Title of the Master's Thesis	**Determinants of Technical Efficiency of Solar Water Pumping System in Rural Nepal**

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ABSTRACT

1. Introduction

Mountainous areas in rural Nepal are facing difficulties for water provision due to lack of electricity infrastructure. The water supply mostly depends on human labor. Villagers, especially women and children have to take much effort and time to convey water to their households as daily work. In response to these situations, Solar Water Pumping System (SWPS) have been introduced as a labor saving technology and expected to become popular for entire Nepal. Alternative Energy Promotion Center (AEPC) under ministry of environment in Nepal started to install SWPS with expectation that SWPS has potential to fill demand for 1,500 villages in rural communities in entire Nepal. However, approximately only 120 units of SWPS have been installed since 1982 when it was first installed. In order to disseminate it more, AEPC adopted a subsidy policy which covers for the most part of initial cost of SWPS since 2006.

Yutaka Ito, et al. (2014) found the price-distortionary that current subsidy policy potentially induces installation of inefficient SWPS in rural Nepal. Therefore, first objective of this study is to review for appropriateness of previous study by expanding the number of samples more. Second one is to find the efficient way to promote installation and to enhance performance of SWPS with consideration both of technical and social factors.

2. Methodology

To accomplish our objective, this study employed two stage approaches. As the first step, Data Envelopment Analysis is employed to measure the productive efficiency of SWPS in each village. In this model, we employ the output-oriented DEA to evaluate the productive efficiency of the DMU as the relative distance to the production possibility frontier in the direction of output expansion. We set two outputs and three inputs respectively. Output variables are, namely (1) the number of households serviced by SWPS and (2) the cross term of (1) and gross head[1]. This cross term implies the amount of work to convey water for villagers. On the other hand, inputs variables are (1) distribution tank capacity, (2) solar panel peak kilo Watts, and (3) the length of distribution pipe. Summary of variables in DEA is shown in Table 1. In order to consider the differences of obtained score from the aspect of institutional context and technical facility, we used a Tobit regression model as second step.

Table 1 Summary of variables for DEA

Output variables
① The number of SWPS supplied households
② The cross term of ① and Gross head
Input variables
① Distribution tank capacity (m^3)
② Solar panel peak kilo Watts (pkW)
③ The length of distribution pipe (m)

[1] gross head means the difference in height between water source and distribution tank.

2.1 Survey and data collection

To collect data for above models, we conducted a questionnaire survey in the period between August and September in 2013 in rural Nepal. The questionnaire contains questions about the basic information of village, decision-making process and villager's satisfaction for SWPS. Moreover, we requested AEPC to provide more information about institutional settings and technical facilities of SWPS based on feasibility study report. As a result, we constructed our data set containing 11 variables for 82 villages covering 28 districts in entire Nepal. 38 villages out of 82 villages are already completed to construction and started to operation, other 44 villages are under construction until November 2014.

3. Results

Table 2 Measurement results of DEA efficiency scores

	Average	Std. Dev.	Min.	Max.
-Output-oriented VRS technical efficiency	0.681	0.215	0.266	1
-CRS technical efficiency	0.626	0.209	0.266	1
-Scale efficiency	0.925	0.109	0.322	1
-for 36 increasing-return-to-scale DMUs	0.877	0.138	0.322	0.998
-for 29 decreasing-return-to-scale DMUs	0.943	0.058	0.791	0.997

Table 2 shows the results of output-oriented efficiency scores by DEA. The average efficiency is 68.1 % with standard deviation of 21.5 % and minimum being 26.6 %, while 16 out of 82 DMUs turned out to be 100 % efficient. There are 66 DMUs that are scare inefficient, of which 36 exhibit increasing return to scare and 29 exhibit decreasing return to scale. Next, this study ran the Tobit regression to see the impact of social and technical factors with obtained efficiency score in Table 2. We denote these factors as follows: proportion of government subsidy in the total installation cost as GOVSUBSIDY; the initial cost per household as UNITCOST; monthly user charges per participating household as TARIFF; yearly average discharge of water source as DISCHARGE. The variables from RDSC to NCDC are set as region dummy.

Table 3 Results of Tobit regression with output-oriented DEA efficiency as dependent variable.

Independent variable	Coefficient	Std. err.
GOVSUBSIDY	-9.16E-03***	2.41E-03
UNITCOST	-4.07E-06**	1.55E-06
TARIFF	2.07E-03**	9.31E-04
DISCHARGE	3.18E-01***	1.18E-01
RDSC	-2.00E-01*	1.15E-01
ASTHA	-3.69E-01***	9.66E-02
DCRDC	-4.73E-01***	1.16E-01
BASE	-3.31E-01***	9.96E-02
RESDTN	-2.28E-01*	1.35E-01
REWSSPC	-6.31E-02	1.43E-01
SCDC	-4.96E-02	1.20E-01
NCDC	-1.71E-01*	9.46E-02
Constant	0.139E-01***	1.78E-01

*** for p<0.01, ** for p<0.05, and * for p<0.1

4. Discussion

As shown in Table 2, GOVSUBSIDY and UNITCOST negatively influence the efficiency of SWPS, being 1% and 5% significant respectively. This result shows that higher government subsidy ratio leads to inefficient installation of SWPS. Also, negativity of UNITCOST tells that higher the fixed cost per household leads to lower efficiency as well. Besides, significantly positive coefficient of TARIFF indicates that higher motivation to maintain well management and maintenance for system leads to higher efficiency of SWPS. It might imply that there was mutual consensus-making among villagers on process of installation. As for DISCHARGE being 1% significant, geographical characteristic of the village is a strong determinant of the resulting efficiency of SWPS. Next, as the region dummy, totally six variables show negative coefficient. This result implies that more remote areas especially outside of capital city has possibility for inefficient installation due to lack of information about SWPS. Beside, high transportation cost might lead to excessive supply of subsidy due to complicating terrain , lower load densities and remoteness.

5. Conclusion

From the analysis, this study concludes:

1) Abundant financial support from the government tends to result in the installation of inefficient systems.
2) To prevent inefficient installations, AEPC should carefully examine with an alternative viewpoint such as geographical characteristics in each village, information disparity in remote areas and consensus building of process among villagers before approval with installation of SWPS.

Title of the Master's Thesis	The Impact of Microfinance on Rural Households in Bangladesh: A Case Study of Jessore District Using Average Treatment Effects from Propensity Score Matching

Student ID Number	M134262
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This study examines how microfinance programs influence households in rural areas of Bangladesh. Microfinance has been a widely used tool to fight poverty in developing countries; however, few studies have taken into account the effect of bias in impact evaluations. As such, this study focuses on assessing bias in the evaluation of microfinance. In 2011 and 2013 household data was collected from members and non-members of microfinance institutions (MFIs) in Jessore District, located in the south west of Bangladesh.

In order to mitigate bias caused from the self-selection problem, the propensity score matching (PSM) was utilized and the average treatment effect on the treated (ATT) was estimated. PSM constructs comparable counterfactual, outcome that members of MFIs would have experienced if they had not been a member of MFIs. Members and constructed counterfactual were matched in terms of probability of participating in the programs that was calculated by observed characteristics, or covariates, and ATT was obtained as the difference of average outcome for matched pairs.

Although there is a limitation on data that collected data is the one observed after people participate in program, to estimate the determinant for the decision to be a member that is made before 2011, covariates which can be as stable as possible before and after participation were selected. 'Members' are defined as households that maintained continuous membership in NGO-MFIs or Grameen Bank until

2013 without having breaks in membership. ‘Non-members’ are households maintained continuous non-membership up to 2013.

The propensity score was calculated by the probit model. The results of probit models indicate that agricultural land and the number of regular wage employee in household have a negative impact to be a member and the number of children in a household has positive impact to be member of MFIs in the context of Jessore District in Bangladesh. Positive ATTs with some statistical robustness were observed when total income and ‘saving in kind’ included such items gold or jewelry. Negative and robust ATTs were observed in health expenditure per capita.

From these results, it can be interpreted that members were able to increase income more than what they would have experienced if they had not been a member, and members allocated income to higher saving mostly in kind such as with gold or jewelry than what they would have experienced without participating in the programs. Members were able to have lower health expenditures per capita than what they would have spent without participation in the programs. That would imply members were able to become healthier than the case if they had not been a member, this would be because they could earn more income and improve their quality of life. Positive impact on gold or jewelry seems unique finding in Bangladesh. Positive impact on household income is consistent and negative impact on health expenditures is inconsistent with the literatures regarding the impact of microfinance in Bangladesh. However, this study analyzed data only in Jessore District and extrapolations to other Districts cannot be assumed to concur with other impact evaluations. These points should be included in the interpretation of these results.

Title of the Master's Thesis	The Impact of Exchange Rate on Trade Balance. The Case of Vietnam

Student ID Number	M134814
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Main Academic Advisor	Professor ISHIDA MIKI

This research analyzes aggregate model and disaggregate models to reveal the impact of real exchange rate on Vietnam aggregate trade balance and bilateral trade balance between Vietnam and major trading partners in both short term and long term.

Due to the condition of data, ARDL bound test for cointegration is applied. This approach is suitable for time series data which is mixed integration, I(0) and I(1).

The annual data in this research covers a period of 24 years, from 1990 to 2013. The research uses a proxy of trade balance, which is the ratio of export value to import value, instead of conventional term.

The aggregate model uses real effective exchange rate and total trade balance of Vietnam. Disaggregate models use real bilateral exchange rate and bilateral trade balance of Vietnam and each of main trading partners.

Main finding indicates the strong impact of the reaction of trade balance against the movement of real exchange rate in the disaggregate model in case of the United States on the aggregate case of Vietnam. In both of the aggregate and the disaggregate models, depreciation in lag 2 improves trade balance in short run but in long run, depreciation deteriorates trade balance. Therefore, to improve trade balance, policy of

depreciating real exchange rate could be effective for short-term target but not for long- term.

In case of China, depreciation is effective in the improvement of trade balance in both short run and long run. Conversely, depreciation in real exchange rate has same direction of depressing trade balance in both long run and short run in the case of Korea.

Depreciation improves the trade balance in long run in case of Japan and Malaysia but in short run only in case of Germany. The unique short run effect is also found in case of Thailand but depreciation deteriorates trade balance.

Title of the Master's Thesis	Does Forest Certification Alter the Relation Between Trade and Deforestation? A Panel Data Analysis

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ABSTRACT

1. Introduction

Deforestation has been a serious problem in the world. While various causes of deforestation are pointed out, the role of globalization is also being emphasized. That is, trade can separate place where goods and services are produced and place they are consumed. It makes consumers easier to externalize environmental costs on producing places, thus causes environmental destruction there. With regard to deforestation, production of forest products, which is thought to cause deforestation, has been rapidly increasing. Increase in demand for forest products in certain place is putting pressure on places where forests are utilized and cleared.

Regarding forest conservation, some efforts to ensure sustainable forest management is being made these days. One of them is forest certification. Forest certification is a system which gives certification to forest managers or owners who meet criteria provided by forest certification organizations. Those criteria include various aspects of forest management, such as maintaining biodiversity of forest ecosystems. As of 2012, 10% forest area is under certification worldwide. Furthermore, forest area getting certification is increasing at about 20 % per year between 2002 and 2010. Therefore, how this increase in certified forest area contributes to forest protection worldwide is an emerging issue to be investigated both academically and empirically.

Concerning the effect of trade openness on the environment, the effect is theoretically thought to differ according to countries' characteristics. For example, in countries with comparative advantage in production of goods of which production process generates more pollution, trade openness deepens their comparative advantage in such production, thus increase in trade openness will bring about environmental degradation. Strength of environmental regulation is also considered to be a factor affecting the relation between trade and the environment.

This issue attracts much attention of empirical literature. Among them, Antweiler et al (2001) develop theoretical framework which describes relation between trade and the environment, and apply the theory to empirical analysis. After their study, some studies about this issue have been conducted referring to the framework they have developed.

Reflecting the abovementioned background, this paper examines the impacts of trade on deforestation, and how forest certification affects the relation between the two. The aims of this paper lie in finding out how increase in trade openness affects deforestation, and the role forest certification plays in determining trade pattern and in mitigating deforestation. The significant point of this study is to incorporate the effect of forest

certification into the existing methodological framework.

2. Methodology

To find out the impact of forest certification on deforestation, the following regression model is constructed referring Antweiler et al. (2001). It is implemented covering 128 countries and year from 2002 to 2011.

$$D_{it} = \alpha_0 + \alpha_1 KL_{it} + \alpha_2 C_{it} + \alpha_3 KL_{it} C_{it} + \alpha_4 Y_{it} + \alpha_5 T_{it} + \alpha_6 RKL_{it} T_{it} + \alpha_7 RKL2_{it} T_{it} + \alpha_8 RC_{it} T_{it} + \alpha_9 RC2_{it} T_{it} + \alpha_{10} RKL_{it} RC_{it} T_{it} + year + \varepsilon_{it}$$

Where D is deforestation rate, KL is capital –labor ratio, C is percentage of forest area that is under forest certification, Y is GDP per capita, T is trade intensity defined by (export + import)/GDP. KL and C are expressed as relative values to their world averages (RKL, RC) when they are interacted with trade intensity, in order to assess the impact of change in comparative advantage brought about by trade openness. RKL2 and RC2 are the square terms of RK and RC, respectively. Year is time trend and ε is the error term. Introduction of certified forest area, instead of income level, as the proxy for strength of environmental regulation is different from previous literature. Dataset on forest loss, which is obtained based on remote sensing data, is utilized to get dependent variable, deforestation rate.

3. Results and Discussion

Both fixed effect model and random effect models are employed. Random effect model was not rejected by Hausman test, and using random effect model, some coeffecients, especially of trade-interacrted variables show significance and cosnsitrnt sign with theoretical expectations.

The single certification term doesn't show significant effect on deforestation. It means current forest certification may not play strong roles in mitigating deforestation when the impact of trade is not considered.

	Expected Sign	Fixed Effect D	Random Effect D
KL	-	-0.00161	-0.00107
C	-	-0.324	0.101
KLC	+	0.00162	-0.00101
Y	+/-	0.0327***	0.00752**
T	0	-0.0489	-0.0343
RKLT	+	0.0631	0.111*
RKL2T	-	-0.00544	-0.0194**
RCT	+	0.0233	0.0179
RC2T	-	-0.000195	-0.00168***
RKLRCT	+	-0.00315	0.00523
Year	+/-	0.0134***	0.0151***
_cons		-26.81***	-30.08***
N		1280	1280

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

However, the result of trade-interacted terms implies two facts. Firstly, the terms RKLT and RKL2T show that trade openness increase deforestation in labor-abundant countries and slows down in capital-abundant countries. Secondly, the result of term RC2T shows that trade openness curbs deforestation in countries where more forests are certified compared to others. This implies that forest certification weakens competitiveness in forest-destructing industry which damages deforestation, thus results in decrease in deforestation rate.

4. Conclusion

This study does not find the evidence that forest certification by itself mitigate deforestation. However, some evidence is found that forest certification alters trade pattern and reduce deforestation. That is, forest certification is playing a role in expelling unsustainable forest utilization through reducing comparative advantage in forestry or other forest utilizing sectors which causes deforestation. Therefore, forest certification is recommended in order for countries to sustain their forest in the globalized economy.

Title of the Master's Thesis	The Effects of Financial and Trade Liberalization on Growth: A Case Study of Vietnam

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Abstract

This study examines the effects of financial liberalization and trade liberalization on economic growth using annual data from Vietnam over the period 1990 to 2012 obtained from World Bank data. This study applies the Autoregressive Distributed Lag model (ARDL) bound testing approach to co-integration and Error Correction model (ECM) to explore the long-run and short-run relationship among financial liberalization, trade liberalization and economic growth for a country-specific case study of Vietnam. The result is replicated when the effects of financial liberalization and trade liberalization on economic growth are examined by endogenous growth theory. The empirical analysis in this study shows that both of financial liberalization and trade liberalization have significantly led to higher economic growth in the long-run, meaning there are significant positive relationships among variables. In the short-run, however, there is only a significant positive relationship between trade liberalization and economic growth, and the relationship between financial liberalization and growth is not significant. The result further provides new evidence in support of the modernization hypothesis that financial liberalization and trade liberalization jointly enhance growth in the long-run in developing country like Vietnam.

Thus, to ensure more international financial inflows into Vietnam, some policy recommendations are suggested: first, the international financial inflows tend to bring the anticipated positive impacts on economic growth, thus government of Vietnam should continue to undertake further reforms and strong commitments to avoid misallocation of financial inflows. Second, further elimination of restrictions on equity market should be undertaken. Third, government should strengthen financial system and improve the institutional quality to ensure more financial inflows into Vietnam. Fourth, government should increase foreign exchange reserves, since the higher the financial inflows and external liabilities, the higher foreign exchange reserves needed to prevent from currency risk.