Household Poverty and Vulnerability in Argentina before and after the 2001 Economic Crisis: An Assessment Using Panel Data

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1. Introduction

The situation of poverty in Argentina was aggravated by the economic crisis that took place in December 2001. In situations of crises like that, people are affected differently according to their socioeconomic conditions such as education, gender, region, etc. Aggravation in economic conditions usually brings those people who are more vulnerable to fall below the poverty line. In our study we observed that certain socioeconomic groups are more vulnerable than others[1].

After Argentina suffered a serious economic crisis at the end of 2001, poverty increased to an unprecedented level. The proportion of Argentines who fell below the poverty line jumped from 38.3% in 2001 to 57.5% in 2002. The unemployment rate rose to 20.4%, real consumption fell to 12.8%, real supermarket sales fell to 24.6%, sales of new automobiles fell to 51.3%, construction activity fell to 28.1%, agriculture sector fell to 2.3%, industry sector fell to 13.8% and services sector fell to 9.2%. Household heads with less education and employed in the private sector were more vulnerable than those employed in the public sector.

The financial sector experienced large losses and bankruptcies. The more affected companies were Metrogas (Gas company), Telecom (Telephone company), Aguas Argentinas (Water company), Galicia Bank and foreign banks[2]. Some companies, such as Canadian-owned Scotiabank Quilmes, the French-owned Credit Agricole and the Italian-owned Intesa Bci, left Argentina rather than inject more capital into their ailing businesses.

The statistics show that the impact of shock on poverty varied according to

region. In the northern provinces, which is the poorest region, the percentage increase of poverty was smaller than that of the richer regions, because their modern sectors, such as the industrial sector and financial sector which would be heavily damaged by an economic crisis, had not yet developed to a great extent in this region, hence the impact of economic shock on those sectors was less serious. The impact also varied among the households with different occupations and education levels.

The purposes of this paper are to estimate the vulnerability to poverty of the Argentinean society by taking into consideration the household characteristics which determine the household income level, to identify the determinants of poverty and vulnerability, such as gender, educational level, and occupation, and to draw policy implications for poverty alleviation from the results of estimation.

Most of the existing literature report that poverty level as well as vulnerability to poverty is inversely related to education, i.e., the higher the education, the lower the poverty or the vulnerability to it. Glewwe and Hall (1998) showed that well educated households appear less vulnerable to macroeconomic shocks in Peru. They explained "that education allows individuals to adapt quickly to new economic circumstances".

Suryahadi and Sumarto (2003) pointed out that "education is a determinant of poverty because people with a higher level of educational attainment have a higher chance of getting better and higher paying jobs. Furthermore, if people acquire skills through education, then higher level of educational attainment is associated with higher marginal productivity of labor. Hence, it is expected that education is negatively correlated with poverty".

Morduch (1994), Jalan and Ravallion (2000), Kurosaki (2002), and Chaudhuri et al. (2002) also studied the problem of poverty and vulnerability, and the common conclusion that derives from the literature is that well-educated people are less vulnerable.

The first contribution of this paper is to find evidence that implies a negative relation between education and poverty or vulnerability for Argentina.

This paper also makes a comparison of the poverty and vulnerability of female head households with those of male head households. The World Bank

[2001] pointed out that it was very difficult to conclude that the female house-hold heads were the poorer on the basis of the existing research works, although the survey results in developing countries suggested that a widow's household is more vulnerable. Glewwe and Hall (1998) showed that female household heads were no more vulnerable than male household heads in Peru.

The second contribution of this paper is that we show that female household heads tend to be less poor and vulnerable than male household heads under the economic crises, while women with tertiary education follow a different pattern, showing a higher level of poverty and vulnerability than men with the same education.

As mentioned above, the impact of economic shock on household economy varied among the regions. The third contribution of this paper is that we uncovered the fact that regional differences in the industrial and occupational structure of Argentina were what caused the different impact of economic shock on poverty and vulnerability.

Since the time frame that we selected for our study was inclusive of the period before and after the economic crisis in Argentina, it was possible to observe significant changes in poverty and vulnerability among the different socioeconomic groups.

We applied the one of the standard methods for estimating vulnerability, using the Permanent Household Survey panel data before and after the crisis.

In the next section, we will define the concept of vulnerability we employed and also present the methodology used to evaluate it. In section 3, the empirical model, data description and estimation results of poverty and vulnerability by province will be presented. In section 4, we make a quantitative analysis of the determinants of poverty and vulnerability, focusing on such household characteristics as gender, education and occupation. Section 5 will conclude this paper.

2. The Vulnerability of the Poor
2. 1 Definition of Vulnerability

In this study, the measurement of poverty status of a household is based on simply observing whether the level of income is above or below a pre-selected

poverty line. The household's level for vulnerability measures a probability to be poor in the future for the households with different sets of characteristics.

A crisis situation usually brings more vulnerable people to fall to a level below the poverty line, hence it is clear that such vulnerability is closely related to the socioeconomic condition. On the other hand, there is a chance for some households to either enter or leave poverty, with some remaining poor and others no longer remaining poor. This brings us to the concept of vulnerability to poverty, which is defined as "the risk or probability of falling below the poverty line".[3] For example, currently non-poor households may become poor tomorrow, if they are affected by an adverse shock. The currently poor who are the transitory poor now may become the chronic poor in the future.

2. 2 Theoretical Framework

This section explains the method used to estimate vulnerability[4] and poverty.

"The difference between poverty and vulnerability is the ex-ante risk of falling into the poverty in the future. Poverty is static concept that concerns one's current socioeconomic status, while vulnerability is a dynamic concept that focuses on changes in socioeconomic status"[5].

This method was developed by Chaudhuri et al. (2002), and is briefly explained in this section[6].

By assuming that the stochastic process generating income is[7]:

(1)　　　$\ln i_h = X_h \beta + \varepsilon_h$

where,

i_h is per capita income of household head for each household.

X_h is a vector of household characteristics, such as a household size for each household.

β is a vector of parameters (It is assumed that β is fixed over time. This means that we consider that the structure of economy is relatively stable over time.)

ε_h is a mean-zero disturbance term which captures idiosyncratic factors (shocks) for each household that contribute to differences in per capita income levels among households.

In equation (1), it may be assumed that the idiosyncratic shocks to income are identically distributed across households. However, we do not assume it, because we want to identify the stochastic process generating income by β. This means that we should calculate the variance of ε_h, and then the variance of log of income.

We can define variance of ε_h as:

(2) $\qquad \sigma_{\varepsilon,h}^2 = X_h\theta$

We can also re-write this as,

$$\sigma_{\varepsilon,h} = \sqrt{X_h\theta}$$

There are different methods by which the variance of log income can be calculated. The three-stage feasible generalized least squares (FGLS) method proposed by Amemiya was used to estimate the variance of log income. Although the maximum likelihood estimators are asymptotically more efficient than the three-stage least squares estimator, the consistency of the maximum likelihood depends on an assumption of normality, while the three-stage least squares estimator does not, so this accounts for the attractiveness of the latter.

The description of the three-stage least squares method below is the standard one[8]:

Step 1: Estimate the equation (1), $\ln i_h = X_h\beta + \varepsilon_h$ is calculated, using ordinary least squares (OLS), and compute the residual e_h

Step 2. A: Regress e_h^2 on X_h to obtain the OLS coefficient estimate θ

(2. A) $\quad \hat{e}_{OLS,h}^2 = X_h\theta + \xi_h$

Step 2. B: $FGLS$ is asymptotically more efficient[9] than the estimator based on $\hat{\theta}OLS$. Then, we can obtain the $\hat{\theta}_{FGLS}$ re-estimating the θ_{OLS}, and using the new estimated error covariance

(2. B) $\quad \dfrac{\hat{e}_{OLS,h}}{X_h\hat{\theta}_{OLS}} = \left[\dfrac{X_h}{X_h\hat{\theta}_{OLS}}\right]\theta + \dfrac{\xi_h}{X_h\hat{\theta}_{OLS}}$

We are able to estimate,

$$\hat{\sigma}_{\varepsilon,h} = \sqrt{X_h\hat{\theta}_{FGLS}}$$

Step 3: Re-estimate equation (1), using $\dfrac{1}{\sqrt{X_h\hat{\theta}_{FGLS}}}$

(3) $$\frac{\ln i_h}{\sqrt{X_h \hat{\theta}_{FGLS}}} = \frac{X_h}{\sqrt{X_h \hat{\theta}_{FGLS}}} \beta + \frac{\varepsilon_h}{\sqrt{X_h \hat{\theta}_{FGLS}}}$$

Assuming that the ln (income) is normally distributed, we can estimate the probability that households with characteristic x_h will be below poverty line.

The probability that the household with characteristic X_h will be poor can be estimated by the equation (4)

(4) $$\hat{v}_h = \hat{Pr}(\ln i_h < \ln L \mid x_h) = \Phi\left[\frac{\ln i - X_h \hat{\beta}}{\hat{\sigma}_{\varepsilon,h}}\right]$$

where:

Φ is a cumulative density of the standard normal distribution

i_h is a probability that the per capita income level will be lower than the poverty line L conditional on household characteristics

$X_h \hat{\beta}$ is an estimate of expected log income

$\hat{\sigma}_{\varepsilon,h}$ is a standard error of log income

The next step in the analysis is to use the estimated degree of vulnerability in combination with the household's current income level and household's estimated expected income level to clarify each household into different categories of poverty and vulnerability, as shown in Figure 1.

Finally, as a result of this process, we can obtain five groups of households: I) the poor group (A+B+C) can be disaggregated into the Chronic Poor (A)[10]

Degree of Vulnerability*		Household's Current Income			Household's Expected Income
		Poor	Non Poor		
	V>0.5	A	D	E[i]<L	
		B	E	E[i]>L	
	V<0.5	C	F		

I) Poor=A+B+C

II) Non Poor=D+E+F

III) Total High Vulnerability Group=A+B+D+E

IV) Low Vulnerability Group=C+F

V) Total Vulnerability Group=A+B+C+D+E

Chronic Poor=A

Transitory Poor=B+C

High Vulnerability Non Poor=D+E

Low Vulnerability Non Poor=F

Low Level of Income=A+D

High Variability of Income=B+E

E[i]=Expected income

L=Poverty line

Source: Suryahadi A. and Sumarto S. (2003)

Figure 1, Poverty and Vulnerability Category

and the Transitory Poor (B+C)[11]; II) The Non Poor (D+E+F) is defined as a combination of High Vulnerability Non Poor (D+E) and Low Vulnerability Non Poor (F); III) High Vulnerability Group (A+B+D+E) is divided into two subgroups: Low Level of Income (A+D); IV) Low Vulnerability Group (C+F), and V) the Total Vulnerability Group (A+B+C+D+E) that consists of a high vulnerability group[12] and the currently poor. In this paper, we assume that high vulnerability is >0.5, and low vulnerability is <0.5 (Pritchett et al. [2000]).

3. Empirical Analysis

3.1 Empirical Model and Data

Having verified the required assumptions, we now proceed to estimation. Using my data, the estimation regression is:

$$(1) \quad \frac{\ln i_h}{\sqrt{X_h\hat{\theta}}} = \beta_0 + \frac{x_1}{\sqrt{X_h\hat{\theta}}}\beta_1 + \cdots\cdots \frac{x_9}{\sqrt{X_h\hat{\theta}}}\beta_9 + \frac{\varepsilon_h}{\sqrt{X_h\hat{\theta}}}$$

Here,

x_1: family size

x_2: proportion of household members in the age >14 or <14 (proportion of adults in the household)

x_3: a household head is single or married

x_4: age

x_5: age squared of a household head

x_6: education level of a household head (primary, secondary and tertiary education) (Dummy Variable)

x_7: a household head is male or female

x_8: a household head is employed in industry, construction, public sector or services (Dummy Variable)

x_9: a head household is a salaried worker or a self employed worker (Dummy Variable).

The data on household characteristics and income come from the Argentina Permanent Household Survey. The survey is conducted in urban areas every year in May and October by INDEC[13]. Our empirical analysis uses the Permanent Household Survey panel data to identify the socioeconomic vulnerable groups

during the economic shock that Argentina experienced in 2001. The periods ana-
lyzed are May 2001 and May 2002, that is, before and after the economic crisis.
In this study, the May 2001 dataset had 17295 household observations while the
May 2002 dataset had 17356 household observations located in 21 conglomerations[14].
The Permanent Household Survey was extended from the Greater Buenos Aires
metropolitan area (started in 1974) to 31 large urban areas (2 conglomerates
were included in 2002). The country is divided into 23 provinces, and the last 2
conglomerates that joined the Permanent Household Survey were Trelew-Rawson
(representing the Chubut province) and Viedma-Patagones (representing the Rio
Negro province). Therefore, these two provinces were omitted from the analysis.

3. 2 Incidence of Chronic Poor and Vulnerability by Region

　　The empirical results can be verified by Table 1, which shows the distribution
of the population by poverty category and vulnerability across the provinces
before the crisis in 2001. Table 2 shows these data after the crisis 2002, and Table
3 and 4 show the changes between the two periods. In these tables, provinces are
arranged according to the incidence of the total poverty groups, from the lowest
to the highest. As shown in these tables, the proportions of the poor and the
vulnerable groups in the population vary hugely across the provinces.

　　From Table 1, in 2001 the total poor ranged from 13.56% of the population
in Tierra del Fuego (high income province that belongs to the South region) to
61.92% in Chaco province (low income province that belongs to the North re-
gion). The table also shows that there was very low incidence of the chronic poor
in Tierra del Fuego and Santa Cruz (high income provinces), but that the inci-
dence of the chronic poor in Chaco, Misiones, Jujuy, and Formosa was very high
(low income provinces). A similar pattern was observed in the total high vulner-
ability group, where the whole proportion was 9.60% in Tierra del Fuego and
64.57% in Chaco. In 2001, the transitory poverty was much greater than the
chronic poverty in every province. The worst incidence was found in Chaco,
Misiones, Jujuy and Formosa, where more than 20% of the population was
chronically poor, and almost 30% was in transitory poverty. These numbers
indicate that half of the population was poor in these provinces. On the other

hand, Tierra del Fuego and Santa Cruz had the lowest incidence in poverty (less than 16%). According to the table, the proportion of transitory poor across regions is not so different, ranging from approximately 23% to 25.8% (except of Tierra del Fuego and Santa Cruz) while the proportion of the chronic poor differs widely among regions, ranging from 0.94% to 36.09%. The total high vulnerability group indices follow a similar tendency for the total poor.

Table 2 (after the economic crisis) shows that Tierra del Fuego and Santa Cruz retained the lowest percentages in poverty and in the total vulnerability group, while Chaco, Formosa, Misiones and Jujuy retained the highest percentage in poverty and also in the total vulnerability group. All the provinces experienced a significant increase in poverty and total vulnerability. In Tierra del Fuego, the total poverty increased from 13.56% (2001) to 23.51% (2002), while in Chaco the percentage of the total poverty increased from 61.92% (2001) to 77.54% (2002). These numbers clearly indicate the significant impact of the crisis in increasing the poverty and the total vulnerability group. One noticeable feature in the indices of the transitory poor is that there was an approximation

Table 1 Poverty and Vulnerability Categories by Province, 2001

Province	Poor			High Vulnerability Group			TVG
	TP	CP	Total	LLI	HVI	Total	
T. del Fuego	12.62	0.94	13.56	1.32	9.60	10.92	20.90
Santa Cruz	15.32	0.63	15.96	0.79	6.48	7.27	18.80
La Pampa	24.33	4.97	29.31	6.04	16.16	22.20	35.70
Neuquen	23.10	6.82	29.92	15.97	17.05	33.02	38.45
Cordoba	23.19	8.49	31.69	9.25	18.48	27.73	43.85
Buenos Aires	25.33	6.89	32.21	7.56	15.52	23.08	38.80
Mendoza	27.17	11.00	38.17	11.66	21.56	33.22	47.96
Entre Rios	25.87	12.38	38.25	12.38	22.38	34.76	45.71
San Luis	27.62	10.69	38.31	19.56	22.78	42.34	47.38
Santa Fe	28.16	10.35	38.51	13.08	26.83	39.91	52.33
Catamarca	25.98	12.91	38.90	25.83	22.52	48.35	49.13
La Rioja	33.33	8.46	41.79	8.79	24.54	33.33	49.09
S. del Estero	27.77	16.85	44.62	17.32	27.15	44.46	55.69
San Juan	37.29	7.49	44.77	8.44	31.09	39.53	55.30
Salta	29.39	18.52	47.91	19.08	27.02	46.10	59.05
Tucuman	30.36	17.58	47.94	29.29	18.51	47.80	60.59
Corrientes	31.33	16.70	48.02	17.04	27.02	44.06	56.11
Misiones	28.37	21.54	49.91	22.08	28.55	50.63	61.58
Jujuy	33.02	20.48	53.49	21.59	32.22	53.81	64.76
Formosa	31.21	23.05	54.26	24.47	28.72	53.19	67.08
Chaco	25.83	36.09	61.92	36.75	27.81	64.57	51.58

Source: Calculated by the Author. Data from INDEC. TP: Transitory Poor, CP: Chronic Poor, LLI: Low Level of Income, HVI: High Vulnerability Income, TVG: Total Vulnerability Group.

Table 2　　Poverty and Vulnerability Categories by Province, 2002

Province	Poor			High Vulnerability Group			TVG
	TP	CP	Total	LLI	HVI	Total	
T. del Fuego	19.78	3.73	23.51	4.01	13.00	17.01	29.88
Santa Cruz	24.01	4.27	28.28	4.90	14.85	19.75	34.60
La Pampa	26.46	16.36	42.83	17.17	23.43	40.61	53.74
Neuquen	26.52	18.28	44.80	32.08	29.21	61.29	60.93
Mendoza	27.95	21.57	49.52	22.74	26.78	49.52	63.34
Buenos Aires	31.31	19.57	50.88	20.79	24.28	45.08	56.82
Cordoba	27.80	23.94	51.74	24.58	26.00	50.58	64.48
Entre Rios	28.45	24.78	53.23	25.48	28.27	53.75	64.57
Catamarca	32.09	21.87	53.96	22.30	32.95	55.25	68.78
San Luis	35.12	19.44	54.56	20.44	34.13	54.56	66.60
Santa Fe	27.93	27.52	55.44	28.54	27.10	55.65	67.35
La Rioja	29.95	26.84	56.79	35.02	33.22	68.25	68.74
S. del Estero	29.56	30.03	59.59	30.03	30.66	60.69	71.86
Salta	24.34	35.50	59.84	35.97	28.99	64.96	73.33
Tucuman	33.06	30.01	63.07	30.57	34.16	64.73	75.38
San Juan	28.61	34.55	63.17	36.83	32.57	69.41	79.00
Corrientes	27.26	35.95	63.21	36.62	31.77	68.39	77.59
Jujuy	30.86	34.49	65.36	35.40	33.43	68.84	77.31
Misiones	24.90	41.90	66.80	43.52	34.41	77.94	84.41
Formosa	26.73	43.18	69.91	43.55	36.07	79.63	87.29
Chaco	21.63	55.91	77.54	56.91	22.63	79.53	75.00

Source: Calculated by the Author. Data from INDEC. TP: Transitory Poor, CP: Chronic Poor, LLI: Low Level of Income, HVI: High Vulnerability Income, TVG: Total Vulnerability Group.

across provinces without exception.

　　Another important feature is that in the provinces of Cordoba, Santiago del Estero, Salta, Corrientes, Jujuy, Misiones and Formosa the proportion of the chronic poor surpassed the proportion of the transitory poor. Further, not only the proportion of total poverty increased but also the proportion of households with expectation of low income increased. Overall the proportion of the total vulnerability group ranged from approximately 30% to 87%.

3. 3 Proportion Changes in Poverty and Vulnerability by Province

　　Table 3 and Table 4 list the provinces according to percentage change in proportion of the total poverty and proportion of the total vulnerability group. Table 3 shows that the percentage change in the proportion of the transitory poor presented a great disparity across regions. Tierra del Fuego, Santa Cruz, San Luis, Buenos Aires and Catamarca showed the highest changes in a range varying from 23.5% to 113.4%, while Salta, Chaco, Formosa, Corrientes, Misiones

and La Rioja showed negative changes varying from −17.2% to −10.1%.

These results are consistent with similar studies (see Suryahadi and Sumarto, 2003, for example) which showed that the transitory poor were likely to diminish in the poorest provinces, while they are likely to increase in the richest provinces. This confirms that the crisis had a greater impact on the big cities and high income provinces rather than the poor provinces. This result is consistent, because the more affected sector was the financial sector that was concentrated in the former provinces. Generally, individual bank depositors in Argentina are middle class. As a consequence of the crisis, those persons became the transitory poor. On the other hand, poor people in Argentina have no bank deposits to begin with, therefore, in the poor provinces the transitory poor did not increase. However, those who had been the transitory poor then became the chronic poor.

Similar results can be found in the changes of the chronic poor, whose percentage change was the highest in Tierra del Fuego, Santa Cruz and Cordoba, while it was the lowest in Chaco, Jujuy, Catamarca and Tucuman. The total poverty proportion change, by consequence, was the highest in the richest provinces of Tierra del Fuego, Cordoba, Santa Cruz and Buenos Aires, while it was lowest in the provinces of Chaco, Jujuy, Salta and Formosa. This is because the incidence of the chronic poor in most of the big cities and high income provinces before the crisis was small in comparison with the poor provinces. As a result, we can conclude that the incidence of percentage change in poverty was higher in big cities and high income provinces.

Table 3 Proportion Changes in Poverty by Province 2001/2002

Province	% Change in Poverty Proportion		
	Transitory Poor	Chronic Poor	Total
Jujuy	−6.50	68.40	**22.20**
Salta	−17.20	91.70	**24.90**
Chaco	−16.25	54.90	**25.22**
Formosa	−14.40	87.30	**28.80**
Mendoza	2.90	96.10	**29.70**
Tucuman	8.90	70.70	**31.60**
Corrientes	−13.00	115.30	**31.60**
S. del Estero	6.40	78.20	**33.50**
Misiones	−12.20	94.50	**33.80**
La Rioja	−10.10	217.30	**35.90**
Catamarca	23.50	69.40	**38.70**
Entre Rios	10.00	100.20	**39.20**
San Juan	−23.25	361.40	**41.08**
San Luis	27.20	81.90	**42.70**
Santa Fe	−0.80	165.90	**44.00**
La Pampa	8.80	229.20	**46.10**
Neuquen	14.80	168.00	**49.70**
Buenos Aires	23.60	184.00	**58.00**
Sta. Cruz	56.70	577.80	**77.20**
Cordoba	14.90	350.20	**104.70**
T. del Fuego	113.40	1,673.70	**144.70**

Source: Calculated by the Author.

Table 4　Proportion Changes in Vulnerability by Province 2001/2002

| Province	% Change in High Vulnerability Group Proportion			% change in TVG
	LLI	HVI	Total	
Chaco	54.82	−18.64	**23.18**	**31.23**
Jujuy	64.00	3.50	**27.90**	**19.40**
Salta	88.50	7.30	**40.90**	**23.20**
Tucuman	4.40	84.50	**35.40**	**24.40**
Santa Fe	118.20	1.00	**39.40**	**28.70**
S. del Estero	73.40	12.90	**36.50**	**29.00**
Formosa	78.00	25.60	**49.70**	**30.10**
Mendoza	95.00	24.20	**49.10**	**32.10**
Misiones	97.10	20.50	**53.90**	**37.10**
Corrientes	114.90	17.60	**55.20**	**38.30**
Catamarca	−13.70	46.30	**14.30**	**40.00**
La Rioja	298.40	35.40	**104.80**	**40.00**
Sta Luis	4.50	49.80	**28.90**	**40.60**
Entre Rios	105.80	26.30	**54.60**	**41.30**
San Juan	336.55	4.76	**75.57**	**42.86**
Cordoba	322.90	35.80	**131.60**	**47.30**
Buenos Aires	175.00	56.40	**95.30**	**48.40**
La Pamoa	184.30	45.00	**82.90**	**50.50**
Neuquen	100.90	71.30	**85.60**	**58.50**
T. del Fuego	955.30	50.10	**88.20**	**82.40**
San. Cruz	520.30	125.70	**171.70**	**84.00**

Source: Calculated by the Author. Data from Indec. LLI: Low Level of Income, HVI: High Vulnerability Income, TVG: Total Vulnerability Group.

From Table 4, we can verify that the richest provinces suffered the highest changes of the Total Vulnerability Group, while the poorest suffered the lowest. This means that the increase was proportionally much higher in big cities and high income provinces. The poor provinces have a much higher proportion of both the transitory and the chronic poor, compared to other provinces. Therefore, the poorest provinces suffered the lowest change of total vulnerability. This result is consistent because those who are already poor have no risk or probability of falling below the poverty line.

4. Determinants of Poverty and Vulnerability: Gender, Education and Occupation

4.1 Determinants of Poverty and Vulnerability Levels

Poverty and education are known to be closely related to each other. Less educated people have a higher risk of becoming poor, because better educated people can find better jobs with higher payment. Figure 2 clearly shows that the

Poverty Level by Education and Gender
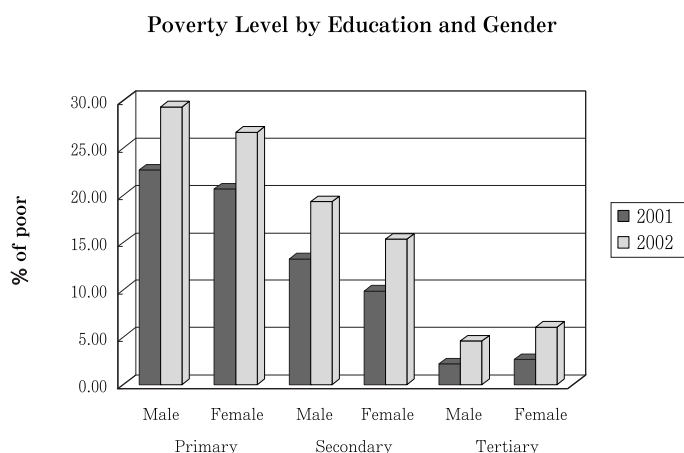
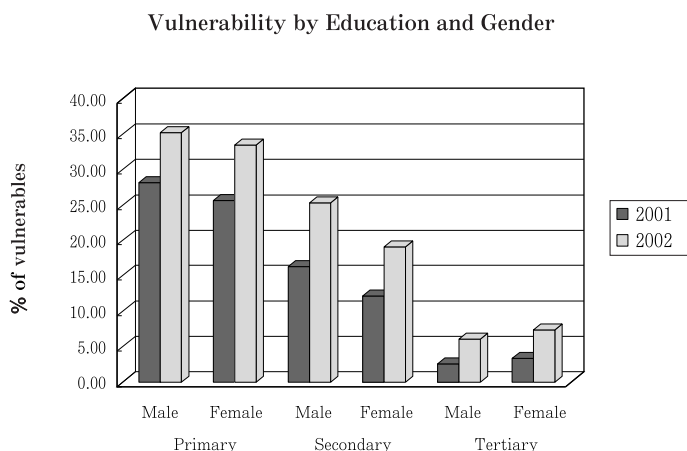Source: Calculated by the Author.

Figure 2

poverty rate of the household with less education becomes higher. The proportion of the poor among women with primary and secondary education is lower than that among men. However, in tertiary education, female household heads show a slightly higher poverty rate than male household heads. After the crisis, the data show an increase in poverty rate throughout the categories.

It is remarkable that, with the exception of people with tertiary education, the female household heads show lower rates of poverty than men. This result is interesting because it contradicts the general idea that women have lower salaries, and face a higher unemployment rate than men. Another interesting feature is that this picture changes with tertiary education, in which the proportion of women below the poverty line is higher than that of men.

4. 2 Determinants of Changes in Poverty and Vulnerability

Figure 3 shows that female household heads with primary and secondary education were less vulnerable than male household heads. On the other hand, in tertiary education the female household heads tend to be slightly more vulnerable than male household heads. Vulnerability also increased in all the categories after the crisis. It is noteworthy that the poverty and vulnerability proportions have a positive correlation with educational levels.

Vulnerability by Education and Gender

Source: Calculated by the Author.

Figure 3

As we have shown in the previous section, the percentage change in poverty and vulnerability were higher in the higher income provinces. But what about the regional differences of absolute change? What are the determinants of absolute change?

To examine the determinants of the changes, we made a simple regression analysis by OLS.

We specified the regression equations as follows,

$$Y = \alpha_0^i + \alpha_1^i X_1 + \alpha_2^i X_2 + \alpha_3^i X_3 + \alpha_4^i X_4 + \varepsilon$$

Y : Absolute Change of Poverty or Vulnerability Index

X_1 : Gender Dummy, if household head is male, =1, otherwise, =0

X_2 : Education Level Dummy, if educational level of household head is elementary, secondary or tertiary, respectively =1, otherwise=0

X_3 : Type of Job Dummy; if type of job of household head is industry, construction, public sector or service worker, respectively = 1, otherwise=0

X_4 : Type of Salary Dummy; if type of salary of household head is salaried wage or self-employed, respectively = 1, otherwise = 0

ε : Error term

i : Region: Northern, Central, South

The results of estimation are shown in Table 5 and 6.

Table 5 shows that education had a negative effect on absolute poverty changes. Household heads with tertiary education suffered lower changes in poverty in all the regions. Overall, the more educated suffered lower changes in poverty.

For type of jobs, the estimated parameters of modern types of jobs showed a positive effect on absolute poverty changes in the Central region, while in North and South regions these effects were not so significant. This is because the economic structure is more industrialized and the modern sectors such as the manufacturing sector and financial sector which are more vulnerable to economic shock, are concentrated more in this region than the others.

Another interesting finding is that the estimated parameters of female household heads showed negative effects on changes in poverty in all the regions although they are not significant.

The analysis of the change in vulnerability shows similar results, that is, that education had a negative effect on absolute vulnerability changes. Types of job had a positive effect on vulnerability change with the exception in the North

Table 5 Change in Poverty

Dependent Variable; Change in Poverty	North Region		Central Region		South Region		Whole Country	
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
Gender	0.025	0.014	0.000	0.016	0.016	0.039	**0.019**	**0.010**
Education Level of the Household Head								
Primary	−0.023	0.041	0.268**	0.031	−0.179	0.144	**0.002**	**0.024**
Secondary	−0.044**	0.013	−0.016	0.014	0.086*	0.033	**0.040**	**0.009**
Tertiary	−0.086**	0.022	−0.085**	0.020	−0.209**	0.064	**0.088**	**0.015**
Type of Job								
Industry	−0.081**	0.025	0.076**	0.021	0.092	0.075	**0.045**	**0.016**
Construction	0.047	0.212	0.104**	0.023	0.210**	0.056	**0.091**	**0.015**
Public Sector	0.038	0.023	0.138**	0.026	0.063	0.063	**0.053**	**0.016**
Service	0.043*	0.018	0.069**	0.017	0.114*	0.054	**0.062**	**0.012**
Type of Salary								
Salary	0.038*	0.018	−0.038*	0.017	−0.083	0.048	**0.009**	**0.012**
Self-employment	0.014	0.019	−0.028	0.019	−0.138*	0.054	**0.020**	**0.013**
Observations		2250		1750		342		4342
R^2		0.034		0.034		0.141		0.031

North Region: Jujuy, Salta, Tucuman, S. del Estero, Catamarca, La Rioja, Formosa, Chaco, Misiones and Corrientes.
Central Region: Buenos Aires, Cordoba, Santa Fe, Mendoza, Entre Rios, La Pampa, San Juan and San Luis.
South Region: Neuquen, Santa Cruz and Tierra del Fuego.
*indicates significance at 5 per cent level; **indicates significance at 1 per cent level.
Source: Calculated by Author.

Table 6 Change in Vulnerability

Dependent Variable; Change in Vulnerability	North Region		Central Region		South Region		Whole Country	
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
Gender	0.026*	0.012	−0.009	0.014	−0.015	0.033	**0.015**	**0.009**
Education Level of the Household Head								
Primary	−0.041	0.036	0.031	0.028	0.116	0.116	**0.000**	**0.022**
Secondary	−0.025*	0.011	−0.009	0.012	−0.073**	0.028	**0.027**	**0.008**
Tertiary	−0.069**	0.019	−0.060**	0.018	−0.196**	0.058	**0.065**	**0.013**
Type of Job								
Industry	−0.030	0.022	0.063**	0.019	0.103	0.069	**0.028**	**0.015**
Construction	0.042**	0.019	0.085**	0.021	0.203	0.497	**0.079**	**0.014**
Public Sector	0.009	0.020	0.132**	0.022	0.067	0.056	**0.048**	**0.014**
Service	0.040*	0.016	0.057**	0.015	0.125**	0.049	**0.055**	**0.011**
Type of Salary								
Salary	0.209**	0.016	−0.042**	0.015	−0.102*	0.044	**0.019**	**0.011**
Self-employment	0.013	0.017	−0.029	0.017	−0.108*	0.048	**0.020**	**0.012**
Observations		3115		2237		452		5804
R^2		0.02		0.034		0.10		0.015

North Region: Jujuy, Salta, Tucuman, S. del Estero, Catamarca, La Rioja, Formosa, Chaco, Misiones and Corrientes
Central Region: Buenos Aires, Cordoba, Santa Fe, Mendoza, Entre Rios, La Pampa, San Luis and San Juan
South Region: Neuquen, Santa Cruz and Tierra del Fuego
*indicates significance at 5 per cent level; **indicates significance at 1 per cent level.
Source: Calculated by Author

region where industry showed a negative effect.

From Table 6 also we can also observe that overall, female household heads were not more vulnerable than the male. This finding is similar to that of Glewwe and Hall as mentioned in section 1.

These estimation results suggest that education had a negative effect on absolute poverty and vulerability changes regardless of regional difference while the type of jobs like industrial, construction and service workers did have distinctly opposite effects on them in the Central region. On the other hand, we cannot find that gender gap had a significant effect on absolute poverty and vulnerability changes for all regions.

5. Conclusion

In this paper, we presented evidence to suggest that education, gender and industrial or occupational structure have affected poverty and vulnerability in Argentina. We find that an educational level has a negative correlation with poverty level and vulnerability to poverty as well as with the change in poverty

level and the vulnerability to poverty, and that more educated household heads had lower poverty levels as well as vulnerability to poverty. In addition, the more educated suffered smaller changes in the poverty levels as well as vulnerability to poverty.

We also find that in the overall picture, male household heads are poorer and more vulnerable than female household heads, although in the case of tertiary education, women are slightly poorer and more vulnerable than men.

Finally, the comparison among regions revealed that the impact of education on the absolute changes of poverty and vulnerability are alike in the cases of poverty and vulnerability levels for all regions while the types of occupation had significantly positive impact on the absolute changes only in the Central region. For gender, we cannot find any significant difference in its impact on them for almost all regions.

These fact findings suggest that the regional differences in the impact of economic crisis on poverty and vulnerability have been created by the regional differences in occupational or industrial structure but not by educational or gender gap.

Therefore, in order to alleviate poverty and vulnerability, the central and local governments should separately consider the transitory poor and the chronic poor when formulating their poverty reduction policies. Specifically, for the transitory poor suffering from the shock of unpredictable events such as economic crisis, the governments should implement short-term emergency measures such as income compensation. But for the chronic poor, they must implement medium- or long-term policies which aim at the reduction of the regional differences in industrial structure and educational level, such as industrial and regional development policies that invite labor intensive industry into the Northern region and new educational policies that increase school attendance at the secondary level in the poorer provinces.

Notes

1. Vulnerability can be defined as the possibility that 'today's poor may or may not be tomorrow's poor.
2. For example, Bank of America's losses from operations in Argentina were $267 million in 2002, Citigroup $235 million in 2001 and 1.704 billion in 2002 and Fleet Boston Financial $1.1 billion in

2001 and \$1.3 billion in 2002, etc. (Saxon 2003).

3. Chaudhuri et al. (2002), p.2.

4. Vulnerability is defined as the risk or probability of falling below the poverty line in the near future.

5. Mansuri G. and Healy A., "Vulnerability Prediction in Rural Pakistan", World Bank Development Research Group and MIT Department of Economics, p.2.

6. For more details of the method, see Chaudhuri et al., 2002, pp.23-24

7. For the definition see Morduch (1994), p.221.

8. Hayashi F. (2000), *Econometrics*, Princeton University Press, Chapter 2.

9. The $\hat{\theta}FGLS$ is more efficient than $\hat{\theta}OLS$, because the $\hat{\theta}FGLS$ estimation procedure can be iterated. This means $\hat{\theta}FGLS$ that the estimation is repeated until the estimates do not change.

10. The Chronic Poor are the currently poor who have an expected income level below the poverty line, and most likely will remain poor in the future.

11. The Transitory Poor are the poor who have an expected consumption level above the poverty line. Some of the Transitory Poor have low vulnerability, but some of them have high vulnerability.

12. A high vulnerability group is a group of people who are currently non poor, but has relative large chances of falling into poverty in the near future.

13. Instituto Nacional de Estadisticasy Censos.

14. Conglomerate covers all large urban areas, where each observation represents one province.

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