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Wages and employment in non-farm agricultural activities: a livelihood strategy in Nicaragua.

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Abstract

This article analyzes the indices for nonfarm agricultural activities, which combine agricultural activities with both employment and wages. They were made with panel data of the Living Measurement Standard Survey (1993, 1998, 2001 and 2005) and they were processed with econometric model as a parametric technique (Binary dependent variable model).

The trend indices explain the varied combination of nonfarm and farming agricultural activities. In summary, when the economic public policy makers promote preventative measures in the labour market, we see that indices for nonfarm agricultural activities grow. In fact, small farmers use first, second and third nonfarm employment as livelihood strategies for clashing the public policy restrictive. (Unemployment)

Keywords: RMEA; RMNFA; RSEA; RSENFA; RTEA; RTNFA; RMWAI; RMWNFAI; RSWAI; RSWNFAI; RTWAI; RTWNFAI.

1 Introduction

Nicaragua is a predominantly agricultural country. 28.1 % of the GDP, 15.9 % of the total exports, and the 42.6 % of national employment is given by agricultural sector. The mean features of small farmers are: a) They represent 80 % of total farmers, while they are owners of 24 % of total land; b) They have a 80 % men and 20 % are women, c) Only 0.02 % have a basic education; d) 46 % have a title deed, 16 % are without title deed, 13 % in process of legalization, and the rest other form of possession (NIID, III CENAGRO: 2001).

The paper is structured as follows. The next section reviews the empirical studies conducted by the community of agricultural economists. Methodology is presented in Section 3 and results of the research are showed in section 4.

2 Empirical studies: RNFE and RNFW

In the reviews of empirical studies we find that some studies were based on the concepts of rural, non-farm agricultural, non-farm income, and non-farm employment. Other authors explain the relation between rural employment and non-farm income, the process of suppuration rural poverty, of transformation farming and the livestock sector, and transformation into a modern rural sector. Even they discuss the trend both employment and non-farm income. They also discuss different kind of employment and non-farm income.

The concept ¨non-farm agricultural¨ is used to describe rural farmers in secondary and tertiary sectors where RNFE and RNFW are employment and income indices (Berdegué et al., 2000), others define it as derived from rural area which define the rural non-agricultural economy (RNFAE): activities and incomes. The RNAE is often defined as including all economic activities in rural areas except agriculture, livestock, hunting and fishing (Lanjouw and Lanjouw, 1997). More over ¨Non-Farm¨ is defined as being all those diverse activities associated with waged work or self-employment in work that is not agriculture but located in rural areas (David and Pearce, 2000). During the 1950, the 54 % was employed in agricultural activities of the population of the rural sector of Latin America, however in 1990 only 25 per cent was employed in it (Milicevic, 2000). This is explained by both rural-urban migrations and structural change in rural labour market.

Past investigations in some countries show that RINFA is a high and increasing proportion of the income of rural poor households in the last decade (Berdegué et al., 2000). It is a livelihood[1] strategy. (The both RNFE and RNFW are part of it).

On the other hand, analysis of rural regions of the EU can point to issues of importance for the transitions economies. Outside Central Europe this studies in this field are now being undertaken, since it is recognized that in the longer term the development of the rural non-farm sector is a critical factor in providing rural employment and income (Bleahu and Janowski, 2001; Breischopf and Schreider, 1999; Deichmann and Henderson, 2000; Chaplin, 2000; Sarris et al., 1999).

[1] The concept of livelihood used in this paper is that given by Ellis (1999, p.6): " A livelihood comprises incomes in cash and in kind; the social relations and institutions that facilitate or constrain individual or family standards of living; and access to social and public services that contribute to the well-being of the individual or family."

In countries such as Romania, where agriculture is acting as a buffer against unemployment and hidden unemployment is widespread and increasing (Davis and Pearce, 2000), RNAE is important for poverty reduction.

3 Methodology[2]

In the binary dependent variable model, the dependent variable, y may take on only two values 0-1 y might be a dummy variable representing the occurrence of an event (in our case this is employment), or a choice between two alternatives: employment in agricultural activities or employment in nonfarm agricultural activities. Suppose that we model the probability of observing a value of one as:

$$\Pr\,(y_i = 1\,/x_i, \beta) = 1 - F(-\,x_i^{'}\,\beta) \tag{1}$$

where F is a continuous, strictly increasing function that takes a real value and returns a value ranging from zero to one. The choice of the function F determines the type of binary model. It follows that:

$$\Pr\,(y_i = 0\,/x_i, \beta) = F(-\,x_i^{'}\,\beta) \tag{2}$$

Given such a specification, we can estimate the parameters of this model using the method of maximum likelihood. The likelihood function is given by:

$$l(\beta) = \sum_{i=0}^{n} y_i \log\,(1 - F(-x_i^{'}\,\beta)) + (1 - y_i\,)\log\,(F\big(-\,x_i^{'}\,\beta\big) \tag{3}$$

The first order conditions for this likelihood are nonlinear so that obtaining parameter estimates requires an iterative solution. I use Eviews 5.1 that by default uses a second derivative method for iteration and computation of the covariance matrix of the parameter estimates. There are two alternative interpretations of this specification that are of interest. First, the binary model is often motivated as a latent variables specification. Suppose that there is an unobserved latent variable

$$y_i^{*}\; = x_i^{'}\,\beta + \mu_i \tag{4}$$

where μ_i is a random disturbance. Then the observed dependent variable is determined by whether y_i^{*} exceeds a threshold value:

$$y_i = \begin{cases} 1 & if \quad y_i^{*} \;>\; 0 \\ 0 & if \quad y_i^{*} \;\leq\; 0 \end{cases} \tag{5}$$

In this case, the threshold is set to zero, but the choice of a threshold value is irrelevant, so long as a constant term is included in x_i . Then:

$$\Pr\,(y_i = 1\,/x_i, \beta) = \Pr\;(y_i^{*} > 0) = \Pr\;(x_i^{'}\,\beta + \mu_i\; > 0) = 1 - F_{\mu}(-\,x_i^{'}\,\beta) \tag{6}$$

where F_{μ} is the cumulative distribution function of μ. Common models include probit (standard normal), logit, (logistic), and gompit (extreme value) specification for the F function. In principle,

[2] See table No 1 that shows exchange ratios, annual inflation, farm sample and description variable.

the coding of the two numerical values of y is not critical since each of the binary responses only represents an event. Nevertheless, Eviews require that I code y as zero-one variable. This restriction yields a number of advantages. For one, coding the variable in this fashion implies that y = 1.

$$E\left(\frac{y_i}{x_i},\beta\right) = 1 \cdot \Pr(y_i = 1/x_i,\beta) + 0 \cdot \Pr\left(y_i = \frac{0}{x_i},\beta\right) \quad (7)$$
$$= \Pr\left(y_i = \frac{1}{x_i},\beta\right)$$

This convention provides us with a second interpretation of the binary specification as a conditional mean specification. It follows that we can write the binary model as a regression model:

$$y_i = (1 - F(-x_i,\beta) + \epsilon_i \quad (8)$$

where $\epsilon_i$is a residual representing the deviation of the binary y_i from its conditional mean. Then:

$$E(\epsilon_i/\, x_i,\beta) \quad = 0 \quad (9)$$
$$Var(\epsilon_i/x_i,\beta\,) = 0 \quad F\left(-x_i^{'}\ \beta\right)\left(1 - F\left(-x_i^{'}\beta\right)\right).$$

As Eviews requires a code dependent variable, it is coding as a zero-one. One if the farm employs working economic population in agricultural activities, zero if the farm no employs it. On the other hand, there are two groups for coding independent variables. The first group is for wage and the second is for employment. The first is coding for the salary index x_i .The calculation for x_i is as follows:

$$x_i \ = \sum_{k=1}^{n} \alpha_k * I_k \quad (10)$$

Where, x_i is the monthly real wage index of each farm; α_k is the more important farm or nonfarm agricultural activity "K" and finally I_k is the simple index for the farm activity "K".
The weighting of each farm activity is arrived at by divide it between the total farm wages in a year. It is as follow:

$$\alpha_k \ = \frac{WAGE(k)}{TOTALWAGE} \quad (11)$$

Where, α_k is the participation of each farm activity in the total earnings; $WAGE(k)$ is the income of each farm activity "K"; and $TOTALWAGE$ is the total wage.
The simple index of each farm activity "K" is used to divide the average salary between farm activities in a month during the current period and the annual average in the base year (Central Bank of Nicaragua, 1994).

The data source is the household survey named Living Standards Measurement Survey (LSMS[3]) of the National Institute of Information and Development (NIID). Hence, I make six wage and six employment indicators (See table 1 and 2).

To estimate a binary dependent variable model, I choose a third method: Probit, Logit and Gompit. For Probit:

$$\Pr(y_i = 1|x_i, \beta) = 1 - \emptyset\left(-x_i'\beta\right) = \emptyset\left(x_i'\beta\right) \tag{12}$$

where $\emptyset$ is the cumulative distribution function of the standard normal distribution.
For Logit:

$$\begin{aligned}\Pr\left(y_1 = 1|x_i, \beta\right) &= 1 - \left(e^{-x_i'\beta/}\left(1 + e^{-x_i'\beta}\right)\right) \\ &= e^{-x_i'\beta/}\left(1 + e^{-x_i'\beta}\right)\end{aligned} \tag{13}$$

where is based upon the cumulative distribution function for the logistic distribution.
For Gompit

$$\begin{aligned}\Pr(y_i = 1|x_i, \beta) &= 1 - \left(1 - \exp\left(-e^{x_i'\beta}\right)\right) \\ &= \exp\left(-e^{x_i'\beta}\right)\end{aligned} \tag{14}$$

which is based upon the CDF for the Type-1 extreme value distribution is skewed.

Table 1: Exchange rate, Annual inflation and farm sample

LSMS Years	Exchange rate C$x US	Annual Inflation (%)	Farm sample
1993	6.35	19.5	11,121
1998	11.1938	18.5	11,610
2001	13.8408	4.7	19,755
2005	17.1455	9.58	19,325

Table 2: Coding variables of binary dependent variable model

Code	Variable	Description
WEP	y_i	Working economic population (more than 10 year and less than 60 year)
RMEA	x_1	Rural mean employment in farm agricultural activity
RMENFA	x_2	Rural mean employment in nonfarm agricultural activity
RMWAI	x_3	Rural mean wage index in farm agricultural activity
RMWNFAI	x_4	Rural mean wage index in nonfarm agricultural activity
RSEA	x_5	Rural second employment in farm agricultural activity
RSENFA	x_6	Rural second employment in nonfarm agricultural activity
RSWAI	x_7	Rural second wage index in farm agricultural activity
RSWNFAI	x_8	Rural second wage index in nonfarm agricultural activity
RTEA	x_9	Rural third employment in farm agricultural activity
RTENFA	x_{10}	Rural third employment in nonfarm agricultural activity
RTWAI	x_{11}	Rural third wage index in farm agricultural activity
RTNFAI	x_{12}	Rural third wage index in nonfarm agricultural activity

[3] Living Standards Measurement Survey (LSMS), is widely recognized as a leader in introducing and improving integrated household surveys in developing countries. The LSMS has been an important effort of the World Bank Development Research Group (DECRG) for more than 20 years (World Bank, 2006)

4 Results[4]

4.1 Employment

In the period 1990-1994, the stability of the work force registered important structural changes. This was the result of reduction of the size of the army, conciliation plan of the country, public sector reduction through the application of a plan of occupational conversion, labour mobilization plan, and privatization enterprise process of the area of people ownership. (Central Bank of Nicaragua: 1994-93)

Interestingly, during 1993 to 2005, livelihood strategies were used in Nicaragua as second and third employment in nonfarm agricultural activities. These were RSENFAI, RTENFAI. In contrast RMENFAI was higher than RMEA in 1993; therefore it was lower than RMEA during 1998 to 2005. The working population was employed on rural mean agricultural activity, however RSENFA (-0.78 probit, -1.62 logit and -1.59 gompit) was negative for 1993. Only in 2005 It reach 1.14 probit, 1.99 logit and 2.02 gompit. So, the third nonfarm agricultural activity (RTENFA) appears as a livelihood strategy. It is an increasing trend. For 1993 to 2005 the ratios of them are: probit 1.08, logit 0.66, gompit 0.58. (See Table No 3 and 4). A possible explication to these ratios may be the economic policy of the government. For example: during 1998, Nicaragua experienced the consequences of hurricane Mitch, in the next year, as a result, public investment increased the in infrastructure to manage reconstruction of bridges, highways, schools, health centers, and house destroy by it. Agriculture, construction and trade were the sectors that contributed to employment generation (82 per cent in 1999) (Central Bank of Nicaragua: 1999).

Employment showed unfavorable behaviour in 2001. It was caused by: a) slowing down of economic activity, which was reflected by fall of the GDP growth of 2.5 points less than the previous year, b) supply increase of the labour force, and c) employment informal increased that absorbed part of unemployment hand work due to decrease activity formal sector. (Central Bank of Nicaragua: 2001)

In 2005, the generation of employment shows more dynamism than economic activity. 107,800 new jobs were created, and the increase was 5.5 per cent, in comparison November 2004. (Central Bank of Nicaragua: 2005)

4.2 Salary

The indices for wages show a varied behaviour. The wages in nonfarm agricultural activities had a great weight in 1993. Therefore RMWNFAI, RSWNFAI, RTWNFAI had highest index. In fact, in 1990 the wage(s) policy was focused in deregulation of labour market, consequently, workers became more efficient and productive. Afterwards, this was a wage freeze policy and public sector reduction until 1994 (Central Bank of Nicaragua: 1994). In contrast, the wage in agricultural activities is highlighted as RMWAI, RSWAI in 1998, although the RTWNFAI was an exception.

For 2001, RSWNFAI was the only index in nonfarm agricultural activities. During 2001, paradoxically the real wage experienced a recovery of 7.8 per cent. In contrast these were a slowing down of economic activity and low average productivity of input work factor. The increase is due to low inflation of this year. The minimum legal wage was established in February of this year, as result modest increase of 12 per cent in each and every economic sector, but the livestock and crop sector

[4] See table No 3 and No 4, Fig 1-4

was the exception, where wages increase 22.2 per cent. This sector shows a basket of necessities cover of 47.7 per cent, if we use as a reference the urban basket; however it increases 112 per cent, if we use the cost of the basket rural. (Central Bank of Nicaragua: 2001)

For 2005, only RSWAI is an index representative of agricultural activities. However, RMWNFAI and RTWNFAI are significant of nonfarm agricultural activities. In 2005 the average national wage shows an increase of 15.5 per cent (8.8 per cent in November 2004). The minimum legal wage was agreed in May 2005, as result increase of 16.5 per cent in construction and financial activity, and 15 per cent in other activities. When the tripartite commission considers the coffee sector, so they agree minimum legal wage increase of 26.6 per cent (7.9 per cent in 2004) (Central Bank of Nicaragua: 2005).

References

Berdegué J.A, Reardon, Thomas., Escobar Germán, (2000). Empleo e ingreso Rurales No Agíricolas en América Latina y el Caribe, Documento presentado en la conferencia ¨Development of the Rural Economy and Poverty Reduction in Latin America and the Caribbean. New Orleans, Louisiana, March 24, 2000, in conjunction with the annual meeting of Board of Governors of the Inter-American Devolopment Bank (IDB) and the Inter-American Investment Corporation.

Breitschopf B and Schreider G (1999*) Rural development in transition economies – the cases of two counties in Romania*. Paper presented at the 48th International Atlantic Economic Conference 7-10 October, Montreal.

Bleahu, A., and Janowski, M, (2001) *Factors affecting Household-level involvement in Rural Non-Farm Economic Activities in two communities in Dolj and Brasov judete*, Romania (unpublished mimeo).

Central Bank of Nicaragua, Annual Report, 1993, pp53-63

Central Bank of Nicaragua, Annual Report, 1994, pp55-62

Central Bank of Nicaragua, Annual Report, 1999, pp23-35

Central Bank of Nicaragua, Annual Report, 2001, pp32-40

Central Bank of Nicaragua, Methodological Notes 2004, Economic Indexes, 2004, pp79-83

Central Bank of Nicaragua, Annual Report, 2005, pp32-40

Chaplin, H. (2000*) Agricultural Diversification: A Review of Methodological Approaches and Empirical Evidence*. Imperial College at Wye, University of London: IDARA Working Paper Series 2/2.

Davis, JR and Pearce, D., (2000). The Non-Agricultural Rural Sector in Central and Eastern Europe, forthcoming in *Lerman, Z and Csaki, C. (2001) 'The Challenge of Rural Development in the EU Accession Process' World Bank Technical Publication.*

Deichmann, U. and V. Henderson., (2000) *Urban and Regional Dynamics in Poland*, World Bank Policy Research Working Paper nr 2457.

Ellis, F., (1999),.Rural livelihood diversity in developing countries: evidence and policy implications. Natural Resource Perspectives, Number 40 (April). London: Overseas Development Institute.

Lanjouw JO and Lanjouw P (1997).The rural non-farm sector: an update. Paper presented at the XXIII International Conference of Agricultural Economist (IAAE) on Food security, diversification and resource management: refocusing the role of agriculture 10-16 August, Sacramento, USA.

Mendoza, J. A. 1999. El empleo rural no agropecuario en México. Ponencia al Seminario Latinoamericano sobre Desarrollo del Empleo Rural No Agrícola, Santiago, Chile, Septiembre 1999, BID-FAO-CEPAL-RIMISP.

Milicevic, Xilena (2000). Empleo e ingresos rurales no agrícolas en América Latina.

National Institute of Information and Development, Third Census National Agricultural.2001

National Institute of Information and Development, Leaving Standards Measurement Survey, 2001

Sarris, AH, Doucha T, and Mathijs E(1999) Agricultural Restructuring in Central and Eastern Europe: Implications for Competitiveness and Rural Development. *European Review of Agricultural Economics*, 305-329

World Bank, 2006, LSMS IV: Research for Improving Survey Data. Poverty Group. DECRG. January 2006.

Annex

Table 3: Coefficients estimates of employ and wage in farm and nonfarm agricultural activities, 1993-2005.

Variables/Years	1993			1998			2001			2005		
(x_i)	Probit	Logit	Gompit	Probit	Logit	Gompit	Probit	Logit	Gompit	Probit	Logit	Gompit
RMEA	1.470089	2.572856	2.601692	1.401132	2.417625	2.345989	0.893810	1.472855	1.559175	1.338052	2.329083	2.371879
RMENFA	1.590444	2.830206	2.851500	1.270763	2.094005	2.060985	0.689232	1.128349	1.252336	0.493499	0.907164	0.911871
RMWAI	-1.716324	-2.920215	-2.548186	965001.2	2060463.	1785737.	137.7747	325.2256	325.2384	-2.471437	-3.902101	-3.066340
RMWNFAI	170.1269	389.2862	383.9317	522.1413	1319.606	1286.728	120.2782	215.4956	199.7701	896.1124	2501.936	2482.696
RSEA	-0.061770	-0.154385	-0.284389	-0.157594	-0.299777	-0.285047	0.297087	0.569033	0.562859	0.315907	0.693121	0.680798
RSENFA	-0.784211	-1.620323	-1.591615	0.122382	0.244378	0.251436	0.053983	0.064857	0.064110	1.135830	1.998564	2.026668
RSWAI	2.359666	5.244134	5.256745	162.2619	347.2373	346.6919	2.934938	5.730237	6.308347	2.586968	5.838355	6.038833
RSWNFAI	5.528641	8.441955	6.526376	97.08692	218.1989	212.7193	6.250066	13.27814	13.31218	-0.241149	-0.374830	-0.344859
RTEA	0.155647	0.363882	0.503238	-0.102967	-0.171747	0.220778	0.614111	1.062746	1.130650	0.926361	1.850769	1.918796
RTENFA	0.509797	1.216886	1.318508	-0.104218	-0.169276	0.164376	0.520787	0.923015	1.041407	1.063946	2.019247	2.076700
RTWAI	0.308129	0.565867	0.352063	27.55524	86.88574	168.0323	47.11100	104.3217	104.1752	0.000799	0.003648	0.003356
RTWNFAI	2.621199	3.339305	14.50571	12343.91	47555.44	50129.27	-11.56483	-17.89829	-10.92828	509.4517	1140.684	1115.716

Source: Panel data from LSMS of 1993, 1998, 2001 and 2005.

Table 4: Technical coefficients

Coefficients	1993			1998			2001			2005		
	Probit	Logit	Gompit	Probit	Logit	Gompit	Probit	Logit	Gompit	Probit	Logit	Gompit
Mean dependent variable	0.616298	0.616298	0.616298	0.591239	0.591239	0.591239	0.647978	0.647978	0.647978	0.692419	0.692419	0.692419
Akaike info criterion	1.122964	1.122749	1.164596	1.152923	1.152452	1.174950	1.186226	1.185690	1.246194	0.994323	0.992295	1.042500
Schwarz criterion	1.130861	1.130646	1.172493	1.161329	1.160858	1.183356	1.194352	1.193816	1.254320	0.999210	0-997181	1.0447386
Hannan-Quinn criterion	1.125623	1.125408	1.167255	1.155764	1.155293	1.177791	1.188967	1.188431	1.248935	0.995925	0.993896	1.044101
Obs with Dep=0	4266	4266	4266	4227	4227	4227	3786	3786	3786	5944	5944	5944
Obs with Dep=1	6852	6852	6852	6114	6114	6114	6969	6969	6969	13381	13381	13381
Total obs	11118	11118	11118	10341	10341	10341	10755	10755	10755	19325	19325	19325

Source: Panel data from LSMS of 1993, 1998, 2001 and 2005.

Fig.1 Employ indexes 1993-2005

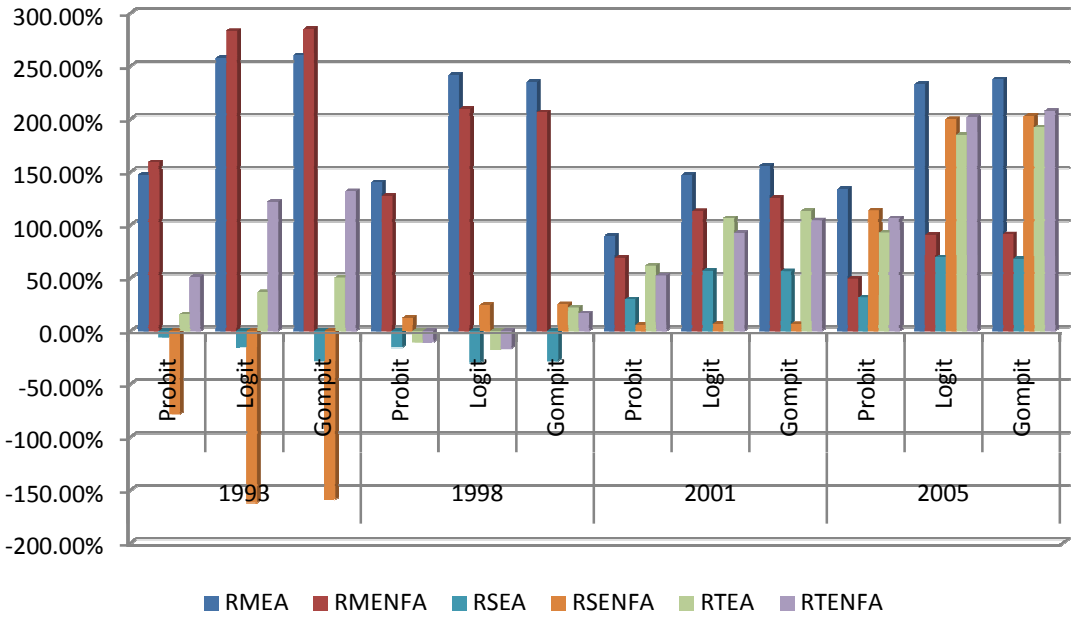
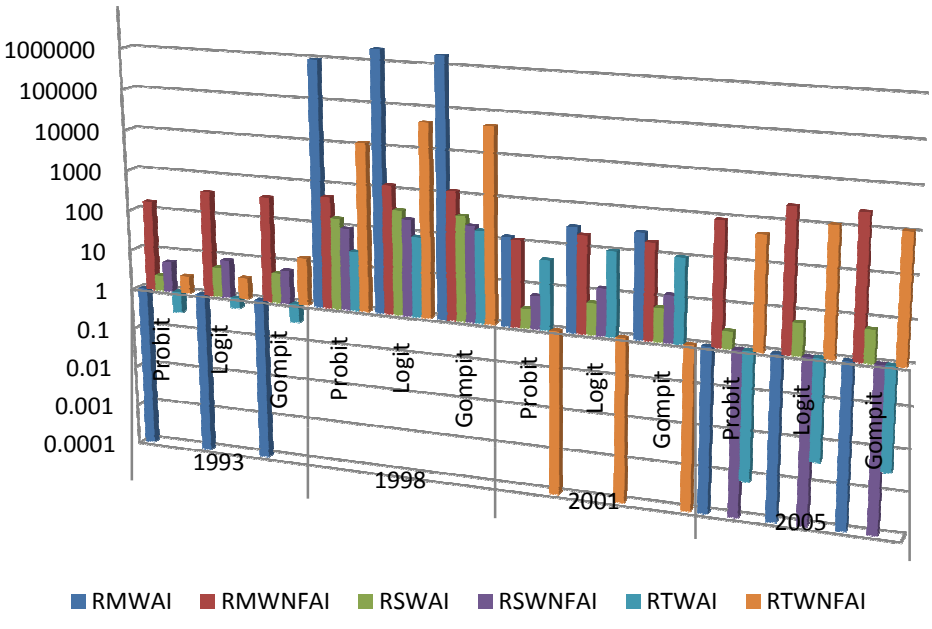


Fig. 2 Real wage indexes 1993-2005



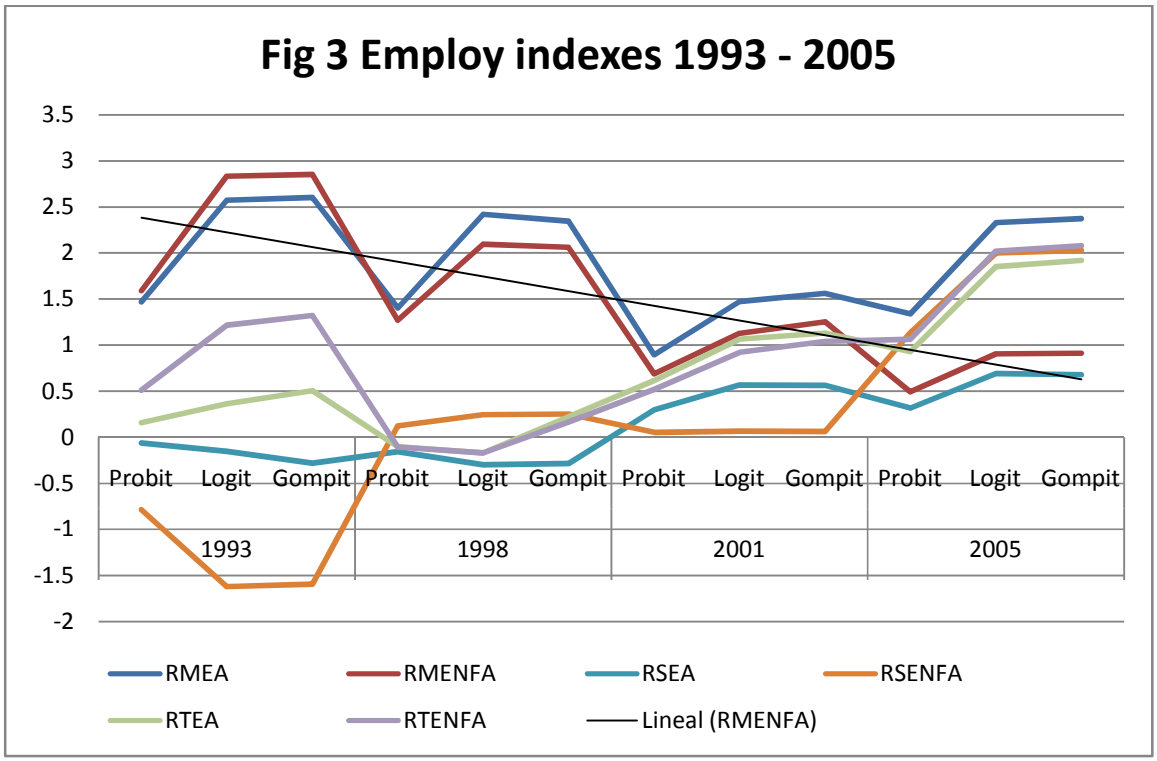


Fig 3 Employ indexes 1993 - 2005
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
Probit Logit Gompit Probit Logit Gompit Probit Logit Gompit Probit Logit Gompit
1993
1998
2001
2005
RMEA
RMENFA
RSEA
RSENFA
RTEA
RTENFA
Lineal (RMENFA)

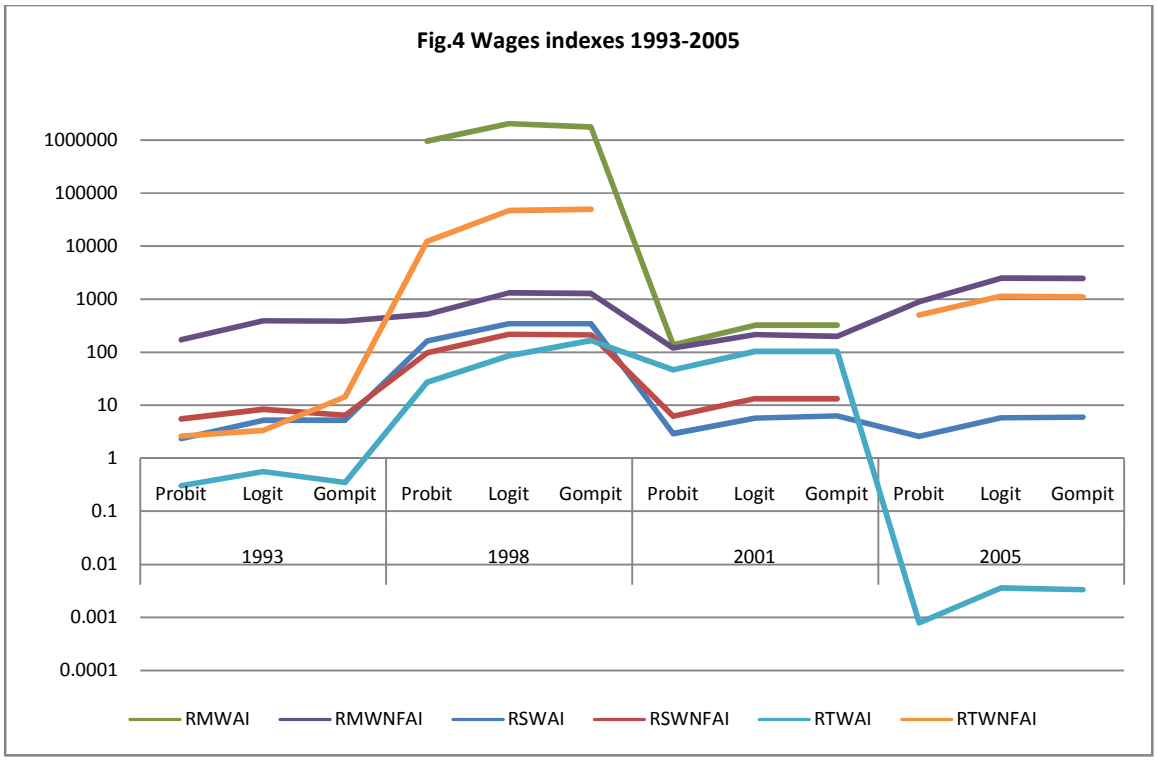


Fig.4 Wages indexes 1993-2005
1000000
100000
10000
1000
100
10
1
0.1
0.01
0.001
0.0001
Probit Logit Gompit Probit Logit Gompit Probit Logit Gompit Probit Logit Gompit
1993
1998
2001
2005
RMWAI
RMWNFAI
RSWAI
RSWNFAI
RTWAI
RTWNFAI