

Double Difference Approach to Impact Evaluation: Case of the Effects of the Comprehensive Agrarian Reform Program (CARP) on Poverty

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Abstract: The Comprehensive Agrarian Reform Program of the Philippines has been one of the major programs of the government since its implementation in 1988. Over the years, a considerable amount of financial resources has been spent for the program that an impact evaluation is merited. Studies have established the impact of the program on some outcome variables like income and poverty. However, the studies done were limited to either a temporal comparison between the period before and after the program or a comparison between the beneficiaries and non-beneficiaries of the program. This study explored the double difference approach to verify the findings of the previous studies. The paper showed that the findings based on either the before-after or with-without comparison were not validated with the double difference approach. The paper recommends that further research be done with a more rigorous design to ensure validity of the estimation of the impacts of the program

Keywords: *agrarian reform, rural development, impact evaluation, double difference, logit regressions*

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INTRODUCTION

Agrarian reform programs in the country have been initiated to mitigate peasant unrests associated with poverty and inequality. The conceptual basis for these interventions is anchored on the argument that in an agrarian community, economic surplus is generated from the exploitation of land as the primary productive resource (Putzel, 1992). The economic surplus is a consequence of the nature of access, use, and sharing of benefits from the exploitation of land. Hence, agrarian reform programs, while primarily designed to restructure the agrarian system, are also aimed at mitigating poverty and income inequality.

The most recent attempt of the Philippine government to restructure the agrarian system is embodied in Republic Act 6657 (as amended), which provides the framework for the implementation of the Comprehensive Agrarian Reform Program (CARP). This recent attempt has been the most comprehensive of all agrarian reform interventions designed so far because its scope cover all agricultural lands irrespective of the crops planted and the tenorial arrangements (Department of Agrarian Reform, 2009). It is in the context of the goals of the program that the impacts particularly on poverty must be assessed to determine the economic merits of the continued implementation of the program.

Attempts were made to measure the economic impact of CARP to the beneficiaries of the program (Reyes, 2006 and Gordoncillo, Peñalba, & Escueta, 2003). However, these attempts were limited to measuring the difference over time or between treatment and control group. The goal of this paper is not only to test the impact of CARP on poverty but also to test if the results established in the previous studies will still be consistent with a double difference approach.

CARP Scope and Components

The estimated scope of CARP was about 8 million hectares (Garilao, 1997). However, this paper focused only on the areas covered by the implementation of CARP under the Department of Agrarian Reform (DAR), which was about 4.2 million hectares.

Program planners operationalized the intent of CARP through three components: land tenure improvement, support services and program beneficiaries' development, and agrarian justice. Land tenure improvements are implemented in several modes: such as institution of leasehold, leasehold rent reduction, and land redistribution. Support services come in the form of productivity enhancing support services such as farm to market roads (Arlanza, 2006).

Land tenure improvement includes both land transfer and non-land transfer schemes. Under the land transfer scheme is land acquisition and distribution, which involves the major processes of land survey; identification of qualified agrarian reform beneficiaries (ARBs); processing of claim folders for landowners' compensation; land valuation and compensation; registration of the awarded lands with the Land Registration Authority; and issuance of certificate of land ownership awards (CLOAs) to ARBs. Under the non-land transfer scheme are leasehold operation, stock distribution option, and production and profit sharing.

Program beneficiaries development involves a wide range of necessary support services that would make their lands more productive including the following: 1) irrigation facilities; 2) infrastructure development and public works projects in agrarian reform areas and settlements; 3) credit support; 4) promotion, development, and provision of financial assistance to small and medium scale industries in agrarian areas; 5) research, development, and information dissemination on ecologically sound farm inputs and technologies; 6) development of cooperative management skills through intensive training;

assistance in the identification of ready markets for agricultural produce and training in marketing; and 7) administration, operation, management, and funding of support services programs and projects.

As a consequence of the redistributive principle underlying the implementation of CARP, it is expected that conflicts among the various stakeholders would arise, particularly between the landowner and the tenants. Ostensibly, legal disputes arise. It is one of the fundamental mandates of DAR to provide legal assistance to farmers in resolving legal issues associated with the implementation of CARP.

CARP Assessments

Since the promulgation of the legal framework for CARP, about 4.1 million hectares have been distributed under the program through the administration of DAR (Gordoncillo and Quicoy, 2013). These lands were distributed to about 3.6 million ARBs. The total cost spent so far since its implementation was estimated at roughly Php 145 billion (Gordoncillo et al., 2003). Considering the amount spent for the program, it is only proper to examine the effects of the program particularly in one of its goals, which was to alleviate rural poverty.

Data and Sources

In 1990, during the initial stage of CARP implementation, the then Institute of Agrarian Studies (IAST) at the University of the Philippines Los Baños was able to solicit a grant from DAR to conduct a baseline study that would establish a benchmark for CARP. The sampling design projected a sample of about 10,000 respondents spread across 43 provinces in the country. These provinces were identified as the strategic operating provinces (SOPs) because said provinces accounted for the bulk of the coverage under CARP. Due to some constraints, only about 9,780 were surveyed for the benchmark study.

In 2000, the Food and Agriculture Organization (FAO) of the United Nations and Asian Development Bank (ADB) with the recommendation of DAR, again commissioned the IAST to resurvey the original 9,780 respondents of the 1990 benchmark survey. In the second survey, the list of program beneficiaries from DAR was matched with the original respondents of the 1990 benchmark survey. The intersection between the two sets was only 927 farmers. Hence, a total of 1,854 respondents were resurveyed from the original sample spread between those who eventually became ARBs of CARP and those who were not qualified for the program. The total number of respondents in the original survey who eventually became beneficiaries were matched with non-beneficiaries. In 2006, DAR again tapped the Institute to do the third survey of the original respondents to track the changes in the attributes of the ARB-respondents vis-a-vis the non-ARBs using the 2000 survey sample.

METHODOLOGY

Studies on the economic effects of rural development interventions such as CARP have been done in the past. Reyes (2006), using a logit model, established that CARP had a significant effect on the livelihood of the ARBs being classified as non-poor. Gordoncillo et al. (2003), using the Ordinary Least Squares (OLS) technique, established that the economic attributes of the ARBs were significantly higher than that of the non-ARBs. To estimate the economic effects of CARP, there is the need to know what would have been the effect without the program.

In the context of the poverty effect, this paper explores two levels of analysis. The first level is a descriptive analysis of the income structure as well as the extent of poverty. The second level is an inferential analysis of the impact of CARP on poverty using the logit procedure of a double difference model.

The arguments outlined by Pindyck and Rubinfeld (1981) and Baker (2000) on qualitative response models are used as the basis for the analysis of the likelihood of being classified as non-poor. Formally, the model is expressed as:

$$\ln \left(\frac{P_i}{1-P_i} \right) = \alpha + \beta_i X_i + \varepsilon_i$$

If P_i is the probability of being non-poor then $(1-P_i)$ is the probability of being poor. Therefore, the left hand side of the equation is simply the ratio of the odds of being non-poor to the odds of being poor. The logarithm of the ratio of these odds is linear in both the parameters and the explanatory variables (X_i).

This specification can readily accommodate additional covariates that would allow for the determination of the effects of development interventions like CARP to the likelihood of being non-poor. Recent studies (Reyes, 2002) used this specification to determine the effect of CARP on poverty. The model in this study used a binary explanatory variable with a value of 1 if the respondent is an ARB, and 0, otherwise. Such a model, however, has some limitations particularly in terms of accounting for the unobservable effects (Baker, 2000).

To address the issues of eliminating the bias due to unobservable effects, it is necessary to do a counterfactual analysis. The logit model can be expanded to allow for the estimation of the differential effects associated with CARP or the treatment effect, the time trend effect, and the double difference. Formally, the model is expressed as:

$$\ln \left(\frac{P_i}{1-P_i} \right) = \alpha_0 + \alpha_1 C_i + \alpha_2 T_i + \alpha_3 C_i T_i + \sum_i^n \beta_i X_i + \varepsilon_i$$

Where:

C_i = a binary variable with a value of 1 if ARB
and 0, otherwise

T_i = the time trend variable with a value of 1 if endline
and 0, if baseline

C_iT_i = an interaction variable capturing the double
difference

To verify if the parameters in the logistic regression function are the double difference estimators, one can take the expected value of the parameters (for this purpose, the other covariates are ignored):

$$E\left(\ln \frac{P_i}{1 - P_i}\right) | C_i = 0, T_i = 0 = \alpha_0$$

$$E\left(\ln \frac{P_i}{1 - P_i}\right) | C_i = 1, T_i = 0 = \alpha_0 + \alpha_1$$

$$E\left(\ln \frac{P_i}{1 - P_i}\right) | C_i = 0, T_i = 1 = \alpha_0 + \alpha_2$$

$$E\left(\ln \frac{P_i}{1 - P_i}\right) | C_i = 1, T_i = 1 = \alpha_0 + \alpha_1 + \alpha_2 + \alpha_3$$

Therefore, it can be verified that the first difference takes out the treatment effect α_1 , and the second difference takes out the time effect α_2 , leaving the double difference effect as α_3 or simply, the parameter estimate of the interaction variable C_iT_i .

RESULTS AND DISCUSSION

Nominal Income

To put the effects of CARP on the economic status of the farmers and farm workers in proper perspective, there is a need to establish the income profile of the respondents. Table 1 outlines the nominal income pattern by source for the three survey periods.

Table 1. Nominal income (mean) of the respondents in three survey periods by source

YEAR	TYPE OF RESPONDENT	FARM INCOME	OFF-FARM INCOME	NON-FARM INCOME	TOTAL INCOME
1990	ARB	25,619	7,566	29,133	38,464
	Non-ARB	19,546	6,485	20,624	29,061
	Total	22,528	6,930	24,380	33,507
2000	ARB	69,721	6,964	49,613	95,985
	Non-ARB	47,121	6,344	51,002	73,681
	Total	58,918	6,618	50,370	84,194
2006	ARB	69,165	11,453	47,523	101,573
	Non-ARB	52,754	10,312	54,259	80,472
	Total	61,814	10,795	51,340	90,497
Total	ARB	52,870	8,279	43,612	77,877
	Non-ARB	36,933	7,383	43,641	60,355
	Total	45,186	7,765	43,628	68,643

In nominal terms, income increased across the three survey periods. From about Php 33,000 in 1990, income increased to Php 84,000 in 2000, and in 2006, income further increased to roughly Php 90,000. In terms of the total income, the income level of the ARBs had been consistently higher compared to that of non-ARBs for all survey periods. The other notable attribute of the income structure is that non-farm income accounted for roughly 45 percent of the total income, which would have significant implications to planning interventions on poverty alleviation. Further, for both farm and off-farm incomes, the ARBs exhibited higher estimates compared to non-ARBs for all survey periods. However, for non-farm income, the subsequent surveys in 2000 and 2006 showed that the non-farm income of the ARBs had been lower compared to that of the non-ARBs.

Real Income

The level of income in real terms (2000 prices) depicted a very different pattern. While total income increased in real terms between 1990 and 2000, the 2006 estimates showed that real income actually declined to almost the same level as in 1990, which is about 15 years earlier (Table 2). This implies that for the last 15 years, there has not been an improvement in the level of income among the farmers.

This pattern is notable because in nominal terms, the level of income in 2006 was about three times than that of the 1990 levels. Again, this has significant implications to both planning and monitoring poverty alleviation interventions. In terms of monitoring, the data revealed how sensitive income is to the changes in the price levels. Any gain from poverty alleviation efforts can easily be negated by corresponding increases in price levels.

Table 2. Real income (mean) of the respondents in three survey periods by source

YEAR	TYPE OF RESPONDENT	FARM INCOME	OFF-FARM INCOME	NON-FARM INCOME	TOTAL INCOME
1990	ARB	53,798	20,162	61,643	56,104
	Non-ARB	38,841	17,380	43,429	46,311
	Total	46,450	18,536	51,684	50,828
2000	ARB	69,721	6,964	49,613	95,985
	Non-ARB	47,121	6,344	51,002	73,681
	Total	58,918	6,618	50,370	84,194
2006	ARB	50,537	11,870	35,361	57,119
	Non-ARB	39,594	10,279	40,533	47,935
	Total	45,713	10,943	38,286	52,274
Total	ARB	57,917	16,307	51,007	61,062
	Non-ARB	42,798	14,489	47,069	50,475
	Total	50,799	15,266	48,838	55,413

Poverty Incidence

Using the poverty thresholds respective to the three survey periods, Table 3 outlines the incidence of poverty among the respondents. Apparently, the incidence of poverty among the ARBs was consistently lower than that of the non-ARBs across the three survey periods. Among the ARBs, the poverty incidence in 1990 was estimated at 63.5 percent. The incidence was down to 46.3 percent in 2000 and in 2006, the estimated incidence was almost the same at 45.9 percent. This is worth noting because the reduction in poverty incidence between 1990 and 2000 was considerable at about 17 percentage points. However, for the six-year period from 2000 to 2006, the incidence of poverty practically did not change.

The pattern was the same for the non-ARBs. In 1990, the poverty incidence was estimated at 72.7 percent. The estimate was down to about 56 percent in 2000, but it only slightly declined to about 54 percent in 2006. This pattern is also reflective of the trend shown with the real income across the three survey periods.

The Logit Procedure

In the earlier section in the methodology, it was argued that the effects of CARP on poverty are commonly explored using the cumulative logistic probability function.

In the logit procedure, the estimated function was specified as:

$$\ln \left(\frac{P_i}{1-P_i} \right) = \alpha_0 + \alpha_1 C_i + \alpha_2 T_{li} + \alpha_3 T_{2i} + \alpha_4 C_i T_{li} + \alpha_5 C_i T_{2i} + \alpha_6 A + \alpha_7 HZ + \varepsilon_i$$

**Table 3. Poverty incidence among sample respondents
across three survey periods**

TYPE OF RESPONDENT			YEAR			
			1990	2000	2006	Total
ARB	Poor	Count	554	404	354	1,312
		% within year	63.5%	46.3%	45.9%	52.1%
	Not-Poor	Count	319	469	417	1,205
		% within year	36.5%	53.7%	54.1%	47.9%
	Total	Count	873	873	771	2,517
		% within year	100.0%	100.0%	100.0%	100.0%
Non-ARB	Poor	Count	713	549	465	1,727
		% within year	72.7%	56.0%	54.6%	61.4%
	Not-Poor	Count	268	432	387	1,087
		% within year	27.3%	44.0%	45.4%	38.6%
	Total	Count	981	981	852	2,814
		% within year	100.0%	100.0%	100.0%	100.0%

Where

C_i = CARP treatment effect: 1 if ARB; 0 if otherwise

T_{1i} = time trend effect: 1 if 2000; 0 if otherwise

T_{2i} = time trend effect: 1 if 2006; 0 if otherwise

A = age

HZ = household size

The logit estimates were consistent with the findings of the previous studies (Table 4). The coefficients (B) of the treatment effect and time effect were significant. However, since the ratio of the odds ($P/(1-P)$) as the dependent variable was expressed in its

Table 4. Parameter estimates of the double-difference logit function

	B	Sig.	Exp(B)
CARP (C)	.481	.000	1.618
Time1 (2000)	.539	.000	1.714
Time2 (2006)	.463	.000	1.589
C*Time1	-.063	.660	.939
C*Time2	-.135	.355	.874
Age	.011	.000	1.011
Household Size	-.184	.000	.832
Constant	-.454	.005	.635

natural logarithmic form, the coefficients had to be converted into its exponential form (Exp(B)). For instance, the Exp(B) value for C (treatment effect) of 1.618 means that the intercept of the odd ratio for the beneficiaries is about 1.618 higher than the intercept of the non-beneficiaries. Similarly, the intercept of the odd ratio line for the respondents in the 2000 survey was about 1.7 higher than the original 1990 respondents.

However, the coefficients of the interaction variable between the treatment effect and the time trend effect or the double difference were not significant. This was true for the double difference parameters between treatments and the 1990-2000 periods and also true for the double difference between treatments and the 2000-2006 periods. This implies that there was no difference in the odds ratio between being classified as non-poor and being classified as poor between treatments and control groups as well as between survey periods.

CONCLUSIONS AND RECOMMENDATIONS

The panel data revealed that while nominal income considerably increased, real income (in practical terms) did not

change between 1990 and 2006. In the descriptive analysis, the data revealed that there was an apparent difference in the extent of poverty between the ARBs and non-ARBs: there are more poor non-ARBs compared to ARBs. The difference in the poverty incidence over time was also notable. Poverty incidence was high for both groups in the 1990 survey but declined in the 2000 survey. It was noted that the difference between the 2000 and the 2006 surveys was not as pronounced as the difference between the 1990 and 2000 comparison.

The inferential logit model, which employed the double difference approach, revealed that the likelihood of being classified as non-poor was higher for ARBs as compared with non-ARBs. Further, the likelihood of being classified as non-poor in 2000 was higher than in 1990, and the likelihood was higher in 2006 than in 2000. However, the parameter estimates of the double difference between the treatment-time effect for the 1990-2000 and for the 2000-2006 periods were not significant. This implies that the observed difference in the likelihood of being classified as non-poor in either intervention or time trend effect cannot be attributed to CARP.

The double difference approach could have reduced both the observable and non-observable biases because the data came from a longitudinal study for the same respondents. However, the double difference model did not support the argument that CARP had an impact in reducing poverty.

It is argued that the main reason for this is partly attributable to the design of the study. The 1990 survey was for all farmers across 43 provinces. The 2000 survey, because of the time and resource constraints, simply overlaid the original sample of the 1990 survey to the list of ARBs available at DAR. From the original sample, only about 927 respondents actually became ARBs of CARP. This intersection in the two data sets became the ARBs sampled for the 2000 survey. The members of the control group were simply chosen from the original 1990 list who did not

become ARBs but who were residing within the same community where the ARB respondents were located.

The implication is that monitoring and evaluation should form an integral part of the program implementation. In the case of CARP, the baseline was done before the list of ARBs were available. What could have been done was to select from the list of ARBs at the beginning of CARP and also systematically select a control group. This is crucial because a lot of big rural development interventions are being implemented. While there are apparent efforts to incorporate baseline surveys in the implementation, the designs are not systematic enough to allow for more robust counterfactual analyses.

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