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11 January 2016

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Abstract

Asset creation through National Rural Employment Guarantee Programme (NREGP) can be carried out both in public as well as in private land. This paper on the basis of micro level field investigation in South 24 Parganas district of West Bengal, India has tried to investigate whether asset creation through NREGP in private land can play a positive role of the benefitted marginal farmer households to enhance their net farm income. The field investigation was done into two purposefully chosen *gram panchayats* of South 24 Parganas district of West Bengal. Using Heckman's treatment effect model, we have proved total absence of sample selection bias of our investigation. With the help of First differenced method, it is observed that enhancement of per *bigha* net farm income is comparatively more among the marginal farm households of our sample gram panchayats who enjoyed the benefit of NREGP work in their private land.

Key words: National Rural Employment Guarantee Programme, Private land, Impact evaluation, Net Farm Income of farm household, Well-beings.

JEL Classifications: C21, C23, C93, Q12 I31.

Introduction

Prime objective of the National Rural Employment Guarantee Program (NREGP) is to provide 100 person-days of employment to each willing rural household. It is expected that NREGP can generate income support for the poor and can augment net farm income of the farm households

through creating different productive assets related to agriculture. The 'productive asset' includes water harvesting, construction of irrigation canals, land development and improvement of rural connectivity. Actually NREGP has demonstrated as an immense potential to reach the rural population and benefit agriculture through public work like irrigation in public land [i](Reddy 2012, Haque 2012). It is expected that water-related assets created through NREGP can increase the number of days of water availability in a year suitable for irrigation.

From 2009 onwards, NREGP can be carried out not only in the public land but also in the private land. These activities can be allowed on land or homestead owned by the households mainly lying below the poverty line or beneficiaries of land reforms. Those households should have the job card. The beneficiary household can work on the project undertaken on his/her land or homestead. (S)He has no liability for work done under NREGP, neither the utilized money during work is treated as loan nor would he/she would be liable to pay for labor who has worked on his/her land. Here NREGP will bear the cost of wages for the unskilled labor and the material components. The basic objective of this policy is to improve the provision of irrigation facilities in land and encourage fish farming and horticultural plantations.

There is a debate about the effectiveness of NREGP works undertaken on private land in comparison to works on public land. It is true that assets created in private lands are relatively well-taken care of and better maintained, however assets created in public land are prone to destruction because of neglect in maintenance in the absence of active local institutions. Actually it is the role of the local gram panchayat to maintain those created asset. But assets created through digging of ponds under NREGP mainly in private land can be utilized for improvement of productivity of land around the area and for fish farming. This reflects the potential of NREGP to contribute to water and livelihood security in the village eco system. If these are

created in the lands of the people who need these facilities but cannot afford it, NREGP can also serve an important social purpose.

Expansion of NREGP in both public and private land can change the cropping pattern as well as cropping intensity. These augmentations can help the small and marginal farm households to enhance their farm income over the time periods. More employment in the agricultural sector can be generated if and only if the farm households cultivate their land with the help of hired casual labor force. Actually after the gradual break up of joint family system, family labor force during the time of cultivation is not always available. In this situation, the small and the marginal farmers have to depend on hired casual labor in the agricultural peak season. But due to expansion of NREGP, the agricultural wage rate has increased rapidly. In the financial year 2011-12, per person-day NREGP wage in West Bengal was Rs.136 and the minimum agricultural wage in that financial year became Rs.167. So it can be told that marginal farmers may be badly affected by NREGP for labor shortage and the steep hike in agricultural wage rate which can be considered as negative aspect of the impact of NREGP on net farm income. In this present investigation, we have to consider both the aspects simultaneously.

Research Objectives:

Nearly two third of Indian population is engaged in agricultural activities and a major percentage of the Indian farmers have land holdings less than two hectors. The question of economic sustainability of the marginal farm households[ii] after the expansion of work through NREGP mainly in private land will be tried to answer here in the objective of per *bigha*[iii] net aggregate farm income of owned land. No specific study has been done about the impact of this type of asset creation on small and marginal farmer households. We are now trying to do that. The costs and returns of some major produced crops will be computed on the basis of primary data taken

from a set of purposive sample of the marginal farm households (who own not more than 1 hector or 2.5 acre or 7.5 bighas of land) of South 24 Parganas district of West Bengal. The economic sustainability of the marginal farm households will be examined mainly on the basis of annual aggregate per *bigha* net return (value of gross return – total cost) of the cultivatable land. Cost of production of any crop is the sum total of several input costs. Cost incurred on a farm can be classified as cash costs or non-cash cost. Cash costs are the costs for which farm spends money for acquisition of different material inputs and non-cash costs or imputed cost includes the wage cost of family labor force. Here we consider only cash costs[iv]. The major considered components of it are: (i) cost of seeds (ii) cost of chemical fertilizers (as sum total of purchase price and transport cost), (iii) costs of insecticides and pesticides (evaluated at purchase price), (iv) cost of hired tractor or bullock, (v) cost of owned irrigation (on the basis of operation cost) or hired irrigation (actual amount spent) and (vi) wage bill (on the basis of number of casual laborers hired during the time of agricultural production and the wage rate offered to them). It has been already mentioned that expansion of NREGP can affect mainly the last two components of the cost of cultivation: (i). it may reduce the cost of irrigation and (ii) it may increase the wage bill due to higher daily wage rate of casual agricultural laborer.

Another important project undertaken in the villages under NGEGP is improvement of rural connectivity which can reduce the transport cost. Actually expansion of asset creation under NREGP in a particular region can help the farm households of those regions to gain few positive externalities. Now the question is whether the presence of positive externalities can help the farm households to enhance their net farm income over the time period or not. If it can, then only we can claim that asset creation through NREGP can create positive impact on the farm households during cultivation.

From the side of Gross Return, expansion of NREGP can help the marginal farm households in two ways: (i) it may improve *per bigha* output of crop and/or (ii) it can help the farm producer to move towards multiple cropping i.e. increasing the Gross cropped area as well as cropping intensity[v].Expansion of NREGP in private land can help the benefitted farm household to produce different horticultural products and fish.

Total annual net return of a farm household from agricultural activities including fish farming in an particular reference year is the sum of the value of net income of the farm households from different crop(s), produced in that year. Initially all the calculations mainly from cost side were done on the basis of current price. In a particular year, the price of the produced crop can be changed over the time due to enhancement of its procurement price (which mainly happens for rice) or when the price determined through market forces (mainly for different horticultural products). Then we have considered the average price level of that crop. To standardize the values of the 'net income' from farming, we have calculated aggregate farm income per *bigha* of each farm household in a particular financial year at current price. After calculating the values in both the time periods on the basis of current price, the aggregate net income from different crops in the 'end line' period is converted in to 'base line' period on the basis of the Consumer's price index of the rural laborers of West Bengal (published by Reserve Bank of India in different times).

After the expansion of NREGP in almost every part of India, we here want to investigate whether NREGP activity mainly in private land can help the beneficiary households (here the marginal farmer households) more than the non-beneficiary farm households to improve their livelihood through enhancing their net farm income.

Sample Design and Methodology:

NREGP is a public policy of the government of India and any Indian citizen can participate in this program any time. So randomized field investigation is here not possible. Hence, for impact evaluation we have to depend on observational data on the basis of responses to survey questions to quantitatively evaluate the effectiveness of that policy. A potential pitfall with these analyses is that, units of observation are not randomly assigned to participate; rather they self-select to participate the program of interest. Here the statistical techniques used to analyze these data are referred to as 'treatment effect' models developed by Heckman (1976) where the policy of interest is 'asset creation though NREGP in private land' (the 'treatment'). To do the impact evaluation we have purposefully chosen two gram panchayats of South 24 Parganas district of West Bengal.

In West Bengal, around 88% of the total landholdings belong to marginal and small farmers (Dev, 2012) and average size of holding is 0.82 hector. NREGP has already expanded in all the districts of West Bengal. Out of its 19 districts, we have chosen South 24 Parganas district as sample district. This district of West Bengal was declared as one of the country's 250 economically most backward districts in 2006 by Ministry of Panchayati Raj. Incidentally the progress of NREGP work both in the public as well as private land was good in this district after 2009. The district has 29 blocks, but we had chosen Mandir bazar block as sample block in our investigation. Now in Mandirbazar block, we have selected Krishnapur and Ghateswar as sample gram panchayats. The population size and the agro-climatic condition of those two gram panchayats are almost identical and it is necessary for evaluation because here the outcome indicator is net farm income. In our investigation, accounting year 2010-11 is considered as base line period and 2012-13 as end line period[vi]. In the financial year 2010-11, total households got

job under NREGP in Krishnapur gram panchayat was 538 and total person-days created was 12136 (i.e 22 person-days per household). In Ghateswar gram panchayat, the number was 461 and 9633 respectively (i.e. 21 person-days per household). This establishes the fact that controlling other factors, the performance of NREGP in terms of average person-days created per household in both the gram panchayats in our baseline period was almost same. Again in the financial year 2012-13 i.e. after two years, total number of households got the benefit of NREGP in Krishnapur Gram panchayat was 859 (60% more than the baseline period) and total person-days created was 40676 (235% more than base line period) i.e. 48 person-days per household (118% more than baseline period). Besides that, in Ghateswar gram panchayat the figure was 699 (51% more than baseline period) and 20941 (117% more than baseline period) i.e. 30 person-days per household on an average (43% more than baseline period) respectively. Besides that total number of completed works done though NREGP in the Krishnapur gram panchayat in the financial year 2010-11, 2011-12 and 2012-13 were 236, 706 and 573 respectively and in the Ghateswar gram panchayat those were 204, 271 and 596 respectively. This establishes the fact that between the 'base line' and 'end line' period of our investigation, progress of NREGP work in Krishnapur gram panchayat was much better than Ghateswar gram panchayat. It is also observed from Government data that during our experimental time period more work on agriculture related activities were done in Krishnapur gram panchayat than Ghateswar gram panchayat[vii]. So we have taken purposive sampling. It actually starts with a purpose in mind and the sample is thus selected to include people of interest and exclude those who do not suit the purpose.

Our target group is only the marginal farmer households of those two gram panchayats. Initially we have chosen the marginal farmer households of both the gram panchayats who had not

enjoyed the benefit of any NREGP work in the private land in the base line period. Next with the help of local people, we had identified the marginal farmer households of both the gram panchayats as sample that enjoyed the benefit of this scheme within our reference period. These households are considered as 'treatment group' in our evaluation study. For comparison group we also have chosen marginal farmer households in both the gram panchayats who did not enjoy the benefit of this work in their private land in our entire reference period. Here it should be mentioned that, within our experimental period, the marginal farm households of comparison group are either voluntarily or involuntary non-participant. Total sample households of Krishnapur gram panchayat were 204 and from Ghateswar gram panchayat were 114[viii]. Again out of 114 sample farm households of Ghateswar gram panchayat, 53 households (46%) have enjoyed the benefit of NREGP in their private land where as the number was 68 (33.33%) in Krishnapur gram panchayat. All the works done on private land in both the gram panchayats is excavation of pond mainly for fish farming and cultivation of horticultural products. Actually in West Bengal, fish farming as livelihood activity for the poor has immense potential. Many small reservoirs, tanks, water harvesting ponds created through this scheme are ideally suited for fish farming. This also can improve the provision of irrigation facility for horticultural plantation and land development facilities on land owned by the households.

We have to investigate whether NREGP work in private land is more effective than work in public land from the perspective of marginal farm households for sustainability of their net farm income over the years. So using household survey, we want to investigate whether implementation of NREGP in private land actually helps the marginal farmers to improve their earnings from multiple cropping or they fail to take the advantage of this public policy.

The costs, gross returns, total net returns (farm income – total cost) and net return per bigha[ix] of land of each farm households from agricultural activity were computed. The principal crops of the state like kharif, boro and other horticultural products cultivated in those areas were considered separately. We have collected those data of the sample farm households both belong to treatment group as well as control group in both the time periods. Then on the basis of first differenced method[x] we want to investigate whether the sample households belong to treatment group can make better improvement in their total annual net return per *bigha* of owned land from cultivation between the base line and in the end-line period if we compare that with the farm households of the comparison group.

In this article, for estimating treatment effect with observational data we use the 'First-differenced' estimator. The estimator estimates the difference between outcome measures of each sample household at two time points[xi].

To do the impact evaluation we want to estimate the following model:

$$\Delta NFRINCOMEBG_i = \delta + \pi PVTLAND_i + \gamma_i GP_i + \phi PVTLAND_i \cdot GP_i + \sigma \Delta NREGP_i + \varepsilon_i \dots \dots Eq.(1)$$

Where the Selection equation will be:

$$PVTLAND_i = \alpha_0 + \alpha_1 POLITICAL_i + \alpha_2 SCATTERED_i + \alpha_3 \ LAND_i + \mu_i \dots \dots \dots \dots \dots \dots Eq.(2)$$

The Selection equation will decide whether there is any sample selection problem or not in our investigation. So in our original equation, we have treated PVTLAND as endogenous. If there is no sample selection problem, we can do the impact evaluation only on the basis of Eq.(1) with the help of simple OLS considering PVTLAND as exogenous.

Initially using all the observations we have to estimate the Probit model mentioned in Eq.(2) from which we have $\widehat{\alpha_h}$ (h = 0,1,2,3).Then we have to compute the Inverse Mills ratio $\widehat{\lambda_i} = \lambda(Z_i\widehat{\alpha_h})$ for each i where Z_i represents the values of each explanatory variable of Eq. (2) for each

'i'. Ultimately we have to estimate Eq.(1) considering $\widehat{\lambda}_1$ as an additional explanatory variable. This regression will help us to identify whether sample selection in our investigation is correct or not. The parameter estimate of $\widehat{\lambda}_1$ is $\widehat{\sigma_\varepsilon}\widehat{\rho}$. Now $\widehat{\sigma_\varepsilon} \neq 0$ but $\widehat{\rho}$ may be 0 or may not be 0. So we have to consider the Null Hypothesis $H_0: \widehat{\rho} = 0.$ If it is accepted then the parameter estimate of $\widehat{\lambda}_1 = 0$ and there is no sample selection problem in our investigation and we can do the impact evaluation only on the basis of Eq.(1).

The variables used in Eq.(1) and Eq.(2) are discussed below:

ΔNFINCOMEBG$_i$ = NFINCOMEBG$_{i2013}$ − NFINCOMEBG$_{i2011}$ i.e. change of per *bigha* aggregate net farm income of the ith household between the two time periods. It was observed that for most of the sample households ΔNFINCOMEBG> 0 i.e. NFINCOMEBG$_{2013}$> NFINCOMEBG$_{2011}$ at 'base year' price.

PVTLAND$_i$ => It is a dummy variable. If the ith household (either belongs to Krishnapur Block or Ghateswar block) has used the opportunity of NREGP work in his private land within this time period, then the value of the variable is 1, otherwise 0. Here we have to remember that in our base line period, no sample farm households either belongs to treatment group or control group had avail any NREGP work in their private land.

GP => It is also a dummy variable. According to government information, overall NREGP work in Krishnapur gram panchayat was better that Ghateswar gram panchayat. So the value of this dummy variable will take 1 if the household belongs to Krishnapur gram panchayat,or 0 if the household belongs to Ghateswar gram panchayat.

PVTLAND.GP=> This interactive dummy variable will take the value 1 if the marginal farm household belongs to Krishnapur gram panchayat have enjoyed the benefit of NREGP in his private land within this reference period.

$\Delta NREGP_i \Rightarrow NREGP_{i2013} - NREGP_{i2011}$ i.e. change of wage income of the ith household through participating in this public employment programme. It is expected that some proportion of earned income through NREGP may be invested by the beneficiary farm household for enhancement of agricultural activities.

There is a possibility that availing NREGP work in private land may be endogenous i.e. there may exist some economic or non-economic factors which can influence a household during the time of taking decision on availing NREGP work in his private land. So we have to consider Eq.(2) as 'selection equation' where 'PVTLAND' is a dummy endogenous variable in Eq.(1). The explanatory variables of Eq.(2) are narrated below:

$LAND_i \Rightarrow$ The area of land owned by the ith farm households. It is expected that if the marginal farm household owns comparatively larger size of land then he may be more inclined for NREGP work in his private land.

$POLITICAL_i \Rightarrow$ The work in private land has to be done through local panchayat. Sometimes few households complained during the time of field investigation that in spite of their willingness they are not availing NREGP work in his private land because to do that they have to 'compromise' with the local panchayat members. If that situation is reported by the ith household then we consider the value of POLITICAL as 1, otherwise '0'.

SCATTERED =>It was observed from our field investigation that land of few marginal farm household is scattered. Then, it will be difficult for them to nurture their pond after excavation through NGREP. So for fear of loss, these farm households sometimes are not willing to take any initiate to avail NREGP work in their private land. This is another dummy variable and takes the value 1 when it is reported that the land of the respondent farmer is scattered; otherwise 0.

The results of the regression mentioned in Eq.(1) and Eq.(2) are presented below in Table-1

Table-1: The Heckman Two step Regression results of Eq.(1) and Eq.(2)

Dependent variable ΔNFINCOMEBG$_i$			Dependent variable: PVTLAND$_i$		
Explanatory variables and corresponding parameters)	Values of the Coefficients	Standard Error	Explanatory Variables	Values of the Coefficients	Standard Error
Constant ($\hat{\delta}$)	2546.801*	920.1533	Constant (α_0)	-1.543057*	.2256
PVTLAND ($\hat{\pi}$)	6465.023*	1516.159	LAND	0.4916545*	.0627551
GP($\hat{\gamma}$)	2465.295*	967.6582	POLITICAL	-0.918523*	.2447
PVTLAND.GP($\hat{\phi}$)	-3060.083**	1441.937	SCATTERED	-0.9683312	.3153468
ΔMGNREGP ($\hat{\sigma}$)	22.757	31.20207			
$\widehat{\lambda_1}$	998.7388	830.5897			

*=> significant at 1% level and **=> significant at 5% level.

It is observed that comparatively large land owners among the marginal farmer households are more prone to avail NREGP work in their private land. Few households are also not willing to avail this benefit mainly due to political hazard. But the parameter estimate of $\widehat{\lambda_1}$ is statistically insignificant. Hence, two step treatment effect models are not required for this program evaluation. We can do that solely on the basis of OLS in the 'First differenced equation' mentioned in Eq.(1). The result is shown in Table-2:

Table-2: Result of the OLS of Eq.(1)

Dependent variable: $\Delta NFINCOMEBG_i$		
Explanatory variables	Values of the Coefficients	Standard Error
Constant ($\hat{\delta}$) Constant time effect for all farm households	1941.008*	775.4837
PVTLAND ($\hat{\pi}$) Differential effect due to enhancement of per *bigha* net farm income of the farm households for availing NREGP work in Private land	7681.965*	1135.777
GP($\hat{\gamma}$) Differential effect due to per *bigha* net farm income of the households belongs to Krishnapur gram panchayat where overall expansion of NREGP is better than Ghateswar gram panchayat.	2766.953*	943.1569
PVTLAND.GP($\hat{\phi}$) Differential effect due to enhancement of per *bigha* net farm income of the households who have done NREGP work in their Private land in Krishnapur gram panchayat which indicates interaction effect.	-3278.658*	1445.484
$\Delta NREGP$ ($\hat{\sigma}$) : Effects due to change of wage income of the sample households in both the areas only through participating in NREGP	19.13667	31.3597
Adjusted R^2	.4799	

*=> significant at 1% level.

Results and Discussions:

The estimated value of $\hat{\delta}$ indicates that there is an enhancement of per *bigha* aggregate net farm income within our experimental time period among the marginal farmer households; either belongs to treatment group or comparison group. This is simple time effect.

The estimated value of $\hat{\pi}$ indicates that '*ceteris paribus*' the average increase of net farm income is more among those households in both the gram panchayats who have availed NREGP work in their private land within this reference period than the non-participant households.

Statistical significance of the estimated value of $\hat{\gamma}$ indicates that *'ceteris paribus'*, the enhancement of per *bigha* aggregate net farm income is more among marginal farmer households of Krishnapur gram panchayat than Ghateswar gram panchayat.

It is observed that the value of the parameter estimate of $\hat{\pi}$ is more than $\hat{\gamma}$. This shows that NREGP work in private land is more effective for enhancement of per *bigha* net farm income of the marginal farm households within our reference time period

The estimated value of $\hat{\phi}$ is negative but significant. Which implies enhancement of net farm income of the farm households who availed NREGP in their private land is more among the farm households of Ghateswar gram panchayat than the farm households of Krishnapur gram panchayat. It was already mentioned that within our reference period, overall expansion of NREGP in Krishnapur Gram panchayat was more than Ghateswar gram panchayat. But percentage of sample households of Ghateswar gram panchayat availed NREGP work in private land was more than Krishnapur gram panchayat.

It came out from our field investigation that from an excavated pond in 1 bigha land, the farm households of Ghateswar gram panchayat in the entire 'end line' period could earn Rs. 20000 on an average from fish farming where the marginal farm households of Krishnapur gram panchayat could on an average earn Rs. 14000 in that reference period. It was also observed that most of the

marginal farmers of Ghateswar gram panchayat had increased their intensity of cultivation through producing different types of horticultural crops around their newly excavated pond from which they can enhance their earnings more than Rs.5000 annually on an average. This activity was not very prominent among the sample households of Krishnapur gram panchayat even among the households who availed NREGP work in their private land in the entire reference period. So we observe negative differential effect.

Holding ΔNREGP unchanged if we add three dummy co-efficient (7681.0965 +2766.953 – 3278.658) we have 7170.26 which lies between 7681.965 (only for farm households who have done MGNREGP work in private land) and 2766.965 (for Krishnapur gram panchayat where we observe better expansion of MGNREGP in terms of person-days and work in public land than Ghateswar gram panchayat) . So in spite of negative differential effect, the overall effect is positive. So for sustainability of positive net farm income among the marginal farm households; NREGP is necessary. It is also observed that NREGP work on asset creation should not be confined on public land but it should give more stress on private land.

Conclusions and policy implications:

Primarily due to financial weakness, it becomes difficult for the farmers to introduce advanced technology in their farm land. Besides that, fast deterioration of soil health and productivity due to excess application of chemical fertilizer and low application of organic input, gradual deterioration of quality of surface water and depletion of ground water; it became difficult for marginal farmers to improve profitability in their agricultural activity. Sometimes they lost interest to cultivate even in their owned land. In this juncture, NREGP work both in public land and private land of the marginal farmers can become helpful to tackle this difficulty. In our field investigation, NREGP work in private land becomes more effective to enhance net farm earnings

of the households who took the benefit of it. So, more stress on NREGP work should be imposed on private land which is very effective for productive asset creation because the assets created in private land can be well maintained. Local panchayat should encourage the poor farm households to take this advantage. This can help the benefitted farm households to get an alternative source of income through fish farming which is comparatively less risky and have high demand of its' product in our study region. This will also improve the irrigation facility as well as productivity of land. They can cultivate different horticultural product suitable for agro-climatic condition of the land which will also help them to earn some extra net farm income and encourage the marginal farm households to continue agricultural activities.

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End Notes:

[i] Public land refers to government land or community land which does not belong to only one individual.

[ii] A household is classified as farm household if it possesses some land and if at least one of its members is engaged in agricultural activity.

[iii] In India 'bigha' is a measure of land area which is 0.33 of one acre.

[iv] In our field investigation it is reported that the opportunity cost of family labour force is 'zero'.

[v] Gross cropped area is the total land area where crops are sown once or more than once in a particular financial year. The area is counted as many times as they are sowing in that year.

[vi] The time gap between the 'base line' period and 'end line' period is only two years.

[vii] In The base line period, total expenditure on asset creation in Krishnapur gram panchayat was Rs. 20.17 lakhs (49% spent on agricultural activity) and in Ghateswar gram panchayatRs. 19.39 lakhs (38% spent on agricultural activities). But in the end line period the expenditures were Rs.45.27 lakhs (43.9% on total expenditure on agriculture) and Rs.29.27 lakhs (33.9% on total expenditure on agriculture) respectively.

[viii] More than 95% of the sample farm households of both the gram panchayats are BPL card holders.

[ix] Here unit of land is expressed as '*bigha*' because in our investigation we have found large number of farmers who own only one *bigha* land.

[x] Using First Differenced method we can remove the unobserved heterogeneous factors of our sample observations.

[xi] The main reason for collecting panel data is to allow for the unobserved effects to be corrected with the explanatory variable. Here unobserved effect covers household specific heterogeneity as well as gram panchayat specific heterogeneity. Actually some factors like demographic feature of a household, education, adult equivalent family member are considered constant between two periods of time. Those possible influencing factors can be removed from our study when first difference estimation method is applied for impact evaluation.