's time relationship, expressions (12) and (13) are re-specified as expressions (14) and (15) respectively.

$$\partial L_f \backslash \partial w_f^m (S_f) = \partial L_f \backslash \partial w_f^m (S_f) \mid_{\partial u=0} + H_f \partial L_f \backslash \partial y(S_f) \qquad (14)$$

$$\partial L_f \backslash \partial w_m^m (S_m) = \partial L_f \backslash \partial w_m^m (S_m) \mid_{\partial u=0} + H_m \partial L_f \backslash \partial y(S_m) \qquad (15)$$

With this specification, we will be making inferences on the time allocation behavior of the couples using schooling rather than actual wages and income. This is plausible because schooling is a positive correlate of both life cycle wages and permanent

[41] see Schultz (1981, pp 93-100) for detailed explanations of the Slutsky effects within the family labor supply framework.
[42] This is the standard assumption of economic theory.
[43] We have a reduced form specification with schooling as the exogenous factor in place of wages and income on the right hand side of the labor supply equation.

income. Even though we cannot explicitly decompose the Slutsky effects and identify pure substitution effects and complementarities from equations 14 and 15, we can make informed inferences as to the possible explanation for the observed sign on the total effect of changes in schooling.[44]

The cross-total effect of schooling on the labor market participation of women is expected to be negative because income and cross-substitution effects are both expected to be negative. It can however be positive if the income-compensated cross-wage effect of schooling is positive and dominates a negative income effect or if income effect is positive and dominates a negative income compensated cross-substitution effect, or if both cross-substitution effect and income effects are positive. The first case would occur if husband's time is complementary to wife's time out of the market, while the second would be the case if home work is not a normal good for women, implying that they would prefer to reduce time allocated to home work if they have sufficient income.

However there is need to exercise some caution in drawing inferences based on Slutsky decomposition from this model. We would need to support our inferences with a number of assumptions: First, we would need to assume a life cycle model of labor participation, with the condition that all women participate in the labor market at one time or the other during their life-time. As a result the participation rate of an individual woman is the lifetime fraction of time spent in and out of labor market. If this assumption is not true of the reference population (that is, if a sizeable proportion of the women never work at any point in their life-time), then the Slutsky decomposition of total wage

[44] The model adopted in this study is under-identified for the purposes of empirically identifying substitution and income effects. To do this, we would need to introduce another exogenous variable that will empirically identify income effect and assume that schooling coefficient captures only pure substitution effect.

effect in a labor participation equation can not be said to be the same with that of the hours equation (see Heckman,1978). This assumption would be truer for total market employment than it is for wage employment.

Secondly, the signs of the Slutsky decomposition given by $\partial L_f \backslash \partial S_f$ and $\partial L_f \backslash \partial w_f^m$ will be the same only as long as $\partial w_f^m \backslash \partial S_f \geq 0$ is true. However if the marginal effect of schooling on wages is negative, then our estimate of schooling effect would carry an opposite sign to that of the endogenous wage effect.

4. DATA

4.1 Description of Sample

This study draws its sample from the sub-sample of the Nigerian General Household Survey (GHS) data[45] comprising 50204 work age adult females who are aged between 30 and 54 years. The reason for restricting the sample is that a sizeable proportion of women below the age of 30 years are unmarried[46], while a substantial proportion of those over 54 years may have retired from waged employment. 28125 (56.0%) of the sub-sample are married and had information on their husbands; 15502 (30.9%) are married but provided no information on their husbands. 5720 (11.4%) are single and reported no information on their spouses, while 857 (1.7%) claimed they are single but reported information on their husbands.[47] All women who reported

[45] The GHS is a national household data collection project carried out by the Federal Office of Statistics (FOS). The overall sample includes 24889 households in 1996/97, 32024 in 1997/98 and 27649 1998/99, for a total of 375,399 individuals, of whom 54.8% are of age 15 to 64 and considered of labor force age. To my knowledge this data set has not been widely analyzed. The number of females within the ages of 15 and 64 is 104864.

[46] The data shows that only 60 percent of women aged below 30 years claim to be married, while 92 percent of those between 30-40 years are married. This percentage decreased to 70 percent for those aged 50-54 years, most of who are unmarried because of the death of their husbands.

[47] The married women with information on husbands are assumed to be those living with their husbands. Those with no information on husband are assumed to be living without their husbands even though they are married. Single women who did not report any information on partner include pure single or never

information on a male spouse are regarded as married for the purpose of this study. This adds up to 28982 individuals. After further cleaning of data, 28691 women between the ages of 30 and 54 years made up the sample used for this analysis of labor market participation of married women. The 22212 women who did not leave with a spouse were all taken to be single women. This is the sum of married women who do not live with their husbands and unmarried women who do not live with a spouse (see Table 3).

4.2 Occupation Characteristics of Married Women

Table 4 describes the work characteristics of the average married woman and contrasts with the two categories of single women (married but not living with husband, and never married and not living with a spouse). 4.17% of the married women are in wage employment, 26% in self employment, and 14% in cooperative work[48], while 55.7 percent are not employed.[49] The corresponding figures for the all women are 4.36%,

married, those separated, and those widowed. Single women who reported information on male partner are assumed to be living with these partners without being officially married yet. They may either be engaged or just cohabiting without any form of legal commitment. There is no way of making these further distinctions within the data. Comparison of mean statistics across data subgroups showed that those women who claimed to be single and still reported information on husband have characteristics that are similar to those married that reported information on husband (See Table 2).

[48] Cooperative workers were not adequately described in the survey. However, their characteristics as gleaned from the data suggest that they could pass for unpaid family labor. 90 percent of them work in agricultural sector, 63 percent are female, 58% are married and 38% are single. 51% are spouses, 32% are sons, 9% are daughters, and 8% are sons in law. Furthermore, no cooperative worker is head of household, 99% earn no income, 61% never attended school, 3.5% are currently in school and 35% have completed schooling. Average age is 30 years.

[49] Further investigation showed that 92% of the married women who are not-employed are home keepers who are not actively looking for job, 3.4% are retired and are not looking for job, while the remaining 4.6% are neither retired, full time home keepers, nor Job seekers. Also, the proportion of non-employed married women is higher in the Northern region compared with the southern part of Nigeria. The proportions are 79% and 97% for north east and north western zones of Nigeria respectively. The figures for the south east, south west and south-south zones are 23%, 12%, and 24% respectively. The proportion of non-employed in the sample of married women in the North central zone is 54%. This observed difference in labor market patterns between the core north and the southern parts of Nigeria may necessitate a further investigation into the possible differences in the responses of married women in the north compared with married women in the south. This issue may be addressed in another paper.

34%, 13.4% and 47.8% respectively.[50] Only about 1.4% of the sample of married women is accounted as unpaid family workers.[51]

Table 5 sheds some light on the occupational structure of the sample of married women who work. 66% of self employed workers are traders and 28% are farmers. Most women in wage employment are either teachers or clerks (66%). Only about 10% of female wage workers are professional/technical workers, while about 2% are administrative workers. Most of the female cooperative workers (92%) are involved in farm production.

4.3 Descriptive Analysis of the Relationship between Female Schooling and Women's Labor Market Participation

Table 6 summarizes the nature of association between the likelihood of labor market participation of married women and the level of education attained. We observe that overall participation in market work increases with level of education, even after controlling for age.

Figures 2 through to 6 present graphical representations of the relationship between female schooling and women's labor market participation stratified by age. Participation rate in self-employment rises sharply in the first year of schooling[52] and

[50] The 48 percent reported as the proportion of all women that are non-employed is similar to that estimated from the Nigerian Demographic and Health Survey (DHS) for 1999. The DHS data showed that 50.3% of women in Nigeria did not work in the last 12 months.

[51] International Labor Organization report shows that 10 percent of the female work force is unpaid family workers, making the 1.4% in this data look more like an understatement. However, if we re-categorize cooperative workers as unpaid family labor, the new figures for unpaid family labor would be closer to the ILO figure.

[52] The implication of this is that the first year of schooling seems to be very critical in influencing labor market participation of married women. This may be an indication that the basic reading, writing and numerical skills sufficient to motivate women into self employment are learnt in this first year of schooling. After this first year of schooling, the marginal effect of the five remaining years of primary education on labor market behavior appears to be minimal.

stays high up to 12 years of schooling, after which it declines sharply. On the other hand, participation rate in wage employment is close to zero below 2 years of schooling, after which it increases slightly and stabilizes at a low level between 2-6 years of schooling. The rate rises sharply at 7 years of schooling (first year in secondary school), but is still dominated by participation rate in self-employment up till 13 years of schooling (first year in postsecondary school). From the first year of postsecondary education, participation rate in wage employment rises sharply to above 70% and dominates participation rate in self-employment, which declines sharply to below 10%. The observed pattern is fairly consistent across age groupings (see figures 2-6).

Thus, the relationship between participation rate and schooling in the self employment sector is approximated by an inverted U-shaped curve, with kinks at 1 and 12 years of schooling, while that of the wage sector is approximated by a "three-step function" with upward jumps at 7 and 13 years of schooling.

There are a number of ways in which we can explain the observed low response of wage-market participation to increasing years of schooling at primary school level. First is that this low response is the result of the equalization of the marginal productivities of schooling in both wage and non-wage work.[53] That is, since both reservation wages (which in this case refers to non-market wages) and market wage offer are positive functions of schooling, if at low levels of schooling, the marginal effects of schooling on each of these wages are similar, wage market participation rate will not respond to marginal changes in years of schooling. Because the marginal productivity of schooling is likely to be higher in wage work relative to non-wage work[54] at higher levels

[53] Lam and Duryea (1999) found evidence for this explanation from Brazilian Data.
[54] By non-wage work, we mean home work and self employment

of education, wage work participation rate is expected to be highest at the postsecondary level of education as observed in figures 2 through to 6.

However, for the foregoing to provide an adequate explanation for the patterns observed in the Nigerian data, we should observe market wage offer increasing with schooling.[55] Table 7 shows that log wage is positively associated with increasing 'level of education', after controlling for age. This smooth positive correlation is not clearly shown in Figures 7-11, when 'years of schooling' rather than 'levels of education' (primary, secondary, postsecondary) are correlated with log wages. The figures show that in wage employment, mean log wages does not increase with schooling during the first 7 years of schooling. There is, however, an evidence of positive association as we get to higher levels of education.[56] Thus the observed relationship between schooling and women's labor market participation rate in the first 6 years of schooling may be an indication that the marginal productivity of primary schooling in non-wage work is at least as high as the marginal productivity of schooling in wage employment at levels of schooling below 7 years. Furthermore, as the level of education increases beyond the first 6 years, the marginal productivity of schooling in wage employment appears to exceed the marginal productivity of schooling in non-wage work.

Marginal productivity of schooling in self employment appears to be higher than marginal productivity in both home and wage work at the primary and secondary school

[55] Using Brazilian data, Lam and Duryea (1999) showed that mean log wages increased substantially with years of schooling at all levels of schooling. Wage returns to schooling at primary education level were substantial. In this case it is easy to interpret the low response of labor market participation rate to schooling as evidence that unobserved reservation wages could have been increasing at the same rate as observed market wages as years of schooling increased.

[56] However, log wage functions estimated for women from the same data by Aromolaran (2002) shows that coefficients of primary schooling average about 2% across age groups, while that of post secondary education averaged 12%. Since these estimates are from the same data, it is an evidence that log wages increases slightly with schooling at the primary education level. Table 6-7 show that the wage market participation rate tends to follow the wage or market price of labor.

levels (1-12 years of schooling). At postsecondary school level, schooling becomes less productive in self-employment relative to wage work and more productive in self-employment relative to home work[57]. The effect of this is that participation in self-employment accounts for a larger share of overall labor supply response of married women with less than 12 years of schooling, while wage work account for a larger share when the woman has attended at least one year of postsecondary education (that is the 13th year of schooling).[58]

In summary, the observed pattern suggest that primary education plays a vital role in getting women to substitute time into self-employment from home time, while postsecondary education motivates the substitution of both time in self employment and time in home work into wage employment. Thus, the preliminary examination of the Nigeria GHS data shows that more educated women tend to participate more in the labor market, after controlling for age. The observed patterns are an indication that that female labor supply behavior is guided by considerations of relative productivity of time in home and market work. The strength and exact nature of these relationships will however need to be established by a formalized model of female labor supply which controls also for the husbands wage opportunities as approximated by his schooling.

[57] If schooling were less productive in self-employment relative to home work at post-secondary school level, then participation rate in self employment at that level would be zero which is not the case as shown in figure 2.

[58] Another possible explanation for the observed pattern is the existence of labor market segmentation. This could be the case if the labor market is so structured that the only waged jobs available to women are those which require high levels of schooling, or if low paying wage jobs such as in the manufacturing sector discriminate against women. Table 5 particularly shows that most women working in wage sector are professionals, teachers, and clerks. These jobs require a level of education that is above the first 6 years. However, because this third explanation does not rest on any articulate theoretical proposition compared with the relative marginal productivity explanation, we will not pursue it further in this paper.

5 EMPIRICAL MODEL SPECIFICATION, HYPOTHESES, ESTIMATION ISSUES

5.1 Model Specification and Description

The following specifications of the female labor supply functions will be estimated:

$$L_{fj} = \alpha_0 + \alpha_1 S_f + \alpha_2 S_m + \gamma_1 E_f + \gamma_2 E_f^2 + \lambda_1 D97 + \lambda_2 D98 + \mu \quad \text{- Model 1} \quad (16)$$

$$L_{fj} = \beta_0 + \beta_1 S_{fp} + \beta_2 S_{fs} + \beta_3 S_{fps} + \beta_7 S_m + \gamma_1 E_f + \gamma_2 E_f^2 + \lambda_1 D97 + \lambda_2 D98 + \mu \quad \text{- Model 2} \quad (17)$$

$$L_{fj} = \alpha_0 + \alpha_1 S_f + \alpha_2 S_m + \alpha_3 S_f^2 + \alpha_4 S_m^2 + \alpha_5 S_f * S_m + \gamma_1 E_f + \gamma_2 E_f^2 + \lambda_1 D97 + \lambda_2 D98 + \mu$$

– Model 3 (18)

Where

L_{fj} is labor market participation indicator variable (j = t, wg, and se; 1 for participation and 0 for non-participation)

L_{ft} is total or overall labor market participation indicator variable (1 for labor market participation and 0 for non-participation or home workers)

L_{fwg} is wage market participation indicator variable (1 for wage market participation and 0 for non-wage market workers (i.e. self-employed + home-workers)

L_{fse} is self-employment participation indicator variable (1 for participation in self-employment and 0 for others (wage workers + home-workers)

S_f is the total years of schooling of woman, undifferentiated by levels (0-17)

E_f is the number of years of working experience of woman (potential)[59]

E_f^2 is the quadratic term of years of working experience * 10^{-2}

[59] Potential work experience was calculated as (Age- years of schooling – 6) for those with 9 or more years of schooling and (for those with less than 9 years of schooling Age-15)

S_{fp} is the number of years of primary schooling of woman (0-6)

S_{fs} is the number of years of secondary schooling of woman (0-6)

S_{fps} is the number of years of post secondary schooling of woman (0-5)

S_m is the total years of schooling of husband, undifferentiated by levels (0-17)

D97 is the indicator variable for period 1997/98

D98 is the indicator variable for period 1998/99

μ captures the effect of excluded explanatory variables and is assumed to be independent and identically distributed.

The empirical model will take the form of a probability model (PM)[60], since the dependent variable is a one-zero dummy for participation in market work. The estimated coefficients of schooling will provide estimates of the likelihood of a woman with one additional year of total, primary, secondary or postsecondary education engaging in market work.

The first model (expression 16) investigates the effect of total years of schooling of women on market work decision. It assumes that both the average and marginal effects of years of schooling on the likelihood of market work participation does not differ across

[60] Both the linear and non-linear probability models are estimated to judge the robustness of the estimates. Our discussions will however center mainly on the linear probability model estimates. The LPM estimate is the preferred choice here because of the underlying assumption that the marginal effect of schooling on probability of labor market participation is constant within education levels. Secondly, the estimates of the probit model may become imprecise or biased if the distribution of the values of the categorical dependent variable is heavily skewed. For example, the wage employment equation may face this problem since workers in waged employment are just about 4 % of the sample. The result is that 96% of the observations carry a value of zero while only 4% carry a value of 1 for the dependent variable. With this kind of wage employment data, the probit estimate through maximum likelihood estimation procedure would give a less accurate estimate of the true population parameter compared to the LPM. However, there are two major disadvantages of the LPM. The first is that its predicted outcomes may sometimes fall outside the permissible range of 0 and 1. This becomes a serious problem when we are interested in the predicted probabilities for values of the independent variables that lie towards the tails of the distribution. Secondly, the standard errors of the LPM estimates are not consistent (due to the heteroskedastic characteristics of the error term). The result is that the LPM model is a less preferred model for testing hypothesis compared with the probit model. Consequently, we estimate the probit version of these labor market participation models to provide a more robust test of hypothesis for the estimates of schooling effects obtained from the LPM as well as examine the stability of the estimates themselves given different empirical estimation approaches.

levels of education (primary, secondary, post-secondary). The model also assumes a linear relationship between schooling and labor market participation. Theoretically, we expect that:

$$\partial L_f \backslash \partial S_f = \alpha_1 > 0 \quad (19)$$

$$\partial L_f \backslash \partial S_m = \alpha_2 < 0 \text{ or } \partial L_f \backslash \partial S_m = \alpha_2 > 0. \quad (20)$$

The second specification (expression 17) assumes that differences exists in the marginal effects of increasing years of schooling across education levels (primary, secondary and postsecondary), but retains the restriction of linearity of the effect of schooling within each level of education. α_1 is split into three component parts, β_1, β_2, and β_3, while α_2 is retained as β_7 without any change in definition. We expect that $\beta_1 > 0$, $\beta_2 > 0$ and $\beta_3 > 0$ for wage market and overall labor market participation.

In the third model (expression 18), we drop the assumption of linearity in expression 16 and include quadratic terms for schooling and an interaction term between husband's and wife's schooling.[61] The sign of the interaction coefficient α_5, is not predicted by economic theory. A negative interaction effect would imply that women's labor market participation is less responsive to changes in own years of schooling if they are married to more educated husbands. That is, increases in wife's schooling becomes less effective in motivating labor market participation as husband's level of education increases. Put in another way, the effectiveness of increased investment in female schooling on market work decisions of women is diminished when they are married to husbands with more years of formal education.

[61] This specification is expected to give us additional information on the non-linear effect of total schooling on probability of labor market participation among women.

The theoretical expectation of the marginal effect of female schooling in this non-linear model is given as:

$$\partial L_f \backslash \partial S_f = \alpha_1 + 2\alpha_3 S_f^* + \alpha_5 S_m^* > 0 \ , \qquad (26)$$

Where S_f^* and S_m^* are the mean years of schooling for women and their spouses.

A reasonably large and negative α_5, such that $/\alpha_5 S_m^{*}/ > /\alpha_1/$ would imply that increased schooling by married women may not necessarily result in increased labor market participation if husband's education is also high. Since the correlation between wife's and husband's schooling is sizeable for many populations[62], a large negative estimate of α_5 would explain why highly educated women may stay out of the labor market. On the other hand a large positive estimate would imply that the response of wife's labor market participation rate to increased schooling is enhanced by husband's schooling.

5.2 Test of Hypotheses

The following hypotheses are tested with the empirical models estimated in this study.

5.2.1 Tests of non-linearity

1) The first test of non-linearity is from model 2 in expression 17: H_0: $\beta_1 = \beta_2 = \beta_3$ or the marginal effect of female schooling on labor supply behavior is equal across levels of education. If this null hypothesis of equality in the linear coefficients of schooling at the 3 different levels of education is rejected, the relative magnitudes of β_1, β_2 and β_3 will indicate the relative importance of each level of education to the labor supply behavior of married women.

[62] The correlation coefficient between the years of schooling of couples in data used for this analysis is 0.764. The United States and Taiwan populations have correlation coefficients of 0.3 and 0.4 respectively.

2) The second test of non-linearity is from model 3 in expression 18: H_0: $\alpha_3 = \alpha_5 = 0$; the marginal effect of female schooling on labor market participation does not vary with increasing years of schooling of either the wife or husband. If we reject the hypothesis that the estimated coefficients of at least one of the non-linear terms in model 3 is different from zero, then the relationship between female schooling and women's labor market participation is non-linear.

5.2.2 Test of Equality of Marginal Productivity of Schooling in Market and Non-Market Work

H_0: $\partial L_{ft} \setminus \partial S_f = 0$; $\partial L_{ft} \setminus \partial S_{fp} = 0$; $\partial L_{ft} \setminus \partial S_{fs} = 0$; $\partial L_{ft} \setminus \partial S_{fps} = 0$ (30)

H_0: $\partial L_{fwg} \setminus \partial S_f = 0$; $\partial L_{fwg} \setminus \partial S_{fp} = 0$; $\partial L_{fwg} \setminus \partial S_{fs} = 0$; $\partial L_{fwg} \setminus \partial S_{fps} = 0$. (31)

H_0: $\partial L_{fse} \setminus \partial S_f = 0$; $\partial L_{fse} \setminus \partial S_{fp} = 0$; $\partial L_{fse} \setminus \partial S_{fs} = 0$; $\partial L_{fse} \setminus \partial S_{fps} = 0$. (32)

The tests in expressions 30 and 31 are one-tailed tests and the alternative hypotheses generally state that the marginal effect of schooling on the probability of labor market participation among married women is greater than zero. However the tests on the self-employment participation coefficients are 2-tailed tests (expression 32). Here the sign of the schooling coefficients is not restricted to positive values and the alternative hypothesis generally states that the marginal effect of schooling on the probability of participation in self-employment is not equal to zero.

A second way of interpreting the results of the above tests is in terms of the ratio of marginal productivities of schooling in market and non-market work (see expressions 9-11). This indirect interpretation is derived from the predictions of the theory of time allocation, since there is no direct estimation of marginal productivities of schooling in this study. For example, a rejection of any of the null hypotheses in expression (30) would imply that marginal productivity of schooling at that level of education is greater

in market work than in home work, while a rejection of any null hypothesis in expression (31) would suggest that the marginal productivity of schooling at that level of education is higher in wage market relative to non-wage market work. Furthermore, one would infer that the marginal productivity of a particular level of schooling in self-employment is higher or lower than in wage and home work in the population under study if we reject the hypotheses in expression (32).

5.2.3 Model Specification Test

This is a test of equality of fit of the two linear forms of specification of the "schooling – labor market participation" relationship to the data. The null hypothesis is stated as H_0: $AdjR_1^2 = AdjR_2^2$ (where $AdjR^2$ is adjusted coefficient of determination). This is a one-tailed test and the alternative hypothesis states that the linear specification of the relationship with 3-schooling splines in model 2 (expression 17) fits the data better than the total years of schooling specification in model 1 (expression 16). If the null hypothesis is rejected, it would suggest that specification with schooling spline is a better form of specification for the estimated relationship between female schooling and women's labor market participation.[63]

5.3 Econometric Issues in Empirical Estimation

Even though, the static family labor supply framework adopted for this investigation necessitates the use of only women who report information on their spouse, restricting the sample to this subset of the total sample of women may subject my estimate of the effect of schooling on the probability of labor market participation to selection bias. This problem may arise if the women who live with a male partner are systematically more likely to stay out of the labor market because of the market wealth

[63] Note however that with large samples, this is a weak rule.

and productive capacity of their husbands. Table 4 for example, shows that participation rate in market work is substantially lower among married women (44%) compared with single women (92%), implying that marital status rightfully belongs to the labor market participation equation. This is likely to result in a biased estimate of the effect of schooling on labor market participation of all women, if schooling is correlated with marital status.[64] In other words, conditional on the woman's age, if the probability of getting married varies systematically with the level of schooling the estimated schooling coefficient may be a biased estimate of the population parameter.[65] Table 8 shows that the probability of living with a spouse varies systematically with schooling conditional on age.[66] We observe that the likelihood of living with a spouse diminishes with schooling for married women between the ages of 30-34 years while the likelihood increases with schooling for the older women between the ages of 40-54.[67] Schooling seems to have no effect on marital status when a woman is between the ages of 35-39 years.[68] Thus marital

[64] Disaggregated analysis based on marital status as in this study assumes that the woman's decision to marry is not responsive to wage and non-earned income opportunities, which in reality may be a fairly restrictive assumption. Economic theories of marriage hypothesize a strong linkage between propensity to marry and wage gap between men and women. It has been argued by Becker (1981) that the gains of specialization in marriage are larger the larger the difference in the couple's individual returns to market work.

[65] In other words, if probability of living with a spouse declines with schooling, we are faced with an upward selection bias, and our estimated schooling coefficient will overstate the true population parameter. If on the other hand, probability of getting married increases with schooling, there will be a downward selection bias and an underestimation of the population parameter by the sample estimate of schooling effect.

[66] It is surprising though to observe that rather than an expected negative relationship between schooling and marital status, the data shows a positive association for the age groups 35-45 years and 45-54 years. A negative association is however observed for age 25-34 years.

[67] The increasing likelihood of living with a spouse as schooling increases among older women may be an indication that marital unions are more stable the higher the level of education of the spouses. The stability of conjugal unions of more educated couples may arise from a more efficient process of sorting and marching compared with couples with lower levels of education. A second possible explanation for this observed pattern among older women is that life expectancy is likely to be higher for more educated couples. As a result, a lower proportion of unions are broken before the age 54 years among more educated couples compared with the less educated couples

[68] This age group differentiated result suggest the possibility of varying magnitudes of schooling effect for different ages groups and thus provide a case for age group restrictions on the estimation of schooling effect. This is however not explored in this paper.

status appears to be a choice variable and should be taken as endogenously determined in this analysis of labor market participation.

With evidence that marital status may not be exogenous, our estimate of schooling effect using the sub-sample of women living with spouse is likely to be biased. Thus the effect of schooling may be over-estimated for the ages 30-34 and under-estimated for ages 40-54.[69]

To adequately address this problem we would need to model the marriage market[70] and use the selection-bias correction technique of Heckman (1979) to correct for selectivity bias in the estimate of the schooling coefficient. This approach will however not be adopted in this paper because of the difficulty of finding a suitable identifier for the decision to live with a spouse which will not be correlated with the error term in the labor force participation equation. In other words, data limitation does not offer a reasonable basis for identifying this structural model.

In light of the foregoing, I proceed to estimate the schooling effects for our restricted sample and compare the estimates with that of the sub-sample of single women. Even though this approach will not eliminate the selectivity bias, we would at least have an idea of the extent of the bias we are confronted with.

[69] Ages 30-34, 35-39, and 40-54 constitute 29.6%, 25.1% and 45.3% respectively of the sample of married women

[70] According to Schultz (1993), a correct forecast of how changing economic conditions are likely to affect labor force participation of women must adequately account for the distribution of the population by marital status. The probability of female labor force participation calculated from a sample of married women would be closer to that of all women the closer the proportion of all women who are married is to unity. So the bias is higher the higher the proportion of single women in the population of study. The sample analyzed in this has only 58 percent of women living with spouse (see Table 3)

6. RESULTS AND DISCUSSION

6.1 Description of Some Key Model Variables

Table 9 shows that the average total years of schooling are highest for wage earners and lowest for the not-employed, implying that on average, wage workers are more educated than non-wage workers and market workers are more educated than home workers. We observe that the average female wage earner has attended school for 11 years, while the average female self-employed and not-employed has attended school for only 4.8 and 1.2 years respectively.

The average years of schooling attained by the male spouses of female wage workers, self employed and not-employed are 11.3 years, 6.20 years and 2.17 years respectively. This gives a male/female education gap of 0.30 years for female wage workers, 1.38 years for married female self employed workers and 0.95 years for non-employed women living with a spouse. This would suggest that the home time of couples whose wives are wage earners would be stronger substitutes than both the families in which the wives are self employed and those in which wife's are not-employed.[71]

In addition, we observe that younger women are generally more educated than older ones and this cut across employment status. Thus, controlling for age should help to estimate the schooling effect on labor market participation.

[71] it believed that the smaller the educational gap between couples the stronger the substitutability of their home time for one another, given that they are already living together.

6.2 Non-Linearity in the Effect of Schooling on Women's Labor Market Participation

The results show that the relationship between the labor market participation and schooling of women is non-linear. The first evidence of non-linearity is the different marginal effects estimated for different levels of education in all 3 equations (Total market, wage market and self employment equations). We estimate that one additional year of primary, secondary and postsecondary education will increase the likelihood of total labor market participation of women by 5.5%, 1.7% and 5.2% respectively (see Tables 10b and 13b). For wage employment, the figures are 0.09%, 2.9% and 15.2% (see Tables 11b and 13b), and for self employment, 5.4%, -1.2% and -10.8% respectively (see Tables 12b and 13b). Thus, while the marginal effects of schooling on women's labor market participation increases from primary to postsecondary education in wage employment; it declines in the self employment sector. This is evidence of a trade-off between the two sectors. [72]

A second evidence of the existence of non-linearity in the relationship is the statistical significance of the quadratic terms in expression 18. The coefficient of the quadratic term of total years of woman's schooling in all three labor supply equations are statistically significant at 1% and carry the expected negative signs, implying that the marginal effect of schooling on labor market behavior of married women diminishes with more years of schooling. (See tables 10a, 11a and 12a).

The third source of non-linearity in the model estimates is the interaction between male and female schooling. This factor is important because of the usually observed

[72] Theoretically, it is observed that the estimates are fairly robust to difference in specification. That is estimates from the linear probability model are virtually the same magnitude and direction as estimates from the probit model.

positive correlation between husband and wife schooling in many populations. Tables 10a, 11a and 12a show that the coefficient of the female/male schooling interaction term is statistically significant in the wage sector and not statistically different from zero for self-employed women. In the wage sector the estimated coefficient of the interaction term is positive and significant, implying that the higher the husband educational attainment, the higher is the effectiveness of increasing wife's schooling in enhancing participation in wage work. For self employment, the estimated coefficient is still positive but not significant, implying that additional years of schooling for women is equally effective in motivating women to be self-employed irrespective of the level of education of the husband.[73]

6.3 Marginal Analysis of the Effect of Female Schooling on Women's Labor Market Participation

Table 13a shows the computed marginal effect of female total schooling on labor market participation of married women from the estimated coefficients of the linear and non-linear forms of specification reported in tables 10a, 11a, and 12a.[74] The table shows that an additional year of total schooling will increase the labor market participation rate

[73] A positive interaction coefficient implies that the marginal effect of female schooling on women's labor market participation increases with increasing schooling of spouse, while a negative coefficient implies that the effect of increasing female schooling on labor market participation probability diminishes with increasing level of education of husband.

[74] Some important econometric issues need to be emphasized here There is a possibility that the estimates of the coefficient on female schooling is biased if their exist certain characteristics, different from their educational attainment, that make women who have more schooling to be more likely to engage in market work. This factor must be such that even without schooling, such a woman would still be likely to engage in market work. Even though we note the possibility of endogenous schooling, the unavailability of data to effectively endogenize schooling in this model is a limitation of this study. However, most of the literature on the effect of education in developing countries is still faced with the problem of non-availability of sufficient data which would be needed to drive exogenous variations in schooling. In any case this limitation does not diminish the importance of these results in giving us a first indication of the effect of education on labor market participation in Nigeria using the General household survey data. Second, it has been argued that since schooling itself may be measured with a certain degree of classical measurement error, the resulting attenuation bias of classical measurement error may offset the upward ability bias that leads to the possible upward bias of the coefficient of education.

of married women by as much as 6 percent in the wage sector[75] and 2.9 percent in the self-employment sector. This implies that an additional year of schooling for the average woman will increase participation in wage employment by as much as 143% over sample average participation rate of 4.17 percent, and participation in self employment by 8.5 percent over the average participation rate of 34 percent.

A decomposition of total years of schooling into primary, secondary and postsecondary school effects show that the observed positive effect of total years of schooling derives substantially from the marginal effect of postsecondary schooling in the wage sector, and primary schooling in the self-employment sector (Table 13b). We also observe a trade off between wage and self-employment in the effect of schooling on women's labor market behavior. Specifically, an additional year of postsecondary education increases labor market participation probability by 15.2 percent in the wage sector and decrease participation probability in self employment by 10.8 percent. In contrast, an additional year of primary education decreases participation of married women in wage employment insignificantly by 0.001 percent and increases participation probability in self-employment by 5.40 percent. With an additional year of secondary education, the likelihood of participation in the wage market increases by a modest 2.86 percent and likelihood of participation in self-employment declines by 1.23 percent. The likelihood of participation in overall labor market increases by 5.50%, 1.71% and 5.19% with marginal increases in primary, secondary and postsecondary schooling respectively.

[75] A notable problem with the reported estimates of probability of wage employment is that the estimated coefficients differ substantially between the linear probability model and the probit model approaches. Since this divergence was not observed for self-employed and total workforce in Tables 7a and 7b, a possible explanation may be the very small proportion of the population that is engaged in wage jobs. The proportion is below 4 percent in this data set. Given the very limited amount of observations on women in wage employment, it is understandable that the probit model which utilizes that MLE estimation procedure will return a coefficient biased towards zero. In such a case, the probability model estimate through OLS estimation procedure would be more reliable.

The estimates for the wage sector would imply that at the primary level of education, additional years of female schooling seem to increase the productivity of married women in non-wage work more than their productivity in wage employment. At post secondary level of education, additional years of schooling increases wage work productivity relative to productivity in non-wage work, and this results in a substantially positive marginal effect of schooling on wage market participation.

Thus, increasing primary schooling for women in Nigeria would tend to raise productivity in non-wage work more than productivity in wage-work, while increasing postsecondary education would raise wage market productivity more than productivity in non-wage work. [76] The results also suggest that the marginal productivity of primary schooling in self-employment is higher than in both home work and wage work.

Even though the results for the overall labor market suggest that the marginal productivity of schooling is higher in market work than in home work at all levels of education, it is important to note that secondary school education has the smallest marginal effect on probability of total labor market participation. This may be interpreted as indicating that the marginal productivities of schooling in home and market work are closest at the secondary school level of education. The result is a V-shaped curve of relative productivity of schooling in market and home work, implying that investment in primary and postsecondary education have the greatest potentials for increasing overall labor market participation of married women in Nigeria.

6.4 Cross-Schooling Effects and Time Allocation Behavior of Couples

Table 13b shows that the cross total effect of husband's schooling on wife's labor market participation is 1.47 percent for the overall labor market, 0.273 percent for wage

[76] Note that these inferences are subject to the assumption that female labor demand is given.

market and 1.16 percent for the self-employment market. Thus, the cross total effect of own-schooling on married women's wage market participation is about 9.5 times as large as the cross total effect of husband's schooling, while total effect of own-schooling on self employment probability is about 2.5 percent times that of the cross total effect of husband's schooling**.**

Secondly, the positive sign of the cross-total effect of husband's schooling on wife's labor market participation in both wage and self-employment has some implications for time allocation behavior of the couples.[77] The result suggests that either the income compensated wage effect of husband's schooling on wife's labor market participation is positive and dominates a negative or zero income effect or income effect is positive and dominates a negative or zero substitution effect, or that both effects are positive.[78] Given the cultural setting in Nigeria, it is more realistic to assume that home times of couples are substitutes rather than complements[79], and that the estimated positive marginal effect of husband's schooling on wife's labor participation is more likely to be evidence that income effect on wage and self-employment participation is positive and dominates a negative or zero substitution effect. This suggests that the time of women in homework is income inelastic or that homework time is not a normal good for the

[77] The estimates of the coefficient of male education may however be biased if we have reason to suspect that the same preferences that drives a man to acquire more education also drives him to prefer a working woman to a homely woman. If this is true this estimate may in fact be an overestimate.
[78] The first case would occur if the husband time is complementary to the wife's time out of the market, while the second and third scenarios could be the case if home work is not a normal good, implying that the woman would prefer to reduce time allocated to non-market work if they have sufficient income
[79] The reason is that marriage in Nigeria is motivated more by the gains of specialization rather than companionship

women. This income inelastic nature of home time may be a result of increasing substitution possibilities for women's time at home as husband's income increases.[80]

The results also show that the estimated cross total schooling coefficient in the wage sector is small relative to that of the self-employment sector. Two explanations can be proffered for this finding. First, it is possible that the income compensated cross substitution effect of husband's wage is more negative in the wage sector or income effect is more positive in self-employment or both. This inference is supported by the following facts about the population under study:

First, we observe that the average years of schooling of women in wage employment is just 0.3 years less than that of their spouse, while women in self employment have attended school for 1.4 years less than their spouses (see Table 9). The implication of this is that the time of couples with self employed wives are likely to be weaker substitutes because of the high degree of specialization in time allocation which is theoretically associated with larger education gaps between couples.[81] Thus we expect a stronger negative substitution effect in the wage sector relative to self-employment for reasons outlined earlier.

[80] The intuition is as follows: If higher schooling of husbands results in higher income, then given the postulate of fertility theory that a positive relationship exist between husband income and fertility, number of children in the household will increase and this will increase the substitution possibilities of the woman. Another common way to improve the substitution possibilities of the woman is when increased husband income enables the household to afford the hiring of "House-Helps" thereby releasing the woman's home production time for market work.

[81] A theoretical argument for this can be found within the framework of the Gary Becker-motivated household time allocation theory, (see Becker, 1965, 1981). According to the theory, the larger the difference between the education of wife and husband, the weaker will be the substitution relationship in the couple's time. Since time is valued in terms of market wage offer and market wage offer is assumed to be directly proportional to educational level, increases in husband's education relative to his wife increases the value of his time relative to that of his wife in market work, and this induces an increase in his supply of labor to the market. Likewise, the resulting decline in the market value of the wife's time relative to the husband implies an increase in her reservation wage which makes the allocation of her time to home production a more economically efficient decision for the household.

Second, the income effect on women labor market participation is likely to be more positive in self-employment relative to wage employment due to the nature of most self employment jobs that women engage in. Many Nigerian women who work in the self-employment sector are petty traders, small farmers, food processors, or artisans (see Table 5). By nature, most of these activities are home-based or community-based, and have flexible time periods. In addition, children in the household are also part of the labor force that assists in many of these self employment activities. Younger children may not participate in production, but their own activities may be flexibly moved to the same place were the mother's business is being carried out. Thus home production time is not distinctly separated from market production time for self-employed women, and increasing income of husband may result in the availability of more investment capital for the wife to produce and earn more income for the family without the need to reduce time allocated to home production. Thus, when husband income increases and home work is income inelastic (i.e. not a normal good), labor market activities of women, especially with respect to self-employment, is likely to rise, particularly because engaging in such activities would not require substitution away from home production time. On the other hand, wage employment (or self-employment jobs based away from home or community) would require that the woman substitute between home and market work. For this to be possible, the woman would have to substitute some of her home production time for less costly time of other household members.[82] In Nigeria, it is common to find other non-working adults and teenagers in the household whose job is

[82] Note that Rosenzweig and Schultz (1982) addressed this same issue from a different perspective when they wrote on the role of grown-up children in the wage market participation decision of married women. They argue that the presence of these caretakers at home increases the likelihood of married women participation in wage employment since the time of these kids could be substituted for the mother's time in the performance of a number of home tasks.

primarily to assist in home production activities. Payments for their services are both in kind and cash. Thus, the higher cost of participation in wage market compared with the largely home based self employment would account for why the income effect is likely to be less positive in wage employment than in self-employment.

6.5. Evidence of Selection Bias

Since schooling is positively correlated with the probability of being married in this population as shown for most age groups in Table 8, we expect the estimate of schooling coefficients in the labor market participation equation to be biased downwards, if marital status is a true source of selectivity bias in this model.

However, a comparison of the estimated marginal effects of schooling for married women (Table 13b) and single women (Table 14) does not provide conclusive evidence of the presence of a downward selection bias in the estimates for the sample of married women, especially for the overall labor market estimates. The estimates of schooling coefficients are higher (upwardly biased) for married women than single women at secondary and postsecondary education levels. The estimates of the schooling coefficients in the wage and self-employment participation equations are close for primary and postsecondary school levels, even though the estimates for single women are higher. For example, while the estimated marginal effects of female schooling on wage market participation probability at primary, secondary and postsecondary levels are -0.001%, 2.86% and 15.2% for married women, the corresponding figures for single women are 0.50%, 3.86% and 15.4%. For participation in self-employment the marginal effects of schooling for the three education levels are 5.40%, -1.23% and -10.8% for married women as against 6.12%, -2.67% and -11.9% for single women.

Thus, our estimate of marginal effects of schooling on labor supply behavior of married women is likely to understate the effect for the entire population of women. As a result, a more precise estimation of the effect of female education on the likelihood of labor market participation should involve the explicit modeling of the state of living with a spouse or being married. This exercise is not undertaken in this study because of the limitation of the data used in providing information on possible identifiers of the marital status equation. (See Schultz, 1990b).

7.0 CONCLUSION

In the period between 1970 and 1992, statistics show that female labor force participation in Nigeria increased by as much as 20-30 percentage points for women aged 40-59 years in spite of declines in GDP per capita, real wages, male labor market participation rates, industrial capacity utilization, and increasing unemployment rates, suggesting that the observed increases in female labor force participation may be associated more with supply-side rather that demand-side factors.

This study investigated the potential contribution of female schooling enrollment and attainment levels which has been increasing in the past 3 decades to the observed rise in female labor force participation. Specifically, I analyzed the contributions of primary, secondary and post-secondary schooling of women to cross sectional variations in female participation probabilities in overall-market, wage and self employment, and draw implications for the underlying relationship between market and non-market productivity of schooling. The major findings of the study are summarized below.

First, I find that the relationship between women's labor market participation and schooling is basically non-linear and that the non-linearity exists mainly between levels

of education. The results show that an additional year of primary, secondary and post-secondary education would increase the likelihood of women's participation in the overall labor market by 5.50%, 1.71% and 5.19% respectively. This implies that the marginal productivity of schooling in market work is higher than the marginal productivity of schooling in home work at the primary, secondary and postsecondary levels of education; the gap in productivity being more pronounced at the primary and postsecondary levels of education. The smallest estimate of 1.71% for secondary education suggests that the marginal productivities of schooling in market and home (non-market) work are closest at this level of education.

Furthermore, we find that the marginal effect of female primary, secondary and postsecondary education on the probability of women's wage employment is 0.00%, 2.86% and 15.2% respectively. This is an indication that productivity in non-wage work rises at least as fast as productivity in wage work with additional years of schooling at the primary school level, while the marginal productivity of schooling in wage work exceeds productivity in non-wage work (home or self-employment) with additional years of secondary and postsecondary education.

In self-employment, the marginal effects of female schooling on women's labor market participation probability is 5.40% for primary education, -1.23% for secondary education and -10.8% for postsecondary education, implying that the marginal productivity of primary schooling in self employment exceeds marginal productivity of primary schooling in wage or home work, while the reverse is the case for secondary and postsecondary schooling.

Cross total effect of husband's education on wife's labor supply, contrary to expectation, is positive and estimated to be 0.273% for wage market work, 1.16% for self-employment and 1.47% for overall labor market. Thus the effect of own-schooling on married women wage market participation is about 9.5 times as large as the cross-schooling effect of the husband, while own-schooling effect on self employment probability is about 2.5 percent times that of the cross-schooling effect of the husband**.**

Assuming that the cross substitution effect of wage changes, as a result of increased husband's schooling, is zero or negative, this result would imply that the income effect of schooling on wife's market labor supply is positive rather than negative and that the positive effect is stronger in self-employment than in wage employment.

These findings are consistent with the following conclusions.

Increasing years of primary education for women in Nigeria would tend to increase productivity in non-wage work more than productivity in wage-work, while increasing postsecondary education would increase wage market productivity of married women more than productivity in non-wage work. Increased investment in secondary education has the least effect on the overall labor supply response of married women, since marginal productivities of schooling in market and home work at are closest at this level of education.

Thus, additional years of postsecondary education may increase wage market participation among Nigerian women, while increased investment in primary education could enhance participation rates in self-employment. These effects are likely to be stronger when a woman is married to a more educated spouse.

Finally, the times of couples at home do not seem to be strong substitutes. Rather there is evidence that suggests that home or non-market work may not be a normal good for the woman either because of the existence of substitutes and less costly labor in the household or because of the lack of clear distinction between time spent in home production and time spent in home-based market production (a common form of self-employment in Nigeria).

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Table1: Nigeria: Economically Active Population as a Proportion of Total Population by Age

	Female		Male	
	1970	1992	1970	1992
Age Group (Years)				
0-14		1.8		4.0
15-19	19.2	13.8	56.1	31.5
20-24	25.5	27.0	85.7	62.0
25-29	29.2	33.3	96.2	92.0
30-34	31.4	36.5	97.3	97.8
35-39	31.4	47.5	97.3	98.9
40-44	31.4	52.2	97.3	98.7
45-49	31.4	62.2	97.3	99.2
50-54	35.0	64.1	97.9	97.5
55-59	34.2	58.4	96.6	97.9
60-64	34.2	42.0	90.6	79.4
65+	30.1	30.6	90.2	50.0

Source ILO Year Book of Labor Statistics (1970, 1992)

Table 2a: Gross School Enrollment Rates in Nigeria (1970-94)

	1970			1975			1985			1994		
	Female	Male	Gap**	Female	Male	Gap	Female	Male	Gap	Female	Male	Gap
Primary	32.2	55.3	23.1	40.3	60.3	20.0	91.8	115.4	23.6	86.6	109.4	23.2
Secondary	3.1	7.2	4.1	5.6	10.4	4.8	27.9	40.1	12.2	30.3	36.2	5.9
Post-secondary	0.1	0.9	0.8	0.3	1.7	1.4	1.9	5.2	3.3	2.3*	6.0*	3.7

Source: UNESCO (2001)
*1990 figures; **Gap is male-female percentage point difference.

Table 2b: Schooling Attainment of Women in Nigeria by Age and Grade

	15-19 years		20-29 years		30-39 years		40-49 years	
Grades	1990	1999	1990	1999	1990	1999	1990	1999
1	0.651	0.731	0.517	0.641	0.288	0.507	0.184	0.353
2	0.654	0.725	0.515	0.640	0.282	0.501	0.177	0.342
3	0.628	0.716	0.503	0.633	0.266	0.493	0.163	0.322
4	0.602	0.70	0.492	0.624	0.241	0.477	0.138	0.292
5	0.576	0.673	0.471	0.609	0.220	0.464	0.123	0.278
6	0.533	0.64	0.452	0.598	0.207	0.452	0.110	0.264
7	0.307	0.482	0.24	0.428	0.09	0.287	0.043	0.118
8	0.268	0.418	0.226	0.416	0.084	0.276	0.036	0.116
9	0.208	0.339	0.202	0.390	0.078	0.261	0.031	0.111

Source: Educational Attainment and Enrollment Profiles: A Resource Book based on an analysis of Demographic and Health Survey Data by Deon Filmer, 2000 Mimeo, Development Research Group, The World Bank.

Table 3: Tabular Summary of Data Description

AGGREGATE SAMPLE			
1	Total Size of GHS Household Sample	84562	
2	Total Size of GHS Individual Sample	375399	
3	Proportion of Work Age Adults (15-64)	54.8%	
SUB-SAMPLE OF WOMEN BETWEEN 30-54 YEARS			
4	Total Number of Women between 30-54 Years		50204
5	Total Number of Married Women Living with a Spouse	28125	
6	Total Number of Married Women Living without a Spouse	15502	
7	Total Number of Married Women		43627
8	Total Number of Unmarried Women Living with Spouse	857	
9	Total Number of Unmarried Women Living without a Spouse	5720	
10	Total Number of Unmarried Women		6577
11	Total Number of Women with Information on Spouse*	(5+8)	28982

*Actual sample used fell to 28691 when data on married women 30-54 was further cleaned.

Table 4: Percentage Distribution of Women by Marital Status and Employment Type (Ages 30-54).

	All Women	Women with Spouse	Married Women without Spouse			Single* Women	Male Spouses
Employment Type			All	Household Heads	Just spouses		
Employer	0.239	0.262	0.187	0.840	0.103	0.280	0.964
Wage worker	4.36	4.17	3.55	11.3	2.64	7.55	13.3
Self Employed	34.14	25.7	32.49	85.3	26.7	81.1	85.1
Cooperative Worker**	13.44	14.1	15.78	0.129	17.5	3.36	0.168
Unpaid Family Worker	0.0339	0.014	.0129	0.00	0.0147	0.140	0.0349
Unemployed	47.8	55.7	48.0	2.39	53.1	7.53	0.446
Mean Age (Years)	38.7 (6.7)	35.7 (5.1)	42.6 (6.5)	40.6 (6.7)	43.0 (6.35)	42.4 (7.1)	44.7 (5.6)
Mean Years of Schooling	2.74 (4.1)	2.74 (4.2)	1.92 (3.7)			3.47 (4.5)	3.7 (4.9)
Number of Observations	50198	28691	15502	1546	13606	5720	28691

* This includes those that are widowed, divorced, and separated, and never married.

** Cooperative workers were not accurately described in the survey. However, their characteristics as gleaned from the data suggest that they could pass for unpaid family labor. 90 percent of them work in agricultural sector, 63 percent are female, 58% are married and 38% single. 51% are spouses, 32% are sons, 9% are daughters, and 8% are sons in law. None is head of household. 99% earn no income, 61% never attended school, 3.5% are in school and 35% have completed schooling, average age is 30 years.

Table 5: Occupational Distribution for Women Living with Spouse Only (Percentage)

Code	Title of job	Wage -Worker	Self-Employed	Cooperative Worker	Employers	Unpaid Family Workers
139	Teacher	34.7			27.4	
399	Clerk	31.9			26.0	
490	Trader	2.91	66.2	6.37	28.8	28.6
611	Farmer	7.44	28.3	92.5	8.22	57.1
72	Professionals/Technical Workers	6.59				
791	Tailors		1.76			14.3
843	Mechanic				1.37	
110	Professionals/Technical Workers	1.54				
133	Professionals/Technical Workers	1.88				
321	Admin/Managerial	1.71			1.37	
391	Admin/Managerial				1.37	
629	Agric				1.37	
394	Admin/managerial				1.37	
	Total Percentage	88.67	96.3	98.87	97.27	100
	Number of Observations	1169	7323	4020	73	7.00

Table 6: Relationship between Female Schooling and Women's Labor Market Participation

(Women living with spouse and aged between 30 and 54 years)

Age Group (Years)	Education Levels	Wage Employment A)	Self-employment (B)	Employers (C)	Total Employment (A+B+C)	Cooperative Workers	Not-Employed (D)	No of Obv. (E)
30-34	No formal Education	0.00263	0.0859	0.000	0.0885	0.131	0.780	7984
	Primary	0.0193	0.479	0.00131	0.500	0.162	0.337	2282
	Secondary	0.129	0.483	0.00912	0.621	0.083	0.296	1535
	Post-Secondary	0.689	0.139	0.0383	0.866	0.0144	0.119	209
35-39	No formal Education	0.00361	0.154	0.000172	0.157	0.151	0.691	5813
	Primary	0.0251	0.544	0.00359	0.573	0.164	0.263	1950
	Secondary	0.167	0.492	0.00585	0.665	0.070	0.265	1026
	Post-Secondary.	0.713	0.140	0.0394	0.892	0.00716	0.100358	279
40-44	No formal Education	0.00630	0.187	0.000574	0.194	0.179	0.626	3487
	Primary	0.0196	0.569	0.0000	0.589	0.161	0.250	1017
	Secondary	0.165	0.563	0.00652	0.735	0.0739	0.191	460
	Post-Secondary.	0.757	0.0786	0.0571	0.893	0.000	0.107	140
45-49	No formal Education	0.00372	0.271	0.00297	0.278	0.202	0.519	1344
	Primary	0.0308	0.600	0.00473	0.635	0.154	0.211	422
	Secondary	0.224	0.444	0.160	0.684	0.0963	0.219	187
	Post-Secondary	0.711	0.184	0.000	0.868	0.0263	0.0789	38
50-54	No Formal Education	0.0119	0.212	0.000	0.224	0.184	0.592	419
	Primary	0.0178	0.553	0.000	0.571	0.0893	0.339	56
	Secondary	0.050	0.450	0.000	0.500	0.100	0.400	20
	Post-Secondary	1.00	0.000	0.000	1.000	0.000	0.000	10

Table 7: Relationship between Female Schooling and Log Wages

(Women living with spouse and aged between 30 and 54 years)

Age Group	Education Levels	Wage Employment A)	Self-Employment (B)	Employers (C)	Total Employment
30-34	No Formal Education	1.65	1.64	NA	1.64
	Primary	1.80	1.68	1.43	1.69
	Secondary	2.15	1.91	2.23	1.97
	Post-Secondary	2.54	2.18	2.17	2.46
35-39	No Formal Education	1.91	1.69	2.22	1.69
	Primary	1.99	1.79	1.88	1.80
	Secondary	2.27	1.96	2.35	2.04
	Post-Secondary.	2.56	2.21	2.72	2.51
40-44	No Formal Education	2.12	1.71	1.84	1.72
	Primary	1.88	1.78	NA	1.78
	Secondary	2.42	2.02	2.06	2.11
	Post-Secondary.	2.54	2.66	2.73	2.57
45-49	No Formal Education	3.36	1.70	1.62	1.72
	Primary	1.92	1.83	1.54	1.83
	Secondary	2.43	2.07	2.22	2.19
	Post-Secondary	2.38	2.95	NA	2.57
				NA	
50-54	No Formal Education	1.90	1.83	NA	1.83
	Primary	1.81	2.26	NA	2.24
	Secondary	1.98	2.64	NA	2.57
	Post-Secondary	2.75	N.A	NA	2.75

Table 8: Relationship between Marital Status and Schooling by Age
(Women aged between 30 and 54 years)

Age	Education Levels	Married with information on spouse (A)	Married with no information on spouse (B)	Single women (C)	No of observation (E)
30-34	No education	0.843	0.130	0.0272	9472
	Primary education	0.792	0.110	0.0988	2883
	Secondary education	0.760	0.104	0.137	2021
	Post-secondary education	0.647	0.102	0.251	323
35-39	No education	0.731	0.214	0.0544	7951
	Primary education	0.732	0.159	0.108	2662
	Secondary education	0.698	0.163	0.138	1469
	Post-secondary education	0.738	0.127	0.134	378
40-44	No education	0.480	0.440	0.080	7262
	Primary education	0.509	0.319	0.173	2000
	Secondary education	0.568	0.305	0.127	810
	Post-secondary education	0.660	0.236	0.104	212
45-49	No education	0.281	0.558	0.161	4785
	Primary education	0.288	0.447	0.265	1467
	Secondary education	0.371	0.441	0.187	503
	Post-secondary education	0.342	0.486	0.171	111
50-54	No education	0.0989	0.639	0.262	4233
	Primary education	0.0734	0.659	0.267	763
	Secondary education	0.0803	0.719	0.201	249
	Post-secondary education	0.146	0.687	0.164	67

Table 9: Means and Standard Deviations of Model Variables
(Women living with spouse and aged 30-54 years)

	Wage Workers (A)	Self-Employed (B)	Total Employment (C)	Not-Employed (D)	Total Sample
DEPENDENT VARIABLE					
Participation Rate	0.041	0.258	0.301	0.556	
EXPLANATORY VARIABLES					
Linear Terms					
Wife's Years of Primary Schooling	5.52 (1.55)	3.64 (2.84)	3.91 (2.77)	0.914 (2.12)	1.91 (2.74)
Wife's Years of Secondary Schooling	4.46 (2.36)	1.16 (2.23)	1.63 (2.52)	0.289 (1.21)	0.63 (1.82)
Wife's Years of Post-Secondary Schooling	1.01 (1.54)	0.0273 (0.30)	0.169 (0.733)	0.0117 (0.207)	0.058 (0.440)
Wife's Total Years of Schooling	11.0 (4.32)	4.82 (4.36)	5.71 (4.86)	1.22 (3.03)	2.67 (4.22)
Potential Years of Working Experience of Wife	18.6 (5.45)	21.4 (5.52)	21.0 (5.60)	4.32 (5.12)	20.6 (5.34)
Husband Total Years of Schooling	11.3 (4.38)	6.20 (4.83)	6.93 (5.09)	20.7 (2.08)	3.67 (4.89)
1997/98 Year Dummy	0.357 (0.479)	0.354 (0.478)	0.354 (0.478)	0.369 (0.482)	0.365 (0.481)
1998/1999 Year Dummy	0.307 (0.461)	0.286 (0.452)	0.289 (0.454)	0.289 (0.452)	0.288 (0.453)
Quadratic Terms					
The Square of Wife's Total Years of Schooling	139.5 (78.4)	42.3 (51.6)	56.2 (65.7)	10 .7 (32.3)	24.9 (49.4)
The Square of Wife's Work Experience* 10^{-2}	3.74 (2.21)	4.86 (2.53)	4.71 (2.52)	4.32 (2.32)	4.53 (2.43)
The Square of Husband's Total Years of Schooling	146.8 (83.9)	61.7 (66.1)	74.0 (75.2)	20.7 (48.8)	37.4 (62.5)
Interaction Terms					
Wife's Total Years of Schooling* Husband's Total Years of Schooling	136.5 (76.8)	44.5 (53.2)	57.7 (65.5)	11.1 (33.3)	25.5 (49.9)

TABLE 10a: Probability Model Regression Results for Total Labor Market Employment with Total Schooling

(Women living with spouse and aged between 30 and 54 years)

	Without Schooling Quadratics and Interaction Terms (Model 1)		With Schooling Quadratics and Interaction Terms (Model 3)	
Explanatory variables	LPM	Probit	LPM	Probit
Wife's Total Years of Schooling	0.0404 (46.2)	0.0395 (39.99)	0.0489 (21.2)	0.0450 (17.8)
Wife's Total Years of Schooling Squared			-0.00112 (-5.54)	-0.000655 (-2.91)
Wife's Potential Years of Work Experience	0.0326 (10.72)	0.0416 (11.58)	0.0255 (8.26)	0.0333 (9.15)
Quadratic of Wife's Years of Work Experience * 10^{-2}	-0.0484 (7.26)	-0.0629 (8.08)	-0.0347 (5.13)	-0.0470 (5.97)
Husband 's Total Years of Schooling	0.0160 (21.45)	0.017 (20.67)	0.0379 (18.7)	0.0419 (18.65)
Husband 's Total Years of Schooling Squared			0.00194 (11.28)	-0.00203 (18.65)
Wife's Total Schooling * Husband's Total Schooling			0.000463 (2.24)	0.0000347 (0.15)
1997/98 Year Dummy	-0.0127 (-2.29)	-0.0153 (-2.29)	-0.0131 (-2.38)	-0.0161 (2.41)
1998/99 Year Dummy	-0.00668 (1.13)	-0.0082 (1.16)	-0.00569 (0.97)	-0.00752 (1.06)
Constant	-0.311 (9.29)		-0.241 (7.09)	
Adjusted R^2	0.255		0.264	
Pseudo- R^2		0.210		0.219

Number of observations is 28691

TABLE 10b: Probability Model Regression Results for Total Market Employment with Schooling Splines
(For women living with spouse and aged between 30 and 54 years)

Without Schooling Quadratics and Interaction Terms (Model 2)		
Explanatory variables	LPM	Probit
Wife's total years of schooling		
Wife's years of primary schooling	0.0550 (42.9)	0.0527 (37.21)
Wife's years of secondary schooling	0.0171 (9.66)	0.0155 (8.00)
Wife's year of postsecondary schooling	0.0519 (8.96)	0.0675 (8.50)
Wife's years of potential work experience	0.0251 (8.15)	0.0332 (9.06)
Quadratic of wife's work experience * 10^{-2}	-0.0336 (4.99)	-0.0463 (5.84)
Husband 's total years of schooling	0.0147 (19.7)	0.0159 (19.2)
1997/98 year dummy	-0.125 (2.26)	-0.152 (2.28)
1998/9 year dummy	-0.00585 (1.00)	-0.0074 (1.04)
constant	-0.232 (6.82)	
Adjusted R^2	0.262	
Pseudo- R^2		0.216

Number of observations is 28691

TABLE 11a: Probability Model Regression Results for Wage Employment with Total Schooling
(For women living with spouse and aged between 30 and 54 years)

	Without Schooling Quadratics and Interaction Terms (Model 1)		With Schooling Quadratics and Interaction Terms (Model 3)	
Explanatory Variables	LPM	Probit	LPM	Probit
Wife's Total Years of Schooling	0.0181 (45.33)	0.00358 (28.1)	-0.0236 (23.63)	0.000357 (0.79)
Wife's Total Years of Schooling Squared			0.00330 (37.47)	0.000336 (10.5)
Wife's Potential Years of Work Experience	-0.00656 (4.72)	0.000144 (0.33)	0.00795 (5.93)	0.00199 (3.32)
Quadratic of Wife's Years of Work Experience * 10^{-2}	0.0139 (4.57)	0.00397 (0.39)	-0.0150 (5.10)	-0.00327 (2.38)
Husband 's Total Years of Schooling	0.00102 (3.00)	0.00873 (7.59)	-0.000243 (0.28)	0.00136 (3.15)
Husband 's Total Years of Schooling Squared			0.000140 (1.86)	0.000019 (0.63)
Wife's Total Schooling * Husband's Total Schooling			0.000499 (5.93)	-0.0000564 (1.76)
1997/98 Year Dummy	0.0120 (0.47)	0.000415 (0.43)	0.00121 (0.50)	0,000657 (0.52)
1998/99 Year Dummy	0.00329 (1.22)	0.000975 (0.96)	0.00141 (0.55)	0.00112 (0.84)
Constant	0.0597 (3.89)		-0.0920 (6.21)	
Adjusted R^2	0.168		0.256	
Pseudo- R^2		0.362		0.378

Number of observations is 28618

TABLE 11b: Probability Model Regression Results for Wage Employment with Schooling Splines

(Women living with spouse and aged between 30 and 54 years)

Without Schooling Quadratics and Interaction Terms (Model 2)		
Explanatory variables	LPM	Probit
Wife's Years of Primary Schooling	0.000911 (1.67)	0.00248 (8.22)
Wife's Years of Secondary Schooling	0.0286 (37.98)	0.00512 (18.67)
Wife's Year of Postsecondary Schooling	0.152 (61.34)	0.0127 (19.15)
Wife's Potential Years of Work Experience	0.00893 (6.80)	0.00233 (3.72)
Quadratic of wife's years of work experience * 10^{-2}	-0.0177 (6.14)	-0.00403 (-2.81)
Husband 's Total Years of Schooling	0.00273 (8.62)	0.00132 (8.61)
1997/98 Year Dummy	0.00181 (0.77)	0.000853 (0.66)
1998/9 Year Dummy	0.00172 (0.69)	0.00126 (0.92)
Constant	-0.0105 (7.2)	
Adjusted R^2	0.284	
Pseudo- R^2		0.386

Number of observations is 28691

TABLE 12a Probability Model Regression Results for Self-Employment with Total Schooling

(Women living with spouse and aged between 30 and 54 years)

	Without schooling quadratics and interaction terms (Model 1)		With schooling quadratics and Interaction terms (Model 3)	
Explanatory Variables	LPM	Probit	LPM	Probit
Wife's Total Years of Schooling	0.0215 (23.8)	0.0200 (22.5)	0.0729 (31.5)	0.0636 (27.3)
Wife's Total Years of Schooling Squared			-0.00458 (22.5)	-0.00368 (17.8)
Wife's Potential Years of Work Experience	0.0402 (12.8)	0.0429 (13.2)	0.0179 (5.75)	0.0220 (6.57)
Quadratic of Wife's Years of Work Experience * 10^{-2}	-0.0647 (9.38)	-0.0685 (-9.67)	-0.0206 (3.03)	-0.0271 (3.75)
Husband 's Total Years of Schooling	0.0147 (19.05)	0.0144 (18.8)	0.0387 (18.9)	0.0390 (18.8)
Husband 's Total Years of Schooling Squared			-0.00218 (12.5)	-0.00203 (11.7)
Wife's Total Schooling * Husband's Total Schooling			0.0000533 (0.26)	-0.000333 (1.59)
1997/98 Year Dummy	-0.0141 (2.47)	-0.0150 (2.47)	-0.0146 (2.63)	-0.0162 (2.67)
1998/99 Year Dummy	-0.0111 (1.83)	-0.0122 (1.89)	-0.00818 (1.38)	-0.0094 (1.45)
Constant	-0.380 (10.9)		-0.152 (4.43)	
Adjusted R^2	0.124		0.175	
Pseudo- R^2		0.109		0.153

Number of observations is 28691

TABLE 12b: Probability Model Regression Results for Self-Employment with Schooling Splines

(Women living with spouse and aged between 30 and 54 years)

Without Schooling Quadratics and Interaction Terms (Model 2)		
Explanatory Variables	LPM	Probit
Wife's Years of Primary Schooling	0.0540 (41.72)	0.0480 (37.2)
Wife's Years of Secondary Schooling	-0.0123 (6.91)	-0.0091 (-5.24)
Wife's Year of Postsecondary Schooling	-0.108 (18.4)	-0.113 (14.5)
Wife's Potential Years of Work Experience	0.0165 (5.30)	0.0209 (6.22)
Quadratic of Wife's Years of Work Experience * 10^{-2}	-0.0168 (2.47)	-0.0238 (3.28)
Husband 's Total Years of Schooling	0.0116 (15.4)	0.0120 (15.6)
1997/98 Year Dummy	-0.146 (2.62)	-0.01605 (2.63)
1998/9 Year Dummy	-0.00866 (1.46)	-0.00966 (1.49)
Constant	-0.130 (3.78)	
Adjusted R^2	0.1712	
Pseudo- R^2		0.148

Number of observations is 28691

Table 13a: Marginal Effects of Schooling on Married Women Labor Market Participation

(Models with Total Years of Schooling)

	Total Employment		Wage Employment		Self Employment	
	Table 10a Model 1	Table 10a Model 3	Table 11a Model 1	Table 11a Model 3	Table 12a Model 1	Table 12a Model 3
Total years of Female Schooling	0.0404 (4.62)	0.0393 (21.2)	0.0181 (45.3)	0.0603 (23.6)	0.0215 (23.8)	0.0290 (31.5)
Total Years of Husband Schooling	0.0160 (21.5)	0.0136 (18.7)	0.00102 (3.00)	0.00683 (0.28)	0.0147 (19.1)	0.0120 (19.1)

*Model 1 is the linear model, while Model 2 is non-linear with both quadratic terms for schooling and interaction terms with husband schooling

Table 13b: Marginal Effects of Schooling on Married Women Labor Market Participation

(Models with Spline-Years of Schooling)

	Total Employment	Wage Employment	Self Employment
	Table 10b, Model 2	Table 11b Model 2	Table 12b Model 2
Total Years of Wife's Schooling			
Wife's Years of Primary Schooling	0.0550 (42.9)	-0.000911 (1.67)	0.0540 (41.7)
Wife's Years of Secondary Schooling	0.0171 (9.66)	0.0286 (37.9)	-0.0123 (6.91)
Wife's Years of Post-Secondary Schooling	0.0519 (8.96)	0.152 (61.3)	-0.108 (18.4)
Total Years of Husband's Schooling	0.0147 (19.7)	0.00273 (8.61)	0.0116 (15.4)

Table 14

Marginal Effects of Schooling on Single Women Labor Market Participation

	Total Employment		Wage Employment		Self Employment	
	Appdx2 Model 3	Appdx3 Model 2	Appdx2 Model 3	Appdx3 Model 2	Appdx2 Model 3	Appdx3 Model 2
Total Years of Schooling	0.0592 (33.8)		0.0572 (20.4)		-0.0601 (40.8)	
Years of Primary Schooling		0.0663 (45.6)		0.00504 (9.03)		0.0612 (41.1)
Years of Secondary Schooling		0.013 (5.16)		0.0386 (39.4)		-0.0267 (10.2)
Years of Post-Secondary Schooling		0.036 (3.83)		0.154 (39.4)		-0.119 (12.22)

*Model 3 includes the quadratic term for total schooling.

Appendix 1:

Means and Standard Deviations of Some Model Variables
(Single Women aged 30-54 years)

	Wage	Self-employed	Total employment	unemployed	Total sample
Total years of schooling	9.88 (4.84)	2.96 (3.93)	3.60 (4.50)	0.72 (2.4)	2.27 (3.91)
Years of primary schooling	5.18 (2.01)	2.36 (2.83)	2.61 (2.89)	0.54 (1.68)	1.68 (2.63)
Years of secondary schooling	3.96 (2.61)	0.59 (1.68)	0.90 (2.03)	0.17 (0.95)	0.90 (2.03)
Years of post secondary schooling	0.74 (1.32)	0.02 (0.21)	0.082 (0.50)	0.007 (0.16)	0.082 (0.50)

Appendix 2

Linear Probability Model Regression Results with Total Schooling

(Single women aged between 30 and 54 years)

Explanatory Variables	Total Employment	Wage-Employment	Self-Employment
Total Years of Schooling	0.0476 (55.12)	0.0214 (61.29)	0.0257 (28.5)
Potential Years of Work Experience	-0.0117 (3.27)	-0.0127 (8.81)	0.00128 (0.34)
Quadratic of Years of Work Experience * 10^{-2}	0.0404 (6.03)	0.0205 (7.57)	0.0194 (2.77)
1997/98 Year Dummy	-0.000818 (0.01)	0.000707 (0.23)	-0.00161 (0.20)
1998/99 Year Dummy	0.00652 (0.80)	0.00387 (1.17)	0.00108 (0.013)
Constant	0.392 (8.47)	0.180 (9.64)	0.209 (4.33)
Adjusted R^2	0.135	0.188	0.0498

Number of observations is 20950

Appendix3.

Linear Probability Model Regression Results with Schooling splines

(Single women aged between 30 and 54 years)

Explanatory variables	Total Employment	Wage Employment	Self Employment
Years of Primary Schooling	0.0663 (45.6)	0.00504 (9.03)	0.0612 (41.06)
Years of Secondary Schooling	0.0132 (5.16)	0.0386 (39.4)	-0.0267 (10.2)
Year of Post-Secondary Schooling	0.0364 (3.83)	0.154 (39.4)	-0.119 (12.22)
Potential Years of Work Experience	-0.0197 (5.48)	-0.00169 (1.23)	-0.0180 (4.88)
Quadratic of Years of Work Experience * 10^{-2}	0.0541 (8.03)	0.00124 (1.48)	0.0528 (7.64)
1997/98 Year Dummy	-0.000898 (0.12)	0.00194 (0.69)	-0.00389 (0.51)
1998/99 Year Dummy	0.00616 (0.76)	0.00349 (1.12)	0.00110 (0.13)
Constant	0.491 (10.6)	0.0438 (2.45)	0.448 (9.38)
Adjusted R^2	0.145	0.275	0.0959

Number of observations is 20950

Figure 1: Average Years of Schooling- Age Profile (for women aged 25-54 years)

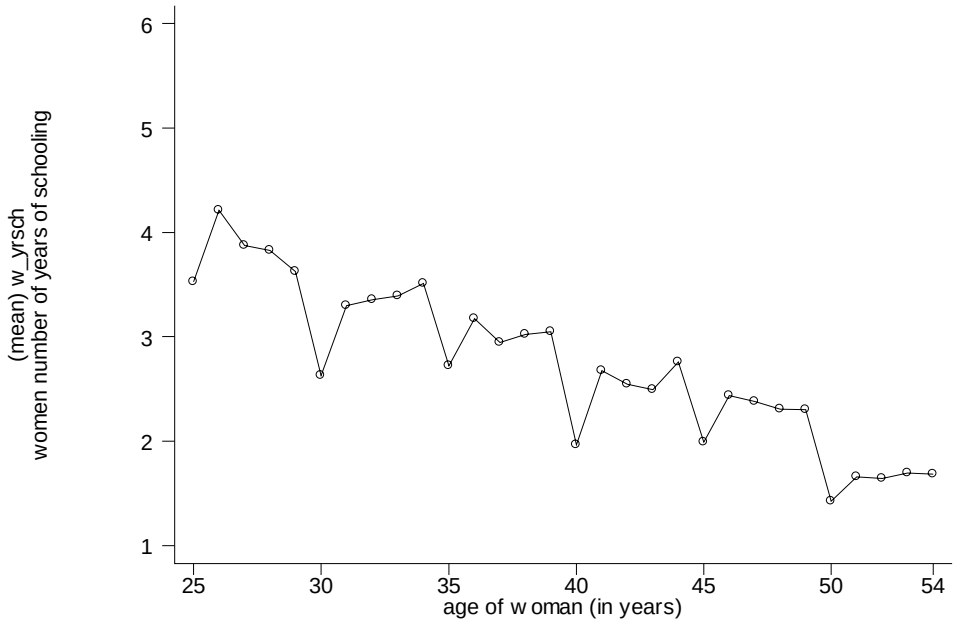

Figure 2: Labor Market Participation and Schooling of Women Living with Husband (Ages 30-34 years)

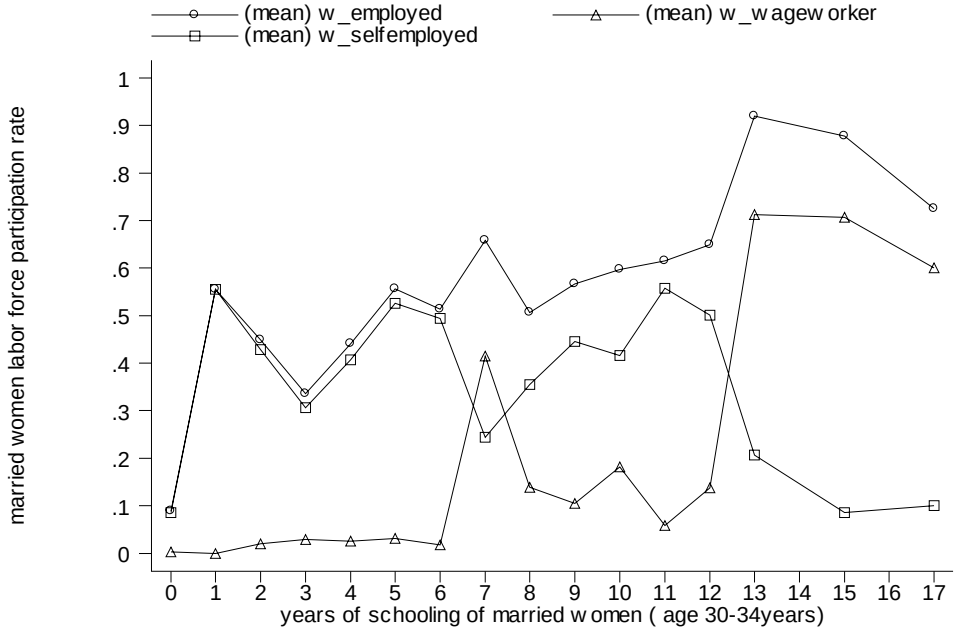

Figure 3: Labor Market Participation and Schooling of Women Living with Husband (Ages 35-39 years)

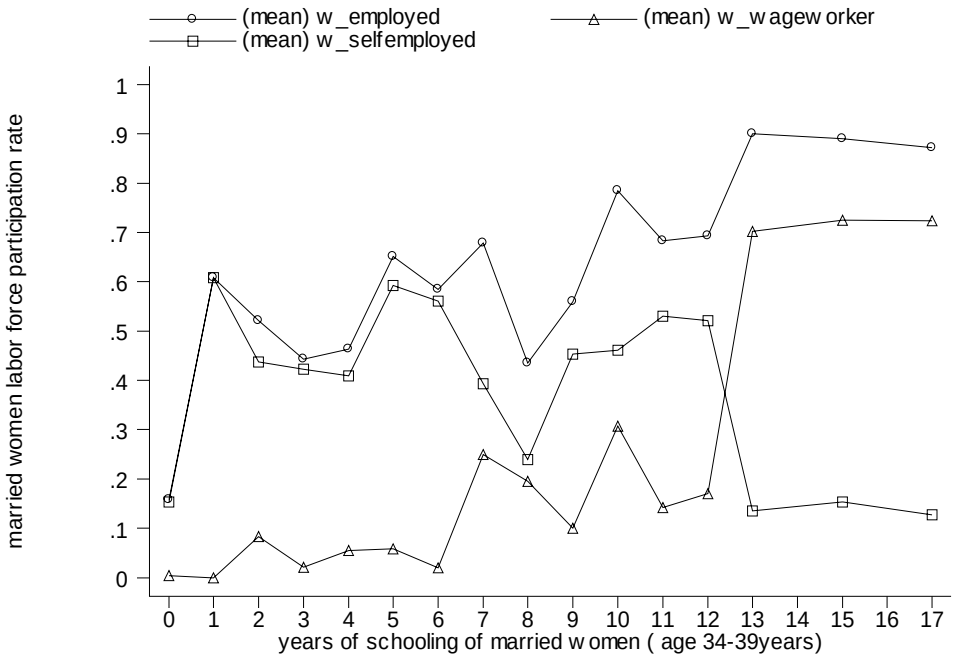

Figure 4: Labor Market Participation and Schooling of Women Living with Husband (Ages 40-44 years)

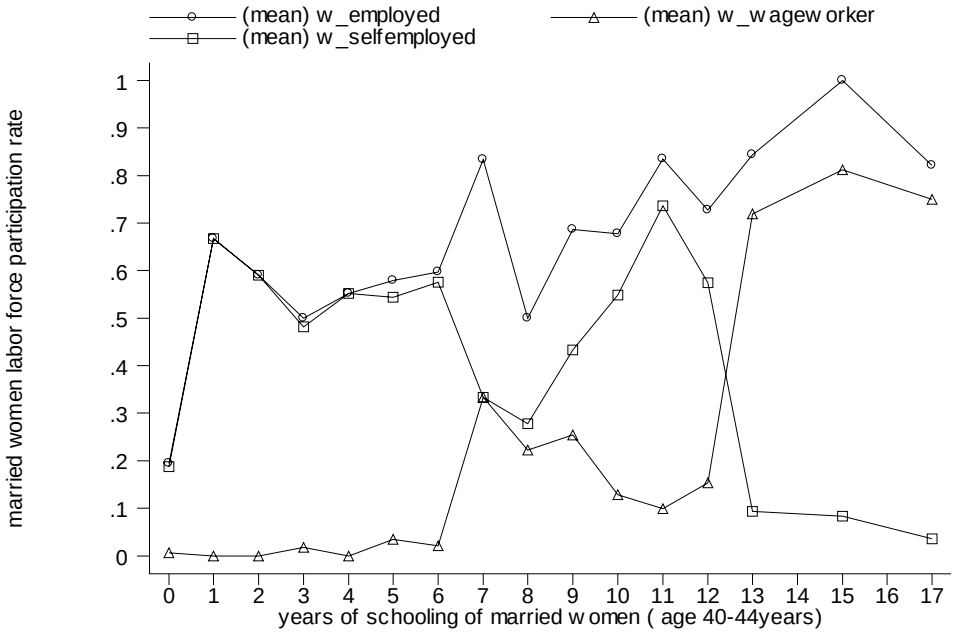

Figure 5: Labor Market Participation and Schooling of Women Living with Husband (Ages 44-49 years)

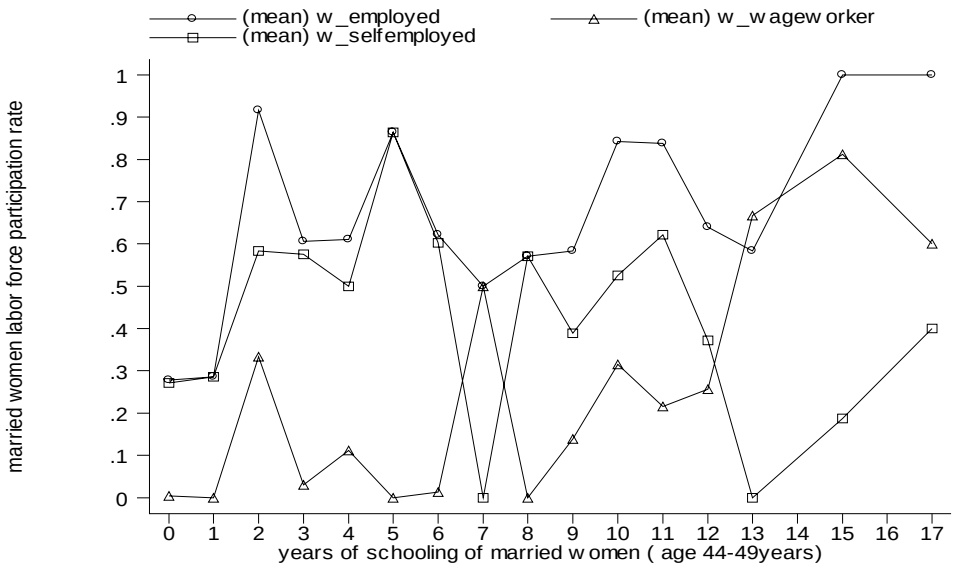

Figure 6: Labor Market Participation and Schooling of Women Living with Husband (Ages 50-54 years)

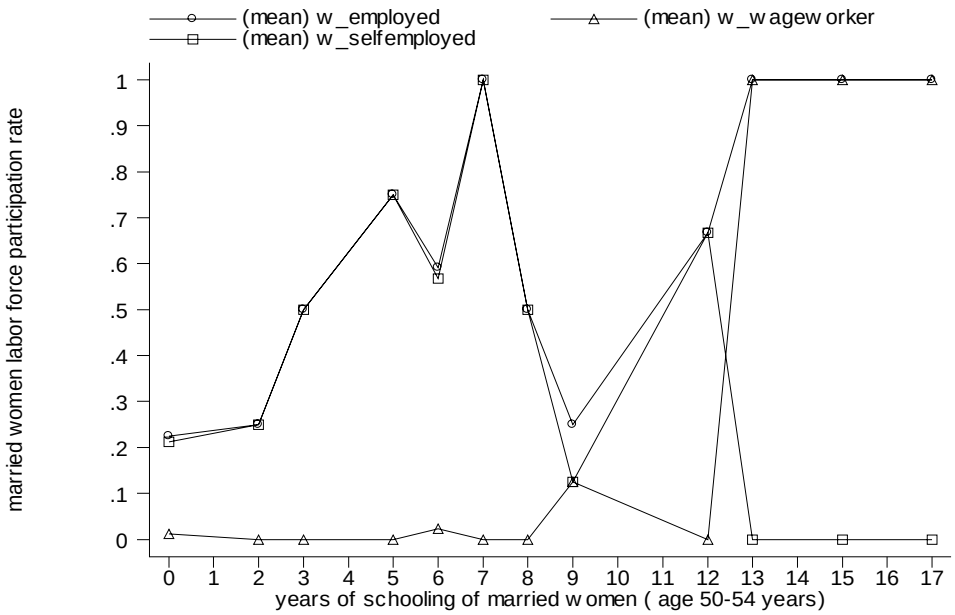

Figure 7: Mean Log Wages and Schooling of Married Women in Wage Employment
(Ages 30-34 years)

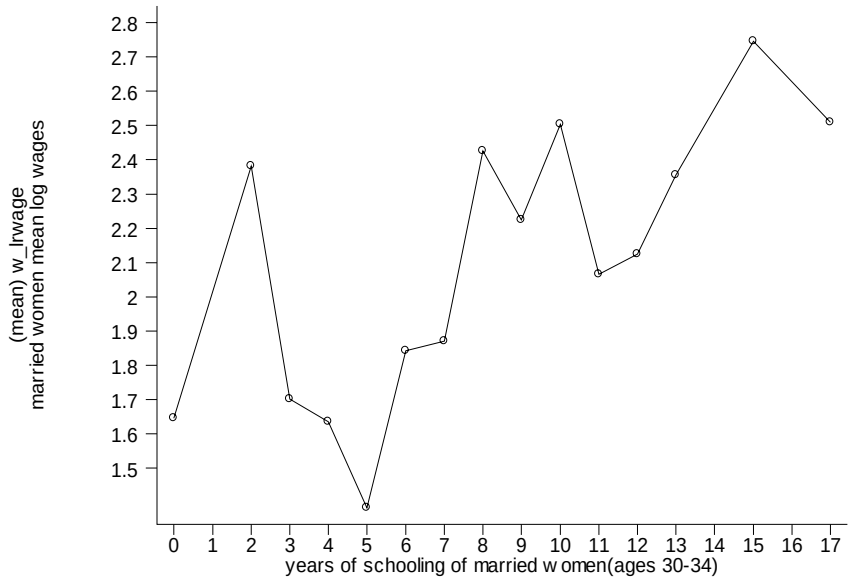

Figure 8: Mean Log Wages and Schooling of Married Women in Wage Employment
(Ages 35-39 years)

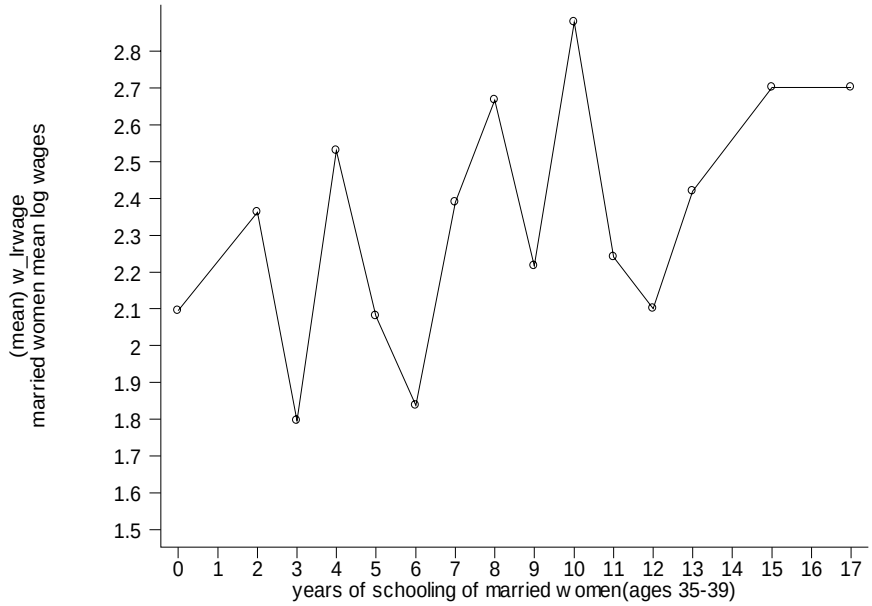

Figure 9: Mean Log Wages and Schooling of Married Women in Wage Employment
(Ages 40-44 years)

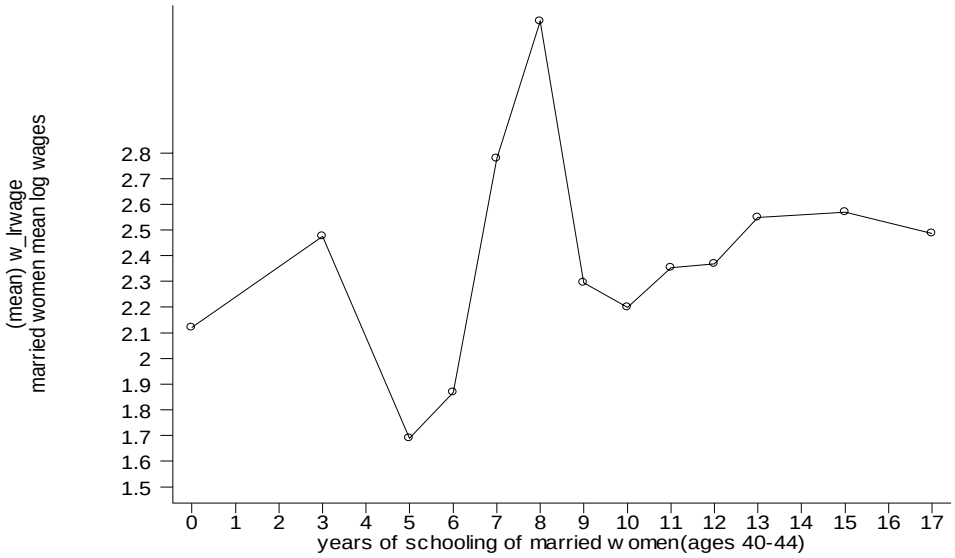

Figure 10: Mean Log Wages and Schooling of Married Women in Wage Employment
(Ages 45-49years)

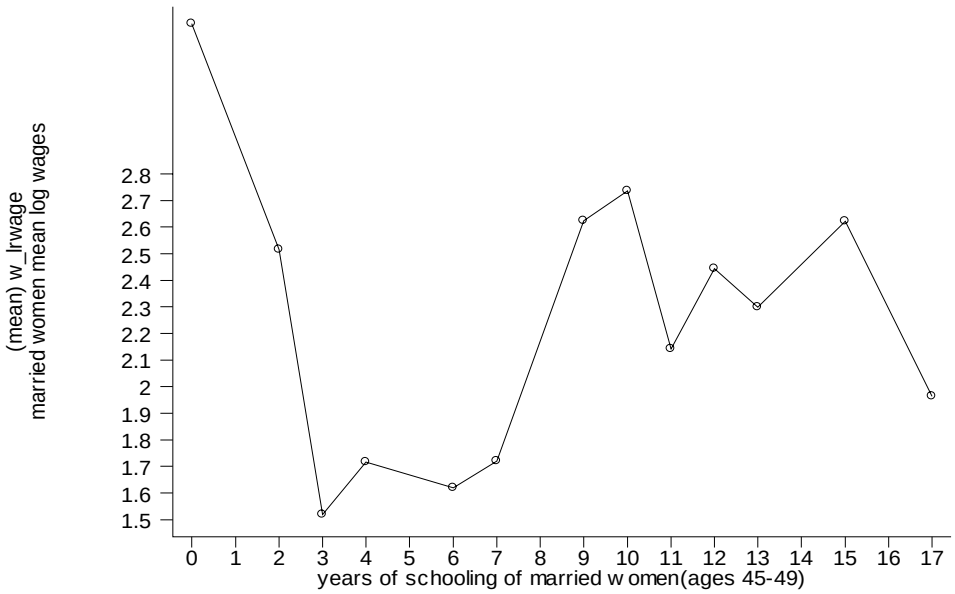

Figure 11: Mean Log Wages and Schooling of Married Women in Wage Employment
(Ages 50-54 years)