DETERMINANTS OF RURAL NON-FARM EMPLOYMENT AND INCOME IN

PARAGUAY

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DETERMINANTS OF RURAL NON-FARM EMPLOYMENT AND INCOME IN

PARAGUAY

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A Thesis

Submitted to

the Graduate Faculty of

Auburn University

in Partial Fulfilment of the

Requirements for the

Degree of

Master of Science

Auburn, Alabama
August 9, 2008

DETERMINANTS OF RURAL NON-FARM EMPLOYMENT AND INCOME IN

PARAGUAY

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Daniel Correa, son of Natividad and Francisco Correa, was born on June 29, 1976, in Asuncion, Paraguay. He graduated from Gutenberg High School in 1994. In March 1996 he entered National University of Asuncion and in December 2001 graduated with a Bachelor of Science in Economics. During his college years he was junior assistant in PricewaterhouseCoopers in the Economics Department. After working for 5 years, he entered Graduate School, Auburn University, in August 2002.

THESIS ABSTRACT

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Master of Science, August 9, 2008
(B.S., National University of Asuncion, December 2001)

66 Typed Pages

Directed by Greg Traxler

During the last decades considerable research has been carried out on non-farm rural employment and income of farm households. The thesis examines the factors influencing non-farm employment and income among rural individuals in Paraguay. The empirical models show that education, assets, access to public services and language skills influence access to non-farm work. Gender and education play an important role in the intensity of participation, but not on the level of income. Heckman's selection model shows that there is no evidence of selection bias. Expansion of non-farm employment in rural areas and income diversification are desirable policy objectives because rural individuals require more options to improve their own living standards. Education and social infrastructure must be important components of any policy intervention, focused on training and access to public services.

ACKNOWLEDGEMENTS

I'm really indebted with so many people. The Economics Department and the faculty gave me the opportunity to know more about economics and wonderful days. Special thanks to Dr. Greg Traxler, for his guide and patience during the period of writing this thesis and his friendship, to Dr. Jim Long and Dr. John Jackson for their guide and support during my graduate studies and comments to the thesis. To some of my friends to helped me in many ways. Andres to helped me a lot since I arrived to US, to David Batista who gave me a hand when I'd really needed, to Guillermo who had help me for a wonderful break during the summer of 2003, to Celeste, my angel who take care of me from the heaven (you are always on my mind) and Ramón, Pedro and Marcos. Other special thanks to Mirna and Fermín because you believed in me. To my parents, Rey y Ñeca from whom I learned all the moral values thanks for your sacrifice and support. To Perla, my wonderful wife, and María Luana my little baby, for all their love and time …I love you.

Journal style used: *The American Economic Review*

Computer software used: *Microsoft Word 2007, E-views 5.0 and SSPS 10*

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I. INTRODUCTION

The number of rural poor in Paraguay has grown over the past 20 years. The General Department of Statistics, Surveys and Census (DGEEC), reports that in 2003, 51% of the rural population of the country was living in poverty, and 31% in a state of indigence[1]. It is widely recognized that efforts to improve the quality of life in rural areas or to reduce rural poverty cannot depend exclusively on agricultural development. Rural development necessarily requires the growth of industry and services. As part of this vision, people have become aware that the rural economy is much more than primary agricultural, cattle and forestry production.

Rural non-farm employment is an important source of income for the rural households in Latin America. This includes households that do not have access to land (Berdegué 2001[2], Reardon 2000[3]), which are common in Paraguay. For many years, in Paraguay rural development policies, especially those oriented to relieve rural poverty, have been concentrated on agricultural development.

It is common to hear economic policy authorities speak of the rural sector as comprised almost completely of agriculture, while focusing on rural poverty policies aimed at increasing farm net income. In spite of this, it is becoming more evident, that

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[1] Well-being Indicators 2002. Annual Publication of the Department of Statistics, Surveys and Census.
[2] Berdegué, Julio et al. Non-agricultural Employment and Income in Chile, International Network of Investigation Methodologies of Production Systems, Santiago de Chile, 2001
[3] Reardon, Thomas et al. Non-agricultural Rural Employment and Income in Latin America and the Caribbean. Conference concerning Development of the Rural Economy and Poverty Reduction in Latin America and the Caribbean, BID, New Orleans, March 2000

the rural sector in developing regions is much more than agriculture and that an important part of the rural population is engaged in non-farm economic activities.

The literature on the importance of rural off-farm economic activity notes a close association with poverty reduction, (Lanjouw and Lanjouw 2001, Ellis 1998), but there has been relatively little analytical work on the joint determinants of non-farm activity and poverty reduction. Rural non-farm activities are understood to be those developed by individuals in tasks other than their own-farm activities, including salaried work on industry, manufacturing (secondary sector) and services (tertiary sector). These kinds of employment are considered activities that are important to (a) escape indigence or poverty (Berdegué et al., 1999); (b) generate income from family labor that is available during times of the year when the demand for farm labor is low; (c) diminish household income fluctuations.

Research in other countries of Latin-America points out that rural non-farm income represents a high and growing share the total income of rural households. The International Network of Methodology in Production Systems, in a document about the Latin-American region, indicates that rural non-farm employment represents a significant percentage of total rural employment, generally greater than 20%, in all countries. Its importance to total rural income is even greater, contributing more than 40%.

In spite of the importance of non-farm activities, very little is known about them, or about the role they have in the strategies of income generation in rural households in Paraguay. Robles (1999) found that non-farm income is more important for individuals who are less poor in Paraguay. Those results reveal the importance of this income source within the Paraguayan rural sector as a means to overcome poverty.

The thesis investigates the role of non-farm employment and income as a strategy for the reduction of poverty in Paraguay, identifying the principal determinants and obstacles to access to these activities. The next sections state the objectives and reviews literature on non-farm activity and rural poverty. These are followed by a social and economic background, then a description of the methodology and data used for the analysis, descriptive statistics, economic and econometric models. The principal factors and their importance relative to the generation of this type of income will be determined. Finally, conclusions and recommendations for policies that could be considered for the formulation of strategies are presented.

II. OBJECTIVES AND SCOPE OF THIS STUDY

The principal objective of this study is to test the importance of non-farm employment and income in Paraguayan rural areas, to identify the factors that influence the probability of access to those jobs, and to quantify the incidence of these determinants on income levels. The relevant factors that influence the probability that an individual will perform non-farm economic activities will be measured. In order to do that, the structure of employment in the rural sector and in particular of non-farm employment is analyzed using data from the Paraguayan Permanent Survey of Households (PSH) 2003. The PSH data contain a comprehensive set of socio-demographic and economic variables that permit analysis to be conducted at the country level.

The following hypotheses will be tested:

➢   rural non-farm employment and the level of income are strictly related to the level of education,

➢   to individual characteristics (age, gender, language, etc.),

➢   to the physical infrastructure,

➢   and to access to public and private services.

III. LITERATURE REVIEW

One of the initial studies on this subject in countries with large agricultural sectors was performed by Klein (1993). He shows that rural non-farm employment grew in the 1980's in almost all of the Latin American countries studied. Reardon and Berdegué (1999) show that on average, non-farm income represented 47% of the income of rural households in the region and that in the absence of the non-farm sources of income, poverty would be many times greater in those countries. Non-farm income is important in other regions as well - 32% of total rural income in Asia, and 42% in Africa. These authors also make a distinction between the roles of wage income and of self-employed income. The income from salaried non-farm employment is more important than the income from salaried farm employment, especially in Africa and somewhat less in Asia. The poorest households tend to be those that rely most heavily on salaried farm employment.

Reardon and Berdegué also show that although the pattern of diversification of income between farm and the non-farm activities varies considerably between regions, it is closely related to the assets held by the households. Other findings from these studies are the static nature of access of poor rural populations to non-farm employment. This is due to the fact that the personal attributes needed to access off-farm employment are rare in the poor rural population. Non-poor rural populations show greater availability of assets, human and social capital.

Woldehanna and Oskan (2001) and Smith et al. (2001) found signs of labor market duality in their studies of Ethiopia and Uganda. The skilled and educated individuals were found either to enter into high paid jobs or to return to self-employment, while the unskilled and uneducated were dependent on low-pay casual employment opportunities. They found that non-farm low wage employment was motivated by "push" factors such as low farm income and the availability of surplus labor. Relatively wealthier individuals enter into non-farm self-employment to earn an attractive return. Substantial entry barriers cause the relatively wealthy rural households to dominate the lucrative self-employment activities. In summary, Woldehanna and Oskan (2001) illustrate that there is a need for a theory that can explain why wages do not adjust downward so that labor markets clear.

Echeverría (2000) and de Janvry (2001) studied the dynamics of poverty in the rural sector. They found that non-farm employment and income constitute an important force to mitigate poverty for many rural households. Other studies[4] substantiate that this activity constitutes, for some households, a mechanism for overcoming poverty that the purely farm sector does not offer since it permits the stabilization of income, compensating for the seasonality of farm production and/or employment, and the diversification of the sources of income, thereby reducing the effect of inherent agricultural risks. There is no agreement on whether this type of employment consists of a substitute or complement for farm income. Nevertheless, a Paraguayan case, Robles (1999) indicates that farm and non-farm income are substitutes for each other. The

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[4] Development of rural non-farm employment in Latin America and the Caribbean. Documents of Conclusions and Recommendations. BID/FAO/CEPAL. Santiago de Chile. September 1999.

existence of assets in households and in poor rural communities is associated with non-farm employment, multiplying the effects of farm activities, and vice-versa.

Reardon, Cruz and Berdegue (1998) confirm that rural households engage in non-farm employment not only to increase their total income, but also to smooth the strong fluctuations in income flows during the year, which are one of the principal characteristics of rural poverty. These authors and Elbers and Lanjouw (1999) conclude that rural households of developing countries have more income from the exploitation of the farms than any other source. Only in countries with a large percentage of landless peasants is non-farm income more important in the rural sector. Escobar (2000) found evidence that rural non-farm employment depends substantially on farm income and on farm demand for non-farm goods and services.

Empirical evidence in many countries supports the notion that agricultural wages are not perfectly flexible, and that rural agricultural labor markets are segmented with certain subgroups of the population such as women and children unable to obtain employment at the market wage.

Lanjouw (1995) found some evidence that small farms in Ecuador obtained higher yields than large farms. A possible explanation for this is that small farmers apply more labor per unit of land than large farmers. Family labor is applied beyond the level where the marginal product of labor is equal to the market wage, because, at least for some family members, the market wage does not reflect the opportunity cost of labor. If indeed agricultural wage employment is not an option for certain family members, then rural non-agricultural employment opportunities, even if they are not highly remunerative can

make a real difference – especially for those households which do not possess farm land or equipment (assets).

Research in rural India indicates that wages in the rural non-farm sector were higher than the agricultural wage, indicating that non-farm activities are not mainly low productivity; residual activities (although one might expect such occupations to be under-enumerated in survey data due their seasonal and self-employed character).

Indian village studies (Huffman, 1993) indicate the most important determinant of the incidence of non-farm employment may be that the poor with the lower reservation wages generally show the greatest inclination to become involved in non-agricultural activities, even at a low wage.

Several studies (Da Silva, 1998 and Weller, 1997) have attempted to identify and characterize the influential factors in the process of developing non-farm employment. These factors may be either endogenous or exogenous to the rural sector. Case studies in Central America[5] indicate that rural development influences are diverse and frequently originate outside of the rural sector. Endogenous factors permit the accumulation of capital (physical, human, financial) up to the point at which the state of development makes a region attractive for foreign capital investment. The exogenous determinants of non-farm employment include the influence of the urban cities on their rural surroundings. Cities demand an expanded set of goods and services and create a larger labor market.

These exogenous factors often emerge after public investments (infrastructure, basic services, etc.) have narrowed the economic gap that separates rural areas from the

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[5] Escobar, G. "Non-farm Employment" An alternative for Development? RIMISP.2000

dynamic sources of demand of goods and services originating in rural non-farm activities. Access to roads, electricity and other public services allows the quality of life for the rural population to begin to slowly match that of the urban population. Thus, employment in industry, manufacturing, commerce, tourism and other services offers employment or professional development options that are more attractive than farm work for many people, especially for young people. This is why the study of access to non-farm income is important in the design of rural development strategies.

For Islam (1977) rural non-farm income is an important option for younger generations, and could help reduce migration to urban areas. This permanence of the rural population would constitute a stabilizing factor for agriculture and improve the dynamics of production-consumption which would tend to grow, generating new non-farm income possibilities. Islam offers several explanations for the expansion of non-farm employment. One explanation refers to the generation of non-farm employment from the demand for rural non-farm goods and services. Another explanation is related to labor supply growth. Growth in the number of workers in the rural sector would induce growth of this type of employment which is currently impeded by the lack of alternatives for workers in rural areas. This is also mentioned in Kartnarathe (1997) where non-farm employment becomes an alternative for workers that are not needed in farm activities.

An empirical study carried out in Chile[6] shows that non-farm employment and income is not only a source of jobs for the households, but are also a means of integrating women into the labor market. It also shows that education is a central element for the

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[6] "Non-farm Employment" Results of the VII Survey of National Socioeconomic Characterization (CASEN 1998). Documents of Labor. MIDEPLAN, Chile, August 2000.

development of jobs for young people. The hypothesis that non-farm employment would be favored in areas of greater economic expansion is rejected.

Escobar (2001) has shown that in Peru, access to public services and an adequate endowment of private assets (especially education and credit) may improve access to non-farm employment. Non-poor households often rely on non-farm employment sources more heavily than poor households. While the findings in Brazil (Da Silva and Del Grossi, 1997) show that the growth of non-farm employment does not necessarily mean that income is rising overall or that labor conditions of the rural population are improving. Rather, new employment alternatives are being created.

IV. SOCIO-ECONOMIC BACKGROUND

Paraguay's population of 5.6 million, according to 2003 EPH, is significantly rural (46%) by Latin American and Caribbean standards. Only Guatemala has a smaller proportion of urban dwellers than Paraguay. While urbanization has experienced a perceptive increase since the 1970s, even today, there are strong ties with rural communities.

Paraguay has only two urban centers wit more than with more 100,000 inhabitants. The largest is the metropolitan are of Asuncion with close to 1.6 million people, followed by Ciudad del Este and its adjacent districts comprising 330,000 inhabitants. Both metropolitan regions include 65% of the country's urban population.

In the recent years Paraguay has experienced increased migration from rural to urban areas; the data seems to indicate that the rising levels of poverty in the country side have not resulted in a big wave on migration from rural to the urban areas. The search for better employment opportunities, public services and expansion of the agricultural frontier seem to be the main reasons for migration. According to the survey (EPH 2003), one in two migrants (45%) above 23 years of age migrated to find a better job (23 years was chosen as cut-off because individuals were at least 18 years old when they migrated). Another 37% migrated for family reasons, and 13% migrated to look for a home.

Paraguay has one of the highest percentages of youth population in Latin America and the Caribbean. About 59% of Paraguay's population is under 24 years old, compared to approximately 45% for both Argentina and Chile. Paraguay's population is

significantly younger than the typical population of a middle-income country (only 3.4%

of the Paraguayan population is over 65 years old of age, well bellow the rate if 6.5% for

countries like Paraguay. The large youth population in Paraguay poses risks as well as

opportunities for poverty reduction and sustainable development.

In Paraguay, language is not necessarily associated with ethnicity, as it is in other

Latin American countries, but rather with geographical location and social class. In daily

life, however, Guarani is essentially reserved for informal settings. Because of its unique

historical heritage, Paraguay´s native tongue is one of its main sources of national

identity and, in 1992 the Constitution established Guarani as one of the country´s two

official languages. Paraguay is the only country in Latin America that is officially

bilingual in Spanish and as native language.

The service sector accounted for close to 52% of the Paraguayan GDP;

agriculture, livestock and forestry 29%, and industry only 14%. Agriculture is the mainly

of the economy, as it employs 36% of the labor force and contributes over 90% of the

total merchandise exports. Cotton, once the basis of small farmers´ production system,

has been in crisis since the mid-1990s. Soybean production has expanded significantly in

recent years, due to the adoption of new technologies.

Over the long term, Paraguay's real GDP per capita has risen significantly, nearly

doubling in the last forty years. However, during the 1990s, Paraguay was the only

country in the Southern Cone where GDP per capita was negative, decreasing by 0.5%:

An economic recession took hold of the country after 1995, and the country is only

slowly emerging.

Paraguay is a poor and unequal society. Various poverty estimates suggest that between one in every three Paraguay (World Bank Poverty Assessment) to half of the population is poor (2003 Permanent Household Survey). In rural areas, 41.2% of the people lack a monthly income to cover basic necessities, whereas in urban centers this figure is 27%. The top 10% of the population holds 43.8% of the national income, while the lowest 10% has only 0.5%. The Gini index is 0.57. The economic recession has worsened income inequality, notably in the rural areas, where the Gini index has risen from 0.56 in 1995 to 0.66 in 1999. Similarly, land concentration in the Paraguayan countryside is one of the highest in the globe; 10% of the population controls 66% of the land, while 30% of the rural people are landless.

The increasingly high levels of poverty and extreme poverty, particularly in rural areas, paired with one of the highest levels of income inequality in the world, present a serious challenge for poverty reduction. Economic growth would not be enough to half poverty levels by 2015. Improved income distribution would assist in achieving the objective of halving the poverty rate by 2015, at the current GDP annual growth rate. Similarly, less concentrated land distribution accompanied by improved extension services, technology and capital, would increase the rural poor´s productive potential and assist them to move out of poverty. In addition to the purely growth related reasons that justify income and land redistribution there is a socio-political dimension that needs to be considered as it also has a direct impact on the levels of investment and growth.

The groups most vulnerable to poverty in Paraguay are the indigenous people, small farmers and landless, women-led households, unemployed and underemployed youth, working children, poor senior citizens and handicapped persons.

The rural poor are composed by two distinct groups. The poorest of the rural families is comprised mostly by families with little land (between 2 and 20 hectares) that have no of-farm income generating opportunities and rural properties, too small to sustain a livelihood. In addition to these near landless precarious land settlers, there is a group of land less rural inhabitants that do not have employment in the agricultural sector and survive combining non-agricultural activities and subsidies.

V. DATA

The data for this study are from the Permanent Survey of Households 2003

(PSH2003) carried out by the Paraguayan Department of Statistics, Surveys and Census.

This survey gathers demographic and economic data. A general characterization of the

data is presented in Table 1. The total number of surveyed individuals is 43,161, of whom

49.8% live in urban areas.

Table 1: Sample characteristics

Description	Male	Female	All
Sample Size			
Urban	10,273	11,214	21,487
Rural	11,338	10,336	21,674
Total	21,611	21,550	43,161
Average age			
Urban	26.1	27.2	26.7
Rural	25.2	24.8	25.0
Average	25.6	26.1	25.8
Household average size			
Urban	5.44	5.41	5.43
Rural	6.16	6.16	6.16
Total	5.82	5.77	5.79
Population 10 years older			
Urban	7,848	8,759	16,607
Rural	8,385	7,651	15,946
Total	6,233	16,320	32.553

Source: PSH 2003

The average number of people per household is 5.8 individuals, with an average

age of 25.8. The average age in urban areas is 1.7 years higher than in rural areas. A total

of 43,161 individuals were surveyed. Individuals 10 years and older were considered to

constitute the working age population.

In Table 2, it can be observed that 55% of the national population is employed. Differences are observed in the distribution by gender, where the percentage of employed men reaches 69% against a level of employment of women of 41%. Unemployment levels are similar by gender. Urban areas have a much higher percentage of unemployment than rural areas. The idle population is significantly higher among women, which is likely explained by the fact that they carry out their work activities in the home.

Table 2: Percentage of population aged 10 years and older by activity, by area of residence and gender.

Activity	Area		Gender		Total	Total
	Urban	Rural	Male	Female	(%)	(Number)
Employed	52.5	58.4	69.3	41.1	55.0	2,350,595
Unemployed	6.6	2.3	5.0	4.6	4.8	206,048
Inactive	40.8	39.2	25.7	54.3	40.2	1,716,701
Total Population	**2,466,771**	**1,806,571**	**2,108,794**	**2,164,550**	**100.0**	**4,273,344**

Source: PSH 2003

Nearly half of the rural population is self-employed compared to just 31% in urban areas. Conversely, just 25.6% of rural workers are salaried, compared to 59.2% in urban areas. Just 2.9% of rural workers are employers, indicating that the main generator of employment of individuals living in rural areas continues to be family enterprises. This proportion of non-salaried has fallen from around 72% in recent years[7].

This outcome calls attention to a significant issue that must be analyzed and which is related to the degree of formality of the labor market. Non-salaried activity serves as the main regulator to absorb the unemployed. Among salaried people in the rural area, the private sector absorbs the most labor with approximately 60%.

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[7] Robles, Marcos (2000)

Table 3. Percentage of 10 and older by occupational category, by area of residence and gender

Category	Area		Gender		Total (%)	Total (Number)
	Urban	Rural	Male	Female		
Public employee	10.4	3.0	5.5	9.6	7.1	166,394
Private employee	16.6	2.4	10.1	10.4	10.2	240,060
Public worker	1.8	0.4	1.5	0.7	1.2	27,640
Private worker	19.3	16.1	25.1	6.0	17.9	419,530
Domestic employee	11.0	3.9	1.2	18.8	7.8	184,052
Salaried	**59.2**	**25.6**	**43.4**	**45.4**	**44.2**	**1,037,676**
Employer	5.4	2.9	5.4	2.4	4.3	100,895
Self-employed	31.0	49.3	37.4	42.1	39.2	921,090
Non-salaried Family	4.4	22.2	13.8	10.0	12.4	290,934
Non-salaried	**40.8**	**74.4**	**56.6**	**54.6**	**55.9**	**1,312,919**
Total Population	**1,295,654**	**1,054,940**	**1,461,043**	**889,552**	**100,0**	**2,350,595**

Source: PSH 2003

The analysis by gender indicates that nationally approximately 42% of employed women are self-employed, this percentage being much higher than any other occupational category for women. In the total employed population, this same category represents 39%, greatly exceeding the category of private employee, which reaches approximately 18% of the total employed population.

Tables 4 and 5 provide information on the population that is older than 10 years old according to the field of employment and the economic sector, classified by area of residence and sex. As might be expected, the rural population is characterized by the preeminence of agriculture, cattle, hunting and fishing. It is important to notice, however, that approximately 4 of every 10 individuals residing in the rural area are employed in other types of activities. Commerce, restaurant and hotel businesses and manufacturing industries are the branches that employ the greater proportion of the rural population. Women concentrate their activities in the branches of community, social and personal services, the latter, with 38.6%, is the main branch of activity for women,

followed by commerce, restaurant and hotel businesses with 26.7% and agriculture, cattle, hunting and fishing with a 20.5%.

Table 4: Percentage of 10 years old and older by activity, by area of residence and gender.

Occupational Category

	Area		Gender		Total	Total
	Urban	Rural	Male	Female	(%)	(Number)
Agriculture, Cattle, Hunting and Fishing	5.5	65.7	39.8	20.5	32.5	764,325
Mines	0.1	0.2	0.2	-	0.1	2,742
Manufacturing Industries	13.0	7.3	10.9	9.6	10.4	244,536
Electricity, Gas and Water	1.0	0.3	0.9	0.4	0.7	16,202
Construction	5.2	2.9	6.6	0.2	4.2	98,334
Commerce, Restaurants and Hotels	31.7	12.3	20.8	26.7	23.0	541,282
Transport and Communications	5.5	1.5	5.2	1.3	3.7	86,778
Finance, Insurance, Real Estate	5.4	0.4	3.4	2.8	3.2	74,428
Community Service and Social	32.5	9.5	12.2	38.6	22.2	521,552
NR	0.0	-	0.0	-	0.0	414
Total Population	**1,295,654**	**1,054,940**	**1,461,043**	**889,552**	**100.0**	**2,350,595**

Source: PSH 2003

Table 5 illustrates the consistency of the percentage levels indicated in the previous data. Indeed, in the rural area, the primary sector, which includes agriculture, cattle, hunting and fishing absorbs 65.7% of workers, while the secondary and tertiary sectors, which include the manufacturing and construction industries and services such as electricity, water, commerce, financial institutions, community and personal services respectively, together occupy 34.3% of the rural population.

In the analysis by gender, similar proportions of men work in the primary and tertiary sectors (40%), while the secondary sector employs just 18% of the male population. For women, the tertiary sector is the main sector of employment, with approximately 70%. The data show that the secondary sector does not constitute an important demand of workers in either rural or urban areas.

Table 5: Percentage of 10 years of age and older per economic sector, by area and gender .

Categories	Area		Gender		Total	Total
	Urban	Rural	Male	Female	(%)	(number)
Primary	5.5	65.7	39.8	20.5	32.5	764,325
Secundary	18.3	10.3	17.7	9.8	14.7	345,612
Terciary	76.2	24.0	42.5	69.7	52.8	1,240,242
ND	0.0	0.0	0.0	0.0	0.0	414
Total Population	**1,295,654**	**1.054.940**	**1.461.043**	**889.552**	**100.0**	**2,350,594**

Source: PSH 2003
ND = No data

VI. RURAL LABOR MARKET DESCRIPTIVE STATISTICS

Focusing the analysis on the employed rural population, this section examines the characteristics of employment, and of rural farm and non-farm income considering demographic aspects of the individuals such as: gender, education, household size, age, and others.

Table 6 shows the rural employed population, by farm and non-farm, by gender and by level of education. Women are employed in equal proportions in farm and non-farm jobs. On the contrary and as might be expected, farming employs 7 of every 10 men in the rural area. An inverse relationship exists between farm employment and level of education. It is observed that 80.1% of the population employed in farm activities has less than a secondary education; only 25.5% of the population employed in the sector has finished primary school. The comparable figures for non-farm employment are 59.8% and 26.2% respectively. Just 3.4% of the individuals employed in farm activities have completed their secondary education. In the non-farm rural sector about 40% have completed primary school.

Table 6: Employed rural population, farm and non-farm, per gender and education

Categories	Farm	Non-Farm	Total (%)	Total (Number)
By gender				
Male	73.0	27.0	100.0	725,070
Female	49.5	50.5	100.0	329,870
Total	65.6	34.4	100.0	1,054,940
Education				
No schooling	5.9	3.3	5.0	52,662
Primary level	48.7	30.3	42.4	447,414
Primary completion	25.5	26.2	25.8	271,921
Secondary incomplete	16.3	22.8	18.5	195,352
Secondary completion	3.0	8.8	5.0	52,865
Graduate	0.4	8.6	3.2	34,110
Total Population	**692,567**	**362,372**	**100.0**	**1,054,940**

Source: PSH 2003

The employed rural population is shown in Table 7, farm and non-farm by language spoken at home, household size and age. Eighty-two percent the rural population dedicated to farm activities speak Guarani at home, compared to 56.1% of the non-farm population. Just 7.8% of the farm-employed population is from a bilingual home, while the non-farm bilingual percentage is 22.1%. Just 2.8% of the population dedicated to a farm activity speaks Spanish at home, while within the population dedicated to non-farm activities; the percentage goes to 14.8%.

The farm workforce is concentrated in the very young and older workers compared to the non-farm workforce. Thirty-three percent of the farm workforce is between 10 and 24 years of age, 4% higher than for non-farm work. The non-farm workforce has higher shares between 25 and 34 years of age and between 35 and 44 years old by 9.7% and 4.9% respectively. This shows that a great part of the rural population in their "prime" work years tends to perform non-farm activities, which would imply that they find more incentives in those activities.

Table 7: Percentage of employed rural population, farm and non-farm, by language spoken at home, number of members in the household and age.

Categories	Farm	Non-Farm	Total (%)	Total (Number)
Primary language spoken at home				
Only Guaraní	82.5	56.1	73.4	774,330
Guaraní/Spanish	7.8	22.1	12.7	134,065
Spanish	2.8	14.8	6.9	73,175
Another	6.8	6.9	6.8	72,115
Don´t talk	0.1	0.1	0.1	894
Numbers of individuals per house				
1	2.8	2.3	2.6	27,851
2	6.7	8.4	7.3	76,830
3	9.4	12.9	10.6	111,636
4 or more	81.1	76.4	79.5	838,623
Age				
10 to 24	33.5	29.5	32.1	338,728
25 to 34	17.1	26.8	20.4	215,560
35 to 44	17.6	22.5	19.3	203,137
45 to 54	15.0	13.4	14.5	152,708
55 to 64	9.8	5.2	8.2	87,030
65 and +	7.0	2.6	5.5	57,778

Source: PSH 2003

Table 8 describes the employed rural population, by farm and non-farm, by income level and poverty status. In the lowest or poorest quintile are 37.2% of the rural population that performs farm activities, while for the same quintile, the population who does non-farm activities is just 9.9% of the total for that group. This situation is reversed in the highest quintile, given that of the total of employed individuals in the farm sector, only 12.4% pertain to that quintile, while in the non-farm sector, that percentage goes up to 25.8%. These results are consistent with the percentages obtained when classifying the population by poverty status. It is important to note the disparity of poverty between sectors. Poverty is accentuated in people employed in farm activities; in contrast, people in non-farm activities demonstrate lower levels of poverty.

Table 8: Percentage of employed rural population, farm and non-farm by income quintile and poverty status.

Categories	Farm	Non-Farm	Total (%)	Total (Number)
Income Quintile				
20% Lowest	37.2	9.9	27.8	293,669
Second	21.4	16.6	19.8	208,535
Third	15.6	22.1	17.8	188,072
Fouth	13.4	25.5	17.5	185,101
20% Highest	12.4	25.8	17.0	179,564
Poverty Status				
Poor	47.9	17.0	37.3	661,566
Non-poor	52.1	83.0	62.7	393,374

Source: PSH 2003

Following are the characteristics shown by rural income for each of the relevant demographic variables. Table 9 presents the average income according to the branch of activity and income quintile of the employed population. The table shows a relevant aspect of the composition of income of the rural sector. In all quintiles except for the richest quintile, the income of the individuals employed in the non-farm sector is greater than the income in the farm sector. The average income of an individual in the non-farm sector is almost 1.4 times more than that of the individual employed in the farm sector. Analyzing the income by quintiles among the branches of activity, it is observed that the individual of the poorest quintile gets an average income 26.5 times lower than the richest individual in the farm sector. This gap is smaller within the non-farm employment, where the average income of an individual of the richest quintile represents only 6 more times than the average income of an individual in the poorest quintile. The highest farm income quintile is important for it includes the big soybean and cattle producers.

Table 9: Average income of the employed rural population, farm and non-farm, by quintile. (In current guaranies of November 2003; 1 US Dollar = 6,370.90 guarani)

Quintile by income	Farm	Non-Farm	Total
20% Lowest	81,959	192,622	95,518
Second	178,323	302,657	214,238
Third	270,829	441,655	343,643
Fouth	426,308	631,626	528,939
20% Highest	2,169,558	1,159,122	643,632
Average income	**437,585**	**627,373**	**502,778**

Source: PSH 2003   1 US Dollar = 6,370.90 Paraguay Guarani

Table 10 shows the level of income of farm and non-farm employment classified by gender. In general women have lower incomes than men. The income difference between women and men in farm employment is less than the difference in the non-farm sector. Women participate in greater proportion in non-farm employment than in farm employment, but the level of income tends to be low, since most of it pertains to domestic employment.

The importance of accumulating human capital to achieve an adequate level of economic and social well-being is demonstrated when analyzing the Active Economical Population PEA employed by level of education. In the non-farm sector income increases as the level of education increases income increases, but education has little effect on farm wage. The average income of a person with no education employed in the farm sector, reaches more than a half of the income of a person with tertiary level of education employed in the same sector. With regard to non-farm average income, this ratio is less than one-fourth. For all levels of education, the average income of individuals in the non-farm sector is higher, although this difference is most pronounced for the two highest levels of education.

Table 10: Average income of the employed rural population, farm and non-farm, by gender and level of education. (In current guaranies of November 2003; 1 US Dollar = 6,370.90 guarani)

Categories	Farm	Non-Farm	Total
Gender			
Male	469,482	805,682	560,324
Female	334,299	417,510	376,288
Education			
No education	245,960	371,087	274,086
Primary level	442,662	470,925	449,606
Primary completion	431,066	562,428	476,966
Secundary incomplete	502,206	589,771	539,164
Secundary completion	423,135	800,850	650,505
Graduate	578,524	1,393,012	1,326,457
ND	240,287	-	240,287

Source: PSH 2003
1 US Dollar = 6,370.90 Paraguay Guarani
ND = No data

With regard to the language at home, in both farm and the non-farm employment, those who speak Guarani have the lowest income, being significantly lower for those who perform farm activities, representing half of the income of individuals who carry out non-farm activities (Table 11). The difference in income for those who speak Guarani/Spanish at home is not very significant, but still favors non-farm activities. When the spoken language is Spanish or another language, the average income is 1.6 and 2.7 times more for those who carry out farm activities. This is related to the foreign (Brazilian) producers that have large parcels of land dedicated to farm activities.

Age is another factor which seems to be a determinant of access to non-farm employment and, to a lesser extent, a determinant of the level of income. Age has a positive effect for individuals with non-farm incomes up to the age range of 35 to 44 years.

Another aspect to consider is related to the fact that for each age range the average income for the non-farm activities is greater than the average income received by

individuals working in the farm sector. Starting with the 45 to 54 year range, farm

income is greater, while for the highest income range, the non-farm income is 1.7 times

more. This is because most of these individuals, because of their ages, are employed in

farm activities, either because of their low education level or because few employment

opportunities exist at their age. The main idea is that youths receive higher wages in non-

farm activities. With regards to poverty status, poor individuals in the farm sector receive

2.2 times less than those with non-farm income. However, the income difference is small

for non-poor individuals, with farm-employed being somewhat higher.

Table 11. Average income of the employed rural population, farm and non-farm, by language spoken, age and poverty condition. (In current guaranies of November 2003; 1 US Dollar = 6,370.90 guarani)

Description	Farm	Non-Farm	Total
Language at home			
Only guaraní	239,829	476,973	302,053
Guaraní/Spanish	618,375	750,660	697,385
Spanish	1,525,297	925,527	1,084,794
Another	2,187,133	817,815	1,710,789
ND	161,553	234,692	185,719
Age			
10 to 24	130,725	397,513	214,889
24 to 34	511,116	712,673	601,758
35 to 44	575,742	815,274	671,703
45 to 54	831,171	703,428	790,429
55 to 64	600,404	543,888	588,070
65 and +	304,936	509,842	338,619
Poverty condition			
Poor	98,195	214,527	116,364
Non-poor	749,966	711,663	732,543
Total	**437,585**	**627373**	**502,778**

Source: PSH 2003
1 US Dollar = 6,370.90 Paraguay Guarani
ND = No data

VI. THEORETICAL MODEL

There is some motivation of why rural household could engage in non-farm activities. This might assume that households seek to engage in such activity that, given its assets and skills, generates highest return. Considering, Harris and Todaro's (1970) labor migration model: rural labor choose to migrate to the urban region (given higher wages than in the rural areas) if the expected income, after transaction costs, exceed the income presently earned under rural employment. Similarly, one could hypothesize that non-farm employment will be undertaken if wage earnings will exceed real income from the own farm. Moreover, non-farm employment will be undertaken if such employment is expected to pay-off better than agricultural jobs.

It is used a basic household model as a reference to point out a theoretical framework of the rural household. Household models are often used as a tool in development microeconomics to model the joint consumption and production decisions made by the rural household. Based on Bardhan and Udry (1999) a static rural household problem is presented:

$Max \ U(c, l)$ subject to   (1)

$pc + wL^h + rK^h \leq F \ (K, L) + wL^m + rK^m$ (2)

$L = L^f + L^h$ (3)

$K = K^f + K^h$ (4)

$E^L = L^f + L^m + l$ (5)

$E^K = K^f + K^m$ (6)

c, l, L^f, L^m, K^f, K^m ≥ 0   *(7)*

where *c* and *l* are the household's composite consumption and leisure, respectively, and *p*, *w*, and *r* are prices of consumption goods, labor, and capital. *F(.)* is the household rural production function with capital (*K*) and labor (*L*) as inputs. The equation (2) represents the budget constraint, which states that expenditures on consumption and on hired labor and capital cannot exceed the revenues from production and from marketed labor (*L^m*) and capital (*K^m*). Equation (3) shows that labor is provided from the own household (*L^f*) or hired (*L^h*), which is similar for capital (4). Household labor and capital endowments are given by *E^L* and *E^K* and are used according to (5) and (6). If it is assumed that the optimization problem is separable, then income can be maximized independently of household preferences. Income is maximized by profit maximization in household production:

π* (w r) = Max $_{L, K}$ F {(L, K) - wL - rK}

Here it is assumed that there is a competitive rural labor market, in which labor is homogenous. Now, it is introduced a *dual* situation of rural labor market by distinguishing between agricultural and nonagricultural labor. The rural household engages in farm production, but can also choose to supply its surplus labor in a farm as well as a non-farm competitive labor market. Assume that labor productivity varies by skills in the non-farm sector but not in the farm sector. The price of one unit of unskilled labor will be equal in the two markets, but labor productivity differentials in the non-farm labor market will be perfectly compensated for.

Let *a* be a household-specific parameter determining its level of labor productivity in non-farm production (*a* is normalized to 1 for unskilled labor). Thus, in the non-farm

labor market, a skilled household will be able to supply more units of "unskilled-labor equivalents" than an unskilled household with the same time endowment. Keeping the utility function unchanged, the household budget and resource constraints become:

$$pc + wL_A{}^h + rK^h \leq F(K, L_A) + w(L_A{}^m + aL_N{}^m) + rK^m \tag{2$'$}$$

$$L_A = L_A{}^f + L_A{}^h \tag{3$'$}$$

$$K = K^f + K^h \tag{4$'$}$$

$$E^L = L_A{}^f + L_A{}^m L_N{}^m + l \tag{5$'$}$$

$$E^K = K^f + K^m \tag{6$'$}$$

$$c, l, L_A{}^f, L_A{}^m, L_N{}^m, K^f, K^m \geq 0; \ a \geq 1 \tag{7$'$}$$

from equation (2), the constraint in (2') takes into account possible wage income from labor supplied on the non-farm labor market. Identity (5') shows that the household can devote its time in different activities. Given its farm production technology and its non-farm labor productivity, the household needs to find its optimal allocation of labor. Under complete markets, the optimization problem of an unskilled household reduces to (1)-(7); the household has no incentive to consider participation in the non-farm labor market. The skilled, and hence more productive, household will supply all its labor on the non-farm labor market (it would lose the compensating wage differential if it were to engage in farm work). Re-arranging (2) and (2') and substituting in (8), the full-income constraints for the unskilled and skilled household become

$$pc + wl \leq \pi^*(w,r) + wE^L + rE^K \tag{9}$$

and

$$pc + wal \leq \pi^*(w,r) + waE^L + rE^K \tag{9}$$

(9) and (9') show that the opportunity cost of leisure is w for the unskilled household and wa for the skilled household. Further, given that the two households have identical endowments, the same production technology, and differ only in skill level, the earnings potential differential is simply $(a-1)w$ times their time endowment. Two implications from the model can be noted. Firstly, with perfect markets, no household has an incentive to diversify its income sources by participating in both labor markets. Secondly, an unskilled farm laborer could not gain by switching to non-farm work; he or she will be paid the same wage. Hence, based on this framework, the concern about income diversification and potential income gains in the rural non-farm sector appears unmotivated.

Under missing or imperfect markets the situation will look differently. Poorly functioning markets for both inputs and outputs are commonly observed in rural areas (but also in urban areas) in less developed countries. Reasons for this could be low population densities, poor infrastructure, and poorly developed institutional arrangements (such as property rights). In the framework above, if there are barriers to entry the land and capital market, the production potential of the household will be largely determined by its endowments. If a household happens to be near landless and cannot easily access productive land, the agricultural production function is no longer part of the budget. Non-farm wage labor will be the household's only source of income (disregarding transfers and migrant remittances). If, at the same time, unemployment emerges in the agricultural labor market in slack seasons at the going wage rate, and if the market for nonagricultural labor is largely fragmented, then the landless household cannot even secure its labor income. If there is a minimum level of skill required to enter the nonagricultural labor

market and to earn the going wage, it will not work as an alternative source of employment for low- or uneducated labor.

Such imperfections in the labor markets would tend to give rise to "disguised unemployment", consisting of low-productive work in the own household or on the own farm. Open unemployment, in the conventional sense, is not an option for the rural household, unless there are government transfers that can secure a subsistence level income. The framework above and this introduction of market imperfections provide a reference point in our continuing analysis of the rural household.

Therefore, the neoclassical labor model assumes the existence of a free and competitive market for labor with perfect information and labor mobility could mitigates wage differences. Given this, there is reason to believe that labor markets in Paraguay; particularly in rural areas are characterized by imperfect information and by the presence of entry barriers and related to individuals' endowments. Rural wages are not determined completely by supply and demand factors, but are also a function of the personal characteristics of wage earners.

VII. ECONOMETRIC MODEL

The present study tests hypothesis using an econometric model. Econometric models make it feasible to find the empirical relationships between a dependent variable - for this study the rural non-farm income, and a set of independent or explanatory variables.

The nature of the data presents a difficulty for the econometric estimation. Rural non-farm employment data is observed only for part of the workforce, resulting in what the literature calls a censored sample. Unemployed rural workers might work if their reservation wage were met, and would therefore become part of the contingent that appears in the sample with income for this type of work. Estimating by OLS using only the observed sample wages delivers inconsistent results (Greene, 1998). In this study, the information of some potential rural residents who do not do rural non-farm work, is being omitted. In other words, you may have data on the explanatory variables (characteristics) for people who are not working, as well as for those who are working, but for the former there is no observed wage.

The problem is the following (Greene 1999). An equation that determines the selection (in our case the existence of income for rural non-farm employment) is given by:

$$z^*_i = \gamma' w_i + \mu_i \qquad\qquad (1)$$

where z^*_i represent the latent, discrete variable of selection equation; w_i represents the vector of covariates for unit i for the selection equation; γ is the vector of coefficients for the selection equation and μ_i is a random disturbance for observation i for the selection equation .

Next there is an equation of primary interest (in this case the level of income of rural non-farm employment), which is given by:

$$y_i = \beta' x_i + \varepsilon_i \tag{2}$$

where β vector of coefficients for outcome equation and x_i vector of covariates for unit *i* for the outcome equation.

The income of rural non-farm workers is observed only if it exists. It is assumed that the joint distribution of μ_i and ε_i is a normal, bivariate with a mean of zero and coefficient of correlation ρ. These assumptions result in a model which describes the behavior of all of the observations contained in the sample, such as:

$$
\begin{aligned}
E\,[y_i|y_i \text{ is observed}] \quad &= E\,[y_i|\, z^*_i > 0] \\
&= E\,[y_i|\, \mu_i > -\gamma' w_i\,] \\
&= \beta' x_i + E\,[\varepsilon_i\,|\,\mu_i > -\gamma' w_i\,] \\
&= \beta' x_i + \rho \sigma_\varepsilon \lambda_i\,(\alpha_\mu) \\
&= \beta' x_i + \beta_\lambda \lambda_i\,(\alpha_\mu),
\end{aligned}
$$

where:

$$\alpha_\mu = -\gamma' w_i / \sigma_\mu \qquad \text{and} \qquad \lambda_i\,(\alpha_\mu) = \phi\,(\gamma' w_i / \sigma_\mu)\,/\,\Phi\,(\gamma' w_i / \sigma_\mu)$$

therefore,

$$
\begin{aligned}
y_i|\, z^*_i > 0 &= E\,[y_i|\, z^*_i > 0] + v_i \\
&= \beta' x_i + \beta_\lambda\, x_i(\alpha_\mu) + v_i \tag{3}
\end{aligned}
$$

The last expression is a second term in the income equation for rural non-farm employment ($\beta_\lambda x_i(\alpha_\mu)$). This parameter contains all the information on the observations that do not participate in the labor market, but that have been censored in Equation 2, the estimation of rural non-farm income.

The technique of Heckman (1979) is used to solve the censoring problem by performing the estimation in two steps. The first of these consists in estimating a PROBIT model with all observations; that is considering all members of the rural population. The dependent variable has a value equal to 0 when there is no rural non-farm employment, and takes the value 1 when rural non-farm employment takes place. The result of this estimation permits an analysis in two stages, the first given by the process of selection and the second permitting the evaluation of the effect of the different personal attributes on the level of income of those that do rural non-farm work.

VIII. MODEL ESTIMATED

In the design of the econometric model it has been taken into account that an important part of rural households receive no income from activities developed in the non-farm sector. This is reflected in the data of Table 6, which shows, for example, that only 34.4% of the individuals are found to be employed in the non-farm sector and only they receive income from this sector. In this context, the individual's income resident in rural area provided by some non-farm activity.

The econometric analysis developed in this section includes the data for all surveyed individuals (residents in the rural area). To verify the possible existence of bias in the selectivity of the sources of income, applying the two-stage regression methodology proposed by Heckman (1979) is used, with the purpose of determining separately the effects of the demographic characteristics of individuals included in the sample on access and on the level of non-farm income equations[9].

The first stage evaluates the probability of being employed in a non-farm job using the PROBIT estimation, as follows:

$$z_i = \alpha_i + \beta_i x_i + \mu_i$$

The dependent variable is defined equal to 1 if the individual is employed in a non-farm job and 0 if not. The x constitutes a vector which contains the variables considered determinant of the probability that an individual has non-farm employment. Once estimated the PROBIT equation is used to obtain the maximum likelihood estimator

γ. For each observation of the selected sample $\lambda_i(\alpha_\mu) = \phi(\gamma' w_i/\sigma_\mu) / \Phi(\gamma' w_i/\sigma_\mu)$

must be calculated.

Then through an estimation of Ordinary Least Squares (OLS), the level of income in the rural non-farm employment is estimated. The functional form of this model is specified in the following manner.

$$Lny_i = \alpha_i + \beta_i x_i + \beta_\lambda \lambda_i + v_i$$

The dependent variable Lny_i is the logarithm of non-farm income. Due to the fact that this variable has a positive value only when z_i, of the probabilistic equation has a value of 1, the variable λ is incorporated in the model, which contains information relevant to the population that has been excluded from the OLS estimation for not having non-farm employment.

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[9] Econometric programs EVIEWS 5.0 and SSPS 11.4 are used for the econometric estimations

IX. MODEL RESULTS

The results obtained from the econometric model are in general similar to investigations made at the regional level concerning the determinants of rural non-farm employment. Tables 12 and 13 present the results of the selection models, and of non-farm income. The presentation format follows the estimation in two stages. First the results of the selection model are shown, and later the results of the OLS estimation of the level of income of those that have non-farm employment are shown.

The empirical analysis performed was corrected using the Huber and White heteroskedasticity method. Results suggest that female heads of households are more likely to be involved in rural non-farm employment. With reference to non-farm income, the available statistical information indicates that the average income of women in the non-farm sector is significantly less than that of men. Consistent with these results, the coefficient of the OLS estimation of the variable gender of the head of household shows a negative sign, which demonstrates an inverse effect on the level of non-farm income.

Household poverty[10] is negatively associated both with the probability of access to rural non-farm employment and with the level of income. Belonging to a household with a larger number of people positively affects the probability of being employed in the non-farm sector, also observing a positive and significant effect on non-farm income.

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[10] Prepared on the basis of the classification established by the Department of Statistics, Surveys and Census.

Table 12. Probit Model. Determinants of rural non-farm employment

Dep. Var: ENOAGRO
Simple(adjusted): 1 9342
Included observations: 3859
QML (Huber/White) standard errors & covariance

Variable	Coefficient	Std. Error	z-Statistic	Prob.
Poverty	-0.6386	0.0636	-10.0431*	0.0000
Gender	0.7251	0.0694	10.4443*	0.0000
SizeH	0.0457	0.0108	4.2110*	0.0000
Educ	0.1026	0.0085	12.0943*	0.0000
Age	-0.0034	0.0020	-1.7079**	0.0876
Language	-0.3165	0.0536	-5.9019*	0.0000
Land	-0.1948	0.0562	-3.4632*	0.0005
Electr	0.3908	0.0748	5.2218*	0.0000
Machinery	-0.9996	0.0574	-17.4191*	0.0000
Migrat	-0.0313	0.0762	-0.4103	0.6816
C	-0.6496	0.1376	-4.7206	0.0000
Mean dependent var	0.3063	S.D. dependent var		0.4610
S.E. of regresión	0.3840	Akaike info criterion		0.9157
Sum squared resid	567.5394	Schwarz criterion		0.9335
Log likelihood	-1755.7707	Hannan-Quinn criter.		0.9220
Restr. log likelihood	-2377.5518	Avg. Log likelihood		-0.4550
LR statistic (10 df)	1243.5622	McFadden R-squared		0.2615
Probability(LR stat)	0.0000			

* Statistically significant at 95% confidence level.
** Statistically significant at 90% confidence level.

Education, measured by years of schooling, is positive and statistically significant, both for the probability of access to rural non-farm employment and for level of income. Considering school performance, the estimation shows that one more year of schooling increases non-farm income by 6%. These results are similar to those obtained in other studies performed in the region and to those obtained by Robles (2000) regarding the direction of their effects, but not in the magnitude. For example, a study performed by the Ministry of Planning and Cooperation in Chile[11] showed that one more year of study increases non-farm income (per hour) by 12.5%, while Taylor (1999), in a study of non-

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[11] Results of the VII Survey of National socio-economic Characterization (CASEN 1998) Document No 17 – Rural Non-farm Employment, Santiago de Chile, August 2000.

agricultural rural activities for rural households in Michoacán, Mexico, found that the

impact on monthly incomes was on the order of 9%.

The fact that rural non-farm employment constitutes a labor alternative for

younger residents, is shown by the negative signs of the coefficients of the age variable.

Although the negative percentage impact of each additional year is relatively low, it is

statistically significant and consequently must be considered in the design of policies

oriented to the rural sector. The most widely spoken language by the head of household

also presents negative and statistically significant effects on the probability of having

non-farm employment and on the level of income. That is, being form a home that

speaks only Guarani reduces the possibility of being employed in the non-farm sector,

and has a negative effect on the level of the income received in non-farm activities.

Table 13. MCO model. Income of rural non-farm employment.

Dep. Var: LOG(ING_RNOA)
Method: Least Squares
Included observations: 1177
White Heteroskedasticity-Consistent Standard Errors & Covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Poverty	-1.1029	0.1218	-9.0537*	0.0000
Gender	-0.6309	0.1118	-5.6428*	0.0000
SizeH	0.0823	0.0124	6.6412*	0.0000
Educ	0.0638	0.0145	4.4116*	0.0000
Age	-0.0093	0.0020	-4.6103*	0.0000
Language	-0.3108	0.0655	-4.7415*	0.0000
Land	-0.0925	0.0543	-1.7026**	0.0889
Electr	0.1670	0.1076	1.5522	0.1209
Machinery	-0.2281	0.1805	-1.2638	0.2066
Migrat	0.0768	0.0624	1.2320	0.2182
Lambda1	0.2130	0.2220	0.9596	0.3375
C	12.7513	0.5517	23.1108	0.0000

R-squared	0.4276	Mean dependent var	13.1676
Adjusted R-squared	0.4222	S.D. dependent var	0.9890
S.E. of regresión	0.7518	Akaike info criterion	2.2774
Sum squared resid	658.4293	Schwarz criterion	2.3291
Log likelihood	-1328.2504	F-statistic	79.1174
Durbin-Watson stat	1.0960	Prob(F-statistic)	0.0000

*   Statistically significant at 95% confidence level
** Statistically significant at 90% confidence level

Finally, the coefficients of the variables that reflect the ownership of assets and access to electrical energy service, are not significant in the non-farm income equation, but are statistically significant in the probability of non-farm employment. As expected, ownership of land and ownership of machinery appear to induce the property owners to concentrate their activities on the farm sector rather than on the non-farm labor market. Access to electricity increases the probability of non-farm labor participation.

The insignificant parameter estimate in the Mills ratio variable suggests that in the present sample there is no correlation between unobserved variables which influence the probability of employment in the non-farm sector and unobserved variables affecting income in that sector.

To complement this analysis, given the important proportion of the rural population that is self-employed, the same model incorporating only this segment of the population was performed. The results, presented in Appendix 3, Tables 1 and 2, are in general similar to those of the non-farm labor participation model, only noting small differences in the magnitude of the parameters. Nevertheless, it is relevant to mention some of the results concerning those which contain such differences. For example, the positive effect of age on the probability of access to rural non-farm employment, contrary to the results obtained in the principal model, whose coefficient reflects a negative impact on non-farm employment. Basically, these results suggest the individuals need a level of experience to have a independent job. Schooling is not significant in the probability of self-employment, but is significant in the self-employment income equation.

According with these results, there is not enough evidence to support that we are in presence of selection sample bias either in the non-farm labor market, nor self-

employed market. That means one can use the whole rural non-farm labor market data

without splitting it and it will not incur in specification errors in the Mincer's equation.

X. CONCLUSIONS AND RECOMMENDATIONS OF POLICY

The recent gains in democratization and economic growth in Paraguay may well be short-lived unless a way is found to relieve the pressure which widespread deprivation can put on the social fabric of Paraguay.

In view of the results and from the point of view of the fight against rural poverty, the principal conclusion affirms that the greater ease of access to non-farm employment and income is concentrated among the less poor rural residents. Individuals with higher levels of schooling have more and better non-farm employment possibilities.

Individuals with their own land have a lower probability of non-farm employment. Meanwhile, migration does not constitute, a priori, a statistically significant factor in the improvement of the level of income of those individuals with rural non-farm employment. For those individuals with large families, it represents a factor which increases the probability of non-farm employment and increases the income from that source.

Access to public services could become an important element in the determination of strategies for rural individuals to generate income given that those who stated that they had electric service had an increased probability of being employed outside of the farm sector. The ownership of machinery and equipment reduces non-farm labor participation.

From this, we are able to present some recommendations for the design and implementation of policies and programs oriented to encourage the development of rural non-farm employment and income.

The comparative advantage of women and the absence of entrance barriers for youths in this type of employment suggest that a strategy of intervention for these groups has a double benefit: potentially greater income for individuals and the incorporation of people who have access limitations in programs of farmer assistance.

Education is a central element for the development of rural non-farm employment. Great attention should be given to education and to training programs that ease the entrance to non-farm activities, given restrictions placed by lack of human resources to put into practice these rural development policies. As experience has demonstrated in Paraguay, public programs of social assistance have not been very effective in increasing participation in non-farm employment. To achieve the retention of rural youths to complete middle school is a challenge that could be translated into greater income for households. Investment in rural education should be directed towards the promotion of wide and generalized technical training plans among youths of rural areas, not only in regular secondary schools, to form a base of workers with the minimum tools that are required in the secondary and tertiary sectors.

Existing studies, such as the Report of the World Bank concerning poverty in Africa[12], attest that the equality of opportunities for women and men can produce economic growth and reduce poverty. Policies and aid programs for rural women should facilitate their access to the salaried job market in agro-industry, commerce and other services. Rural conditions are currently biased in favor of the creation of micro-companies that seem to offer fewer opportunities for rural women.

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[12] World Bank 1999

One result which has been observed in the last few years is the growth of off-farm employment that has accelerated the abandonment of subsistence farms. These farms have traditionally been central to maintaining rural peasant families, with intensive employment of female labor because male family members are absent, working off-farm. It is important to consider policies for reducing poverty from a perspective of gender equality. Employment policies focused on rural women must consider that off-farm employment possibilities are a significant complement to low productivity peasant farms.

In many cases rural development policies have focused on the farm as the principal element of gender strategies. As a result the farms' economic function has improved, but at the cost of additional work requirements for women. These strategies have been linked to the achievement of self-sufficiency as well as to social and community services. Nevertheless, these strategies are short-run and not sustainable, with little possibility of generating substantial changes in the equality of income across genders.

Another argument for encouraging this type of employment is related to the fact that it might be an efficient alternative to the use of contract farm workers. The advance of mechanized agriculture, market inefficiencies, incorrect assignment of land titles, the deterioration of soils and the precarious conditions have forced many peasant workers off of their farms. Nevertheless, secondary sector employment is not a viable alternative to absorb this excess labor either, at least in the short-run. To increase employment in services it will be necessary to increase the capacities of the workers principally though education.

Studies have considered that encouraging the settlement of rural families is an important element of policies to reduce migration. In this sense, the institutionalization and strengthening of the Paraguayan institutions in charge of creating rural settlements and other similar organizations is a crucial challenge. Such strengthening supposes the coordinated work of these institutions with the government departments in charge of executing health, education, security and other programs.

Creation of infrastructure requires the removal of important entry barriers, such as the possibility of rapid and secure movement to the sources of work and a system of communications which permit greater information levels.

Another important strategy is to have a differentiated treatment of the richer and poorer rural zones. In the first zones, the essential item is the reduction of transaction costs which are faced by the agents who develop investments in factors that encourage rural non-farm employment, and by the individuals who participate in non-farm activities. In the poorer zones a more active role of the public sector is required to increase the attractiveness of these zones to the private sector (roads, electrification, other public services), such as a strong focus of public investment in the development of the capacities of individuals to participate in a greater range of reimbursed activities (education, access to credit, activation of the land market, etc.) In addition it is essential to correct the distortion of development projects which promote the initiation of micro-companies and other family or associative enterprises which end up being rural non-farm employment but that are not connected to dynamic markets.

The evidence from other countries also shows that rural non-farm employment must not be thought of as *the* solution for all poor peasants and small land owners whose

potential for farm development is low. In the majority of the marginal zones, the

development of this type of employment can not be visualized as isolated from the

development of agriculture and from the management of natural resources. These zones

are characterized by the absence of factors which encourage the consumption and

production of goods and services. The connection of productive local or regional

development with the social process of generation of policies of rural development is

necessary. A multi-sector vision of productive regional development contains evident

points to connect the process of generating policies which are characterized by being

participative, decentralized and based on local and regional institutions (production

organizations, cooperatives, municipalities and departmental governments) which permit

the negotiation and conservation of multiple sectors.

With the multi-sector focus it is intended to enrich the traditional sector approach

imposed by national institutions and policies. In the local territorial environment the

productive sectors are interrelated and the economic, social and political dimensions are

closely linked. Thinking about territorial development implies referring to all of these

sectors and dimensions and to their mutual relationships. This does not imply that a

significant space should not exist for the farm policies, but simply optimizing these forces

for the development of other forms of income generation.

From a more macro-regional perspective, the need for a deeper institutional

reform emerges, given the existence of institutions with restricted sector vision, in

procedures of top to bottom planning and in centralized policies. The question of how

the Ministry of Agriculture and Livestock and interacts with the Ministry of Industry or

Tourism and with the Municipal or Regional Governments, or with the social committees

at a local level continues to be a pending matter to be resolved. Therefore, the problem is that development of rural non-farm employment is frequently *nobody's land.* At the same time, a concern that still does not have an answer is how these institutions or their policies are oriented towards a closer relationship with the financial credit markets, since those continue having a very strong urban bias.

Part of the institutional reform process is to connect the micro with the macro, the local with the national, with the aim to create channels of communication which serve to aim resources and other aid efficiently, which is very important for the development of the non farm employment at the local level. The knowledge and the local institutions by themselves are not sufficient to think and act in a globalized market scenario, for which it is necessary to resolve how they can be linked effectively to the organization capable of providing access to technical knowledge, to the skills and the networks that are a necessary condition for the participation and competition in more related economies. Besides, and particularly in the poor rural regions, the human and capital resources locally available are insufficient to put into practice the sustained dynamics of growth, of the necessary significance so that they would have an impact on the poverty levels and life quality of households. On the other hand, it is known that the policies that are designed and arranged in a centralized manner are in general simply and clearly inefficient and ineffective. Local instances of public-private negotiation with sufficient authority to influence investment and public expenditure decisions should be created that would help to generate a propitious environment to identify and put into practice strategies for economic growth in the poorest rural zones, complementing the role that the

market performs in those zones that, because of their conditions, there are barriers to

access to this type of employment.

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APPENDIX A

DEFINITION OF THE UTILIZED VARIABLES

Dependent variables

Enoagro: dichotomic variable, value 1, if employed in the secondary and tertiary sector (non-farm employment), value 0, if not.

Inc_rnoa: per capita income of the resident individuals in the rural area, employed in the secondary and tertiary sector (non-farm employment), logarithmic.

Independent variables

Poverty: dichotomic variable, value 1, if below the poverty line, value 0, if not.

Gender: gender of the head of family, value 1 if woman, value 0 if not

SizeH: number of members of the household

Educ: years of schooling

Age: age in years

Language: language spoken at home y the head of family, value 1 if Guarani is spoken, value 0 other languages.

Land: ownership of parcels, dichotomous variable, value 1 if true, 0 if not.

Electr: availability of electricity, dichotomous variable, value 1 if available, 0 if not.

Machinery: ownership of equipment, dichotomous variable, value 1 if true, 0 if not.

Migrat: dichotomous variable, value 0 if resided "here in this same area." Value 1 if not (five years ago)

APPENDIX B

DESCRIPTIVE STATISTICS OF THE UTILIZED VARIABLES

Variable	Mean	Standard Deviation
Poverty	0.3353	0.4722
Gender	0.1340	0.3407
SizeH	4.8531	2.5704
Educ	4.9565	3.2245
Age	45.1731	14.2054
Language	0.7209	0.4486
Land	0.6686	0.4708
Electr	0.8362	0.3701
Machinery	0.4400	0.4965
Migrat	0.1179	0.3225
lambda1	1.3684	0.5366
Lambda2	1.3527	0.5534

Table14: Probit Model – Self-employed rural non-farm employment

Dependent Variable: ERNA_CP
Method: ML - Binary Probit
Included observations: 3859
QML (Huber/White) standard errors & covariance

Variable	Coefficient	Std. Error	z-Statistic	Prob.
Poverty	-0.1498	0.0709	-2.1124	0.0347
Gender	0.7687	0.0676	11.3791	0.0000
SizeH	0.0221	0.0121	1.8235	0.0682
Educ	0.0105	0.0086	1.2155	0.2242
Age	0.0063	0.0021	2.9329	0.0034
Language	-0.2215	0.0624	-3.5483	0.0004
Land	-0.0835	0.0651	-1.2824	0.1997
Electr	0.2381	0.0826	2.8827	0.0039
Machinery	-0.5837	0.0659	-8.8618	0.0000
Migrat	0.0253	0.0846	0.2989	0.7650
C	-1.4765	0.1512	-9.7661	0.0000

Mean dependent var	0.1278	S.D. dependent var		0.3339
S.E. of regression	0.3194	Akaike info criterion		0.6905
Sum squared resid	392.4960	Schwarz criterion		0.7083
Log likelihood	-1321.3254	Hannan-Quinn criter.		0.6968
Restr. log likelihood	-1474.4984	Avg. log likelihood		-0.3424
LR statistic (10 df)	306.3460	McFadden R-squared		0.1039
Probability(LR stat)	0.0000			

Table 15: OLS Model – Self-employed rural non-farm income

Dependent Variable: LOG(INGR_CP)
Method: Least Squares
Included observations: 493
White Heteroskedasticity-Consistent Standard Errors & Covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Poverty	-1.0489	0.1412	-7.4278	0.0000
Gender	-0.8158	0.6232	-1.3091	0.1911
SizeH	0.0986	0.0233	4.2337	0.0000
Educ	0.0326	0.0169	1.9267	0.0546
Age	-0.0142	0.0059	-2.3970	0.0169
Language	-0.2489	0.1915	-1.3003	0.1941
Land	-0.0941	0.1060	-0.8873	0.3754
Electr	0.0508	0.2124	0.2390	0.8112
Machinery	0.0534	0.4095	0.1305	0.8962
Migrat	-0.0730	0.1154	-0.6322	0.5276
Lambda2	-0.3254	0.9576	-0.3398	0.7342
C	14.3163	3.0887	4.6350	0.0000

R-squared	0.3763	Mean dependent var	12.7113
Adjusted R-squared	0.3621	S.D. dependent var	1.0663
S.E. of regression	0.8517	Akaike info criterion	2.5408
Sum squared resid	348.9012	Schwarz criterion	2.6431
Log likelihood	-614.3166	F-statistic	26.3847
Durbin-Watson stat	1.0732	Prob(F-statistic)	0.0000

Table 16: OLS Model – Rural income

Dependent Variable: LOG(INGR_RURAL)
Method: Least Squares
Included observations: 3843
White Heteroskedasticity-Consistent Standard Errors & Covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Age	-0.0124	0.0014	-9.1107	0.0000
Educ	0.0434	0.0055	7.9304	0.0000
Poverty	-1.2193	0.0385	-31.6964	0.0000
SizeH	0.0832	0.0072	11.5580	0.0000
Gender	-0.6296	0.0502	-12.5330	0.0000
Language	-0.5580	0.0402	-13.8880	0.0000
Land	-0.0735	0.0370	-1.9853	0.0472
Land Size	0.0026	0.0005	5.5064	0.0000
Electr	0.0638	0.0426	1.4965	0.1346
Machinery	0.0942	0.0362	2.5988	0.0094
Migrat	-0.0321	0.0515	-0.6235	0.5330
C	13.4422	0.0893	150.4867	0.0000

R-squared	0.4024	Mean dependent var	12.6816
Adjusted R-squared	0.4007	S.D. dependent var	1.2459
S.E. of regression	0.9645	Akaike info criterion	2.7687
Sum squared resid	3563.7451	Schwarz criterion	2.7882
Log likelihood	-5308.0202	F-statistic	234.5536
Durbin-Watson stat	1.7615	Prob(F-statistic)	0.0000

Table 17: OLS Model – Rural farm income

Dependent Variable:
LOG(INRAGR)
Method: Least Squares
Included observations: 2665
White Heteroskedasticity-Consistent Standard Errors & Covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Age	-0.01065	0.00193	-5.51579	0.00000
Educ	0.02433	0.01033	2.35504	0.01859
SizeH	-0.01025	0.00838	-1.22374	0.22116
Gender	-0.73076	0.08108	-9.01259	0.00000
Language	-0.91221	0.06536	-13.95759	0.00000
Electr	0.15388	0.05545	2.77514	0.00556
Land	-0.02208	0.05732	-0.38526	0.70008
Land Size	0.00299	0.00051	5.82133	0.00000
Machinery	0.34061	0.04962	6.86495	0.00000
C	13.36350	0.12956	103.14733	0.00000

R-squared	0.21652	Mean dependent var		12.46502
Adjusted R-squared	0.21387	S.D. dependent var		1.28278
S.E. of regression	1.13737	Akaike info criterion		3.09906
Sum squared resid	3434.53298	Schwarz criterion		3.12115
Log likelihood	-4119.49557	F-statistic		81.52656
Durbin-Watson stat	1.89926	Prob(F-statistic)		0.00000