Pyrex Journals 2035-4344

Pyrex Journal of Agricultural Research
Vol 1 (1) pp. 001-007 June, 2015
http://www.pyrexjournals.org/pjar

Full Length Research Paper

Determinants of Earning Distribution in Rural Households of Nasarawa state, Nigeria

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Accepted 13th May, 2015

The rising poverty incidence amidst "economic prosperity" and the restiveness in some part of Nigeria which has been repeatedly tied to poverty has agitated the minds of scholars. Policy prescriptions on tackling poverty are not in short supply, but often of the majority of the labor force (rural household) which is the worst hit by poverty, appear to hold much prospect in the fight against poverty. Understanding the determinants of criticizing as palliative measures with sustainability in doubt, increasing the earning capacity their earning capacity is therefore instructive. Using the Jacob Mincer model in its elaborate form, a cross sectional data set obtained from six hundred and fifty seven farmers were applied to an ordered probit model. Among others, it was revealed that age, years of schooling and experience have the likelihood of impacting positively on the earning capacity of labor. Though the rate of return on schooling was low, perhaps given the nature of occupation and the type of education given, it was however, recommended that agric business education on staggered modules be implemented in the study area.

Keywords: Determinants, Rural, Household Earnings, Earning Function, Rate of Returns.

INTRODUCTION

Until recently, traditional labor economics treated labor as a combination of homogeneous workers. Conventional reasoning now considers labor as a conglomeration of heterogeneous human beings, each differing in on-the-job productivity. This is partly responsible for the renewed emphasis on motivation and investment in human capital as channels to enhance employee-by-employee productivity. Also, the apparent limitation of the standard neoclassical production function framework that was based on the assumption of input homogeneity necessitated the thought if input quality particularly labor was constant. It is now established that education and training reflect labor quality. Hence, the new line of thought is on the earnings distribution across workers.

Human capital theory shows that neither luck nor decree lessen poverty, but instead concerted individual investments in human capital raise earnings and ease deprivation. Even low-ability workers can benefit from training. These insights are vital in designing policies for increasing overall wealth, especially in third world countries. While macroeconomic growth considerations can explain the motives for public human capital investment, other patterns, such as repeated evidence that the most educated workers have the highest earnings led researchers to explore reasons why individuals devote their own resources to educational investments.

Clearly, if education enhances personal earnings then private spending on education pays. Understanding such investments in education resulted in studies deriving methods to estimate private (Becker, 1964) and social rates of return (Psacharopoulos, 1985)

In most developing countries, a significant proportion of the total population lives in rural areas with a relatively high population growth rate. These rural areas are worst hit by poverty. The share of rural areas in overall poverty, in most African countries, is around 90 percent (World Bank, 2000). In Nigeria, poverty appears to be more of a rural phenomenon.

The Harmonized Nigeria Living Standard Survey (HNLSS) conducted between 2009 and 2010 presented a worrisome poverty profile of Nasarawa state-North central Nigeria. The majority (60.4 per cent) of the residents were absolutely poor using the dollar per day measure (NBS-

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HNLSS, 2010). Understanding individual earnings get at the very core of social science because it answers questions regarding the very foundations behind human well-being. Indeed, comprehending the determinants of earnings will help policy makers develop tactics to promote wealth, to help ease poverty and eventually to put the country on a path to increased growth and prosperity.

Recent studies in Sub Saharan Africa (SSA) indicate that rural households are increasingly diversifying their income sources by combining farm and non-farm activities to sustain their livelihoods (e.g. Losch et al. 2011; Winters et al. 2010; Ellis 2005; De Janvry et al. 2002; Barett et al. 2001). That asset, activity, investment in education and income diversification characterize the livelihood strategies of rural households in rural Africa (Barrett, Reardon and Webb, 2001).

Again, earnings differ for various demographic groups. For instance, women earn less than men. For men, earnings increase with age, but at a decreasing rate. For women, earnings vary less with age. In addition, earnings rise with education, yet they vary across occupations. Earnings tend to be higher in urban areas. They tend to be lower in rural areas. Earnings are not uniform across the population, but instead vary based on a host of socioeconomic demographic characteristics. In this study, we are primarily concerned with variation in earnings within the rural labor in particular. We shall seek to address, who earns high wages, and why? Why do wages vary across demographic groups the way they do? These shall be determined using data from rural households in a North Central Nigeria state (Nasarawa state). Following the above, literatures were reviewed as well as a theoretical framework presented in the second section. The third section is the methodology of the research which the Mincer model was recast in its enlarged form. The results obtained were discussed in the fourth section while the paper was concluded in the last section.

2. The study Area

2.1 Literature Review

Agriculture is the predominant activity for most rural households in Sub-Saharan Africa (SSA), and it offers a strong option for spurring growth, overcoming poverty, and enhancing food security as stressed by the World Development Report 2008. This sector in SSA is mainly based on smallholder farms and contributes about 29% to GDP and employs up to 65% of the labor force (World Bank, 2007). However, recent studies examining agricultural dynamism in Africa find that only a small proportion of farms exhibit any dynamism in terms of intensification, extensification or expansion; with almost half of all surveyed farms stagnated (Djurfeldt et al., 2008). They find that the agricultural sector is characterized by decreasing farm sizes, low levels of output per farm, low productivity, a high degree of subsistence farming, with increases in production being driven mainly by area and not yield growth (Jirström et al., 2011).

In addition, demographic pressures and the resulting land constraints; the lack of capital related to poverty, and of missing markets and insufficient public goods are also key constraints (Barrett, Reardon and Webb, 2001). Other constraints to smallholder agriculture in SSA are linked to structural adjustment and market liberalization (Bryceson 2002; Ellis 2005), and the globalization of competition, which have led to restructuring of agri-food markets (Reardon and Timmer, 2005), and growing differentiation between production and marketing structures (Losch et al. 2011). These structural shifts in which global marketing systems are transforming from commodity to product markets have opened new market opportunities for smallholder farmers, especially through the production of nontraditional export crops and contract farming with agro- industry (Reardon and Timmer, 2005). However, it is likely that many smallholders who are unable to take advantage of these opportunities because of limited assets may be marginalized (Hazell et al. 2007; Barrett and Mutambatsere 2005).

It has been the conventional way of thinking for several years that increasing output and incomes from agriculture would be the catalyst for growth in other non-agricultural sectors (Ellis, 1999; Ellis and Biggs, 2001). However, in the context of the above constraints, some skeptic authors argue that smallholder agriculture in SSA cannot replicate the Asian green revolution experience of the 1970s, nor can it be the sole engine for rural growth, employment and poverty reduction (Ellis, 2005). Therefore, it is argued that to ensure alternative sources of livelihood for the rural poor, activities in the non-agricultural sector need to be enhanced; since most rural non-farm activity tends to be linked directly or indirectly to local agriculture or small towns (World Bank 2007; Reardon 1997; Ellis and Biggs 2001; Ellis 1999). Accordingly, the World Development Report 2008 suggests pathways out of rural poverty besides agricultural entrepreneurship to include the rural labor market, the diversification of activities and migration (World Bank, 2007).

Diversification refers to the expansion of the range of rural activities outside the farm and is seen as a dynamic adaptation process created through pressures and opportunities (Ellis, 2000). The farm household expands its activities in order to increase farm income or to reduce income variability by exploiting new or existing market or non-market opportunities, including waged employment in the local nonfarm sector and the exploitation of natural resources (FAO and World Bank, 2001). Diversification may occur as a deliberate household strategy or as an involuntary response to crisis; and can be used both as a safety net for the rural poor or as a means of accumulation for the rural rich (Ellis, 1998).

Two sets of factors induce rural households to diversify their activities: Push factors and Pull factors. Push factors such as “risk and seasonality” are the two common reasons for rural farm households diversifying their activities outside agriculture as a means of dealing with agricultural risks and to smooth income and consumption (Ellis 2005; Barett, Reardon and Webb, 2001). In an agricultural environment full of uncertainty, rural households aim at lower covariate risk between different household activities to smooth consumption (Lay et al. 2008; Bryceson, 1999). However, in developing countries, many farm activities such as own farm production and farm wage labor exhibit high risk correlations between alternative income generating activities, while nonfarm incomes in contrast, can result in lower risk correlations between income generating activities (Ellis, 1998). In addition, diversification is used as a risk management strategy mainly due to lack of social insurance or safety nets for government transfers, non-government agencies, and community or family members. Rural African households therefore substitute for social insurance by self-insuring through diversified income sources (Barrett, Reardon and Webb, 2001).

As regards seasonality; in the dry season, especially in the study area-Nasarawa state some rural households obtain remittances from seasonal migrants, incomes from local nonfarm activities and, cash from the sale of crop and livestock products (Reardon 1997; Ellis 1998). While some farm

households can also allocate part of their labor during the rainy season where nonfarm labor pays better than farming and where farm households can count on food markets to buy food (Reardon 1997).

Pull factors on the other hand, are opportunities for diversification of income sources linked to commercial agriculture, improved infrastructure, proximity to an urban area, better market access, etc. There is widespread agreement that smallholder farmers require improved access to agricultural markets to raise their farm productivity and living standards (Chamberlin and Jayne, 2012). Some studies find that market access is a key determinant of diversification of activities (Winters et al. 2009; Barrett et al. 2001). Those with access to adequate assets and infrastructure and faced with appropriate incentives engage actively in the markets, while those who lack one or more of those three essential ingredients largely do not (Barrett, 2008). Proximity to markets provides opportunities to sell output, and purchase inputs, from self-employment activities as well as opportunities for non-farm wage employment (Winters et al., 2009). Barrett et al. (2001) argue that farmers with superior access to urban markets and those involved in contract farming schemes with processing plants or exporters are better able to overcome factor market constraints to produce for market. Opportunities available for farm households to engage in higher nonfarm income activities that can lead to accumulation seem to be more available in areas with better endowments in terms of agricultural potential, market access, proximity to urban centers and better infrastructure such as roads (Losch et al., 2011). Better infrastructure is linked to higher opportunities for farm and nonfarm employment (Escobal, 2001) and to increase agricultural production (Djurfeldt et al., 2008).

According to Ellis (1998), in practice the causes and consequences of diversification are differentiated by location, assets, income, opportunity and social relations. Social factors such as gender, social positions, networks, associations are also important (Ellis, 1998). For instance, poor, uneducated women who lack social ties may not enjoy the same access to remunerative opportunities like to educate males with strong social networks in the community (Barrett, Reardon and Webb, 2001). Rapid population growth and the related pressure on the natural resource base, in particular land, have also been identified as major causes for the rise of non- farm activities in SSA (Lay et al., 2008; Ellis 2005). Lay et al. (2008) find that declining farm size and related declines in soil fertility force land poor households to diversify into nonfarm activities to ensure survival. Other drivers include supply factors, such as technological advances and the expansion of educational attainment (Reardon, 1997). Educational attainment is one of the most important determinants of nonfarm incomes, especially from high return salaried and skilled employment. Skills and education act as entry barriers to high return nonfarm waged employment in rural Africa (Barrett, Reardon and Webb, 2001).

Barrett et al. (2001) find that inter-household heterogeneity in terms of constraints and incentives are key determinants of livelihood diversification behavior in rural Africa. They find that complete reliance on own agricultural production is rare, except among the wealthiest rural African households. Non-farm income sources are most extensively used by households in agro- ecologies of lowest potential (higher risk & drier areas), likely because agricultural productivity is relatively low. While in the higher potential regions (more humid, high agricultural areas), patterns of non-farm income dependence have more to do with local market conditions and household characteristics. In poor areas with significant liquidity constraints and high transport demands to reach major markets, relatively high income households were heavily engaged in trades and commerce than the lower or middle-income households. The poorest households in their study were mostly dependent on the retained output of their own agricultural production.

Incomplete markets for assets such as land, labor, credit or insurance are major causes of diversification behavior (Barrett, Reardon and Webb, 2001). For instance, input credit market failure can lead households to diversify their income sources to pay for farm inputs such as seeds, fertilizer, labor, farm capital like irrigation (Reardon et al., 1994), and animal traction (Savadogo et al., 1995). Some farm households may also undertake local farm and nonfarm investments by selling their labor in the migratory labor market and then use the remittances to set up nonfarm businesses, buy farm capital and to invest in education (Reardon, 1997).

The components of rural household income can be classified using income from productive assets (earned income) (Barrett, Reardon and Webb, 2001). Given the peculiarity of the study area, the author specifies a three-way classification by sector, by function or by a space. Accordingly, by sector; farm (agricultural) or non-farm (non-agricultural) assignment concerns the nature of the product and the types of factors used in the production process, irrespective of the location, scale, technology or returns from the activity. Farm income is derived from the production or gathering of unprocessed crops or livestock or forest or fish products from natural resources and non-farm income is derived from all other sources of income, including processing, transport or trading of unprocessed agricultural, forest and fish products). While by function, activities in the rural labor market can be classified into wage employment or self-employment. With wage employment, people sell their labor services to an employer in exchange for a wage or salary, while those who are self- employed sell their labor services to themselves.

2.2 Theoretical Framework: The Mincer Earnings Function

The Mincer earnings function is a single-equation model that explains earnings as a function of schooling and experience, named after Jacob Mincer. The equation has been examined on many datasets and can be argued to be one of the most widely used models in empirical economics. Typically the logarithm of earnings is modelled as the sum of years of education and a quadratic function of "years of potential experience

$$\ln Y = \ln Y_0 + rS + \beta_1 X + \beta_2 X^2 + \varepsilon_i$$

Where Y= earnings Y_0 are the earnings of someone with no education and no experience; S= years of schooling; is years of potential labor market experience and r=rate of return to education (assuming all schooling costs are opportunity costs), and β_1 and β_2 are related to both the amount and the financial return to on-the-job training. Mincer (1958, 1974) was the first to derive an empirical formulation of earnings over the lifecycle. He argued that increasing rates of return to education are indicative of the persistently higher earnings of skilled workers caused by skill-based and technological change. One manifestation of this is that technologically based changes in demand for human capital caused the most able workers to sort into the more technologically based industries and jobs.

The Mincer earnings function yields at least three important empirical implications. First, it argues that earnings

levels are related to human capital investments. This means, the more human capital investments an individual makes the higher his or her earnings. Further, the coefficient on the schooling variable reflects the rate of return to school. As such, given relatively competitive markets, empirical analysis should yield schooling coefficients in the range of common interest rates. Borrowing and other constraints on human capital investments could alter these rates, but not too greatly.

Accordingly, earnings should be related to the quality of schooling. In essence, those attending higher quality schools should earn more. Assuming the market rewards productivity, higher earnings should reflect higher actual productivity.

Second, earnings functions are concave. Earnings rise more quickly for the young, then earnings growth tapers off midcareer. Third, the model has implications regarding the distribution of earnings. For example, because human wealth is the present value of lifetime earnings, the distribution of earnings should exceed the distribution of "human wealth." Thus the variation in earnings should exceed the variance in human wealth as measured by the present value of the earnings stream. Also holding schooling level constant relative earnings differences (for example measured as the variance of the logarithm of earnings across the population) should narrow with experience then widen. Thus experience, profiles of the log variance of earnings should be U-shaped.

3. Methodology

3.1 Area of Study

The study was carried out in Nasarawa state located in the North central geopolitical zone of Nigeria. The state lies between latitude 70 45' and 90 25'N of the equator and between longitude 70 and 9037'E of the Greenwich Meridian. It shares boundaries with Kaduna state in the north, Plateau state in the east, Taraba and Benue state in the south, while Kogi and the Federal Capital Territory flank it in the west. Nasarawa State has a population of 1,863,275 (provisional census, 2006) with thirteen (13) Local Government Areas, grouped under 3 senatorial zones, namely; Nasarawa south comprising Awe, Doma, Keana, Lafia and Obi Local Government Areas while Nasarawa west zone comprises Karu, Keffi, Kokona, Nasarawa and Toto Local Government Areas. The Nasarawa central zone is made up of Akwanga, Nasarawa Eggon, and Wamba Local Government Areas. The state was created on the 1st October, 1996 and prides herself as the Home of Solid Minerals. The primary economic activity engaging over 80 % of the labor force is the farming of basically food crop and a few cash crops.

3.2 Sample Design

Administratively, Nasarawa state is divided into thirteen Local Government Areas (LGAs). Each LGA is divided into localities. Localities are stratified into Urban and Rural areas using a population threshold of less than 20,000 population for rural and above for urban. Each locality is subdivided into census, Enumeration Areas (EAs) following the 2006 population census. The list of EAs used in the last census will be adopted as the sampling frame for the study.

From the EAs, clusters are defined which will constitute the Primary Sampling Units (PSU) of the study. A minimum requirement of 80 households with an average population of 5 persons per household has been imposed on the design for a cluster size by the National Population Commission (NPC). The sample was selected using a two-stage cluster design. A total of 6 clusters for the 3 LGAs purposively selected to represent the three senatorial zones in the state constituted the first stage. In the second stage, using probability systematic sampling, an average of 20 households was selected in each cluster producing a representative sample of about 687 respondents- the Secondary Sampling Units (SSU).

3.3 Model /Technique of Analysis

Based on the theoretical framework above, the Mincer Earning Function was adopted. The most popular version of the Mincer earnings function is log-linear, emanating from the linear declining post-school investment function. It is interesting to note that when Mincer originally fit his original earnings function in 1958, he used an abbreviated "schooling model" of the form;

$$\ln Y(t) = a_0 + rS + \varepsilon_i ----1$$

Where r= measures the marginal return (in this case measured in terms of marginal physical productivity of labor) to schooling level Si in terms of the particular definition of earnings. The "error" term εi is added to capture measurement error in earnings.

This omits the experience and experience-squared terms. Omitted variables lead to biased results if the omitted variable is correlated with the dependent as well as the remaining independent variables.

Nowadays, most earnings functions include numerous supplementary variables in addition to the schooling and potential experience terms used by Mincer. These include race, gender, regional dummy categorical variables, health status, ethnicity, marital status, children, union membership, city size, and numerous other variables. They serve as exogenous "control variables" which essentially shift the earnings function upward or downward depending on the sign. The coefficients of some, such as gender or race, are often interpreted as discrimination since they allegedly indicate how earnings levels differ between otherwise similar individuals.
Using a cross sectional data, cutting across the three senatorial zones of the state and including other explanatory variables, the Mincer function can be restated thus;

$$lnY = \ln Y_{0i} + \beta_1 S_i + \beta_2 X_i + \beta_3 X_i^{\,2} + \beta_4 Gen_i + \beta_5 MS_i + \beta_6 HS_i + \varepsilon_i - 2$$

Where MS=Marital Status, HS=Health status and Gen=Gender
Since the dependent variable (earning) is categorical and ordered, it is only convenient that we use the ordered probit model.

3.4 Data/ Variables description (measurement)

Data was primarily obtained from questionnaires that were distributed containing relevant questions bordering on the years of schooling, years of potential labor market experience and the rate of return to education (assuming all schooling costs are opportunity costs).

Table 1: Summary statistic

Variable	Earning	Yexp	Age	Marsta	Hstatus	Gender	Sch	Yexp3	Ysch
Mean	2.39	11.01	3.1	2.7	1.97	.62	8.1	165.7	74.7
Std Dev	0.67	6.67	.98	.46	.19	.48	3.11	192.9	59.96

Source: Author's computation

Table 2: Regression result estimates

Variable	Coefficient	Standard Error	P-Value
Age	.2614	.5714	.000
Marsta	-.489	.1101	.656
Hstatus	-.281	.255	.218
Gender	-.065	.99	.509
Yexpe3	.000039	.00025	.875
Ysch	.0010	.000807	.200
/cut 1	-1.0817	.593	.082
/cut 2	.2827	.5933	1.44

Source: Author's computation

Table 3: Marginal Effect after Oprobit

Variable	dy/dx
Age	-.46339
Marsta	.00869
Hstatus	.0499
Gender	.0114
Yexp3	-7.01e-06
Ysch	-.00018

Source: Author's computation

In measuring education, this study uses a single measure - years of schooling. Though it is restrictive for not incorporating the different trends in returns for different education levels, but for analytical convenience, the study chooses to adopt it. There are at least three distinct ways of defining the 'returns to education': (a) the private return, (b) the social return and (c) the labor productivity return. The first of these is made up of the costs and benefits to the individual and is clearly net of any transfers from the state and any taxes paid. The second definition highlights any externalities or spill-over effects and includes transfers and taxes. The final definition was adopted for this study, which measure returns to in terms of the gross increase in labor productivity (or growth).

Earning is categorized into three; low income earners (those receiving a yearly income less than #360,000), middle income earners (between #361,000 to #550,000) and high income earners (those earning above #550,000 yearly) These were coded between 1 to 3 in the above order. Yearly as oppose to monthly income averages were adopted given the seasonality of income earning of the respondents.

Health status as supported by the literature, determines significantly the productivity of a worker. Farming which is the primary economic activity is highly physical and requires a high level of good health. It was categorized into two by asking the respondent subjectivity if he/she enjoys good health (1 was assigned) or otherwise (0 was accorded). It was also important to include the gender variable as disparity due exists between male and female earnings.

4.0 Results and Discussions

From Table 1, earnings of majority of the respondent's fall between the income range of #361 to #550 (given a mean value of 2.39). The average years of farming experience (being the dominant economic activity) of the respondents was discovered to be 11 years. The majority of the respondents are married and staying together. The respondents (majority) are endowed with good health considering the mean health status of approximately 2 (1.97). With a mean of at least 8 years of schooling, it can be infer that most of the respondents at least have attended primary school but certainly will not have completed secondary education (school drop-out).

Table 2 contains a cross-sectional rate of return estimates computed for 657 respondents cutting across the three zones of the study area. These estimates are computed using equation (2) fit to cross-sectional data in an ordered probit model. At least several observations are noteworthy. First, the magnitudes of some of the determinants of earnings are positive. These determinants include; age, experience and years of schooling. The positive magnitude for schooling, for instance, implies that investment in schooling is likely to yield higher earnings. This is in line with the prediction of the human capital model. Thus, the higher the investment in schooling, the more likely the farmer will migrate to higher level of earning. Same inference can be deduced from the positive signs of the magnitudes of age and years of experience. It is more probable that an increase in years of experience will result in change of income level as it will impact on earning positively. However, marital status, health status and gender were negative in sign. For gender, as the population proportion increases, there is less likelihood that earnings will increase. In fact, it might decrease. Interestingly of all the determinants,

only age was discovered to be significant at 1 percent. All the other variables were neither significant at 1, 5 or 10 percents. The nature of the occupation (farming) can be said to be largely responsible for this result.

To check for the significance of the categorization of the dependent variable, the standard error test was employed to investigate if the threshold values indicated by cut 1 and 2 are significant. The threshold values were discovered not to be significant, implying that the earning categories can be merged into two categories.

It will also be important to reveal the marginal effect of the ordered probit model. The results obtained are presented in Table 3 below. For instance, it is obvious that with an increase in age by say a year, the probability of earning decreasing is only about 4.6 percent. In the same vein, the probability of health improvement of labor corresponding with increase in earnings is 0.8 percent.

5. Conclusion

The earning patterns across rural households have been established using the Jacob Mincer's pioneering innovations in developing human capital theory to understand the earnings distribution. It was revealed that the young earn less than the old; the educated, earn more than the less-educated with earnings likely to rise as educational expenditure increases. Of these determinants, only age was significant perhaps due to the nature of occupation. To enhance the earning of this category of labor, a form of education-agric-business education is needed. This is instructive if agriculture is to continue performing in its role as the main stay of the economy and alleviating poverty.

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Appendix

SUMMARY STATISTICS

Variable	Obs	Mean	Std. Dev.	Min	Max
earning	657	2.391172	.665423	1	3
yexp	649	11.01695	6.667918	2	30
age	585	3.169231	.9898856	1	6
marsta	657	2.753425	.4750719	1	3
hstatus	657	1.960426	.1951043	1	2
gender	657	.6194825	.485884	0	1
schooling	657	8.059361	3.119736	6	15
yexpe3	649	165.7658	192.9871	4	900
yschool	657	74.67123	59.96044	36	225

REGRESSION RESULT ESTIMATES

Ordered probit	regression		Number of obs =	578	
		LR chi2(6) =	29.50		
		Prob > chi2 =	0.0000		
Log likelihood	= -540.86477		Pseudo R2 =	0.0265	
earning	Coef.	Std. Err.	z	P>z [95% Conf.	Interval]
age	.2614381	.0571421	4.58	0.000 .1494416	.3734346
marsta	-.0489854	.1100752	-0.45	0.656 -.2647288	.166758
hstatus	-.2817471	.2551373	-1.10	0.269 -.781807	.2183127
gender	-.0647951	.0980863	-0.66	0.509 -.2570407	.1274505
yexpe3	.0000395	.0002508	0.16	0.875 -.000452	.000531
yschool	.0010337	.000807	1.28	0.200 -.0005479	.0026154
/cut1	-1.081791	.5938279	-2.245673	.0820902	
/cut2	.2827078	.5933712	-.8802784	1.445694	