

Rural Poverty Reduction in Ghana: Evidence from MiDA Intervention Zones

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Abstract

As continual poverty reduction in African countries remain a global focus, the preliminary success of MiDA's administration of the MCA first Compact aimed at poverty reduction in Ghana has set a policy-interventional model that could improve rural living. Using a nationally representative data, the GLSS6, this study employs propensity score matching approach to assess the effect of MiDA intervention on rural poverty in Ghana. The study finds that rural households in MiDA intervention zones had higher consumption expenditure compared to their counterparts not in the MiDA intervention zones. It is therefore believed that the administrative role of MiDA was instrumental in initiating and supervising development projects in Ghana.

Key words: Millennium Development Authority (MiDA), Millennium Challenge Account (MCA), propensity score matching, rural household, consumption expenditure

I. Introduction

With the increased focus of the international community on development within the poorest countries in the world, the United States, acting through the Millennium Challenge Corporation (MCC), an independent U.S. government foreign aid agency, signed a five-year development compact equivalent to \$547 million (called the Millennium Challenge Account, MCA) with the Republic of Ghana in August 2006. The primary goal of the MCC Compact was to reduce poverty by raising farmer-household income through private sector-led and agribusiness development. In order to utilize the Compact funds, Ghana's government established the Millennium Development Authority (MiDA) in 2006 to administer the MCA to support the implementation of various projects in hopes of meeting the Compact goals. The duration of the Compact was from February 2007 to February 2012, which has been touted as successful, and therefore another Compact (known as the Power Compact) focusing on the electricity and energy sector has been granted since 2014.

Given the joint endeavors of MCC and MiDA, United Nations' Economic and Social Council in its GPRS I (The Ghana Poverty Reduction Strategy – I) report (2007) revealed that although Ghana has experienced drastic relief in poverty since the Compact implementation, Ghana still faces key challenges which may hinder further economic growth and poverty reduction. These challenges include institutional constraints in structural reforms and physical infrastructure development, whereas keeping market liberalization is equally crucial to promote private sector competitiveness in agribusiness and other industries. Provided such a limitation, this paper is designed to examine the overall impact of the MCC Compact on rural poverty in the MiDA intervention zones. As ongoing and sustainable rural development is desired and anticipated, the instrumental role of MiDA as a pilot administrative agency in the development process is assessed and related policy recommendations also drawn.

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This analysis is novel given that most existing literature focusing on poverty issues in Ghana has only been district-specific and never covered the national impact of MiDA intervention. Hence, its empirical findings could add intellectual value and a complementary view to the field of economic development and practice of intervention-based projects in both developing and less-developed countries. The paper is constructed as follows. After the introduction, the literature review is summarized, followed by the analytical framework and methodology. Empirical results and discussion are presented in the fourth section, and the final section will draw the conclusion and relevant policy implication.

2. Literature Review

Poverty reduction has been a major development challenge and a key policy focus for most African countries including Ghana in the twenty-first century (Appiah, Demery & Layea-Adjei, 2000). Ghana has been touted as one of the strongest economic performers in Africa since the mid-1980s, although after 59 years of independence, it is still grappling with rural poverty. Ghana's overall poverty rate has declined, yet rural poverty remains high and unenviable, especially as such an acute situation is found in Northern Ghana (IFAD, 2015). Poverty rates in Northern Ghana are two to three times Ghana's average, where chronic food insecurity remains a critical challenge, along with inevitable constraints including lack of infrastructure and insufficient access to agricultural capital and technology, scarce facilities for storing and processing products, as well as the marketing techniques (IFAD, 2015).

Appiah, Demery, and Layea-Adjei (2000) asserted that poverty affects virtually all aspects of a citizen's life and well-being including life expectancy, health and nutrition, literacy, political participation, and access to social and economic networks and amenities. These components are both economic and non-economic, which needs policy makers' cautious attention to set the remedial priority, while achieving poverty reduction with improved communal welfare. Nyanteng and Seini (2000) claimed that agricultural productivity can contribute to rural poverty reduction if measures to improve rural infrastructure such as roads, storage and processing facilities, and provision of market information prevail.

Few studies on the MiDA intervention have disclosed economic impacts on district-specific agrarian development in Ghana. Agyekum (2013) using propensity score matching techniques assessed the effect of MiDA intervention on the productivity of maize farmers in the Afram Basin, where it is concluded that those farmers intervened by MiDA had experienced improvement in maize productivity. Another study developed by Tortoe and Amo-Awua (2012) emphasized the training phase of MiDA to the Ghanaian Farmer Based Organizations (FBO's) in the Northern Horticultural Zone allowing the creation of farming business plans while the FBO's were granted possible financial support by MiDA participating financial institutions, which otherwise are inaccessible for commercial development in the Northern rural communities.

Analyzing at a larger scale, the ISSER (2012) submitted an impact evaluation report of MiDA FBO training claiming that MiDA intervention (1) produced no evident overall impact on crop yields and crop incomes across all intervened regions, even if the results varied district-specifically with a positive income effect on the Northern Horticultural Zone, zero impact on Afram Basin crop income, and a significantly inverse income effect on the Southern Horticultural Belt; (2) resulted in an increasing use of seeds and fertilizers by individual and independent farmers to start their farming investment and business; (3) promoted farmers to apply and use more formal sources for agricultural loans, and (4) increased the yields of plant-agricultural cash crops such as pineapples, tomatoes, and mangoes which are predominant in Southern Horticultural Belt.

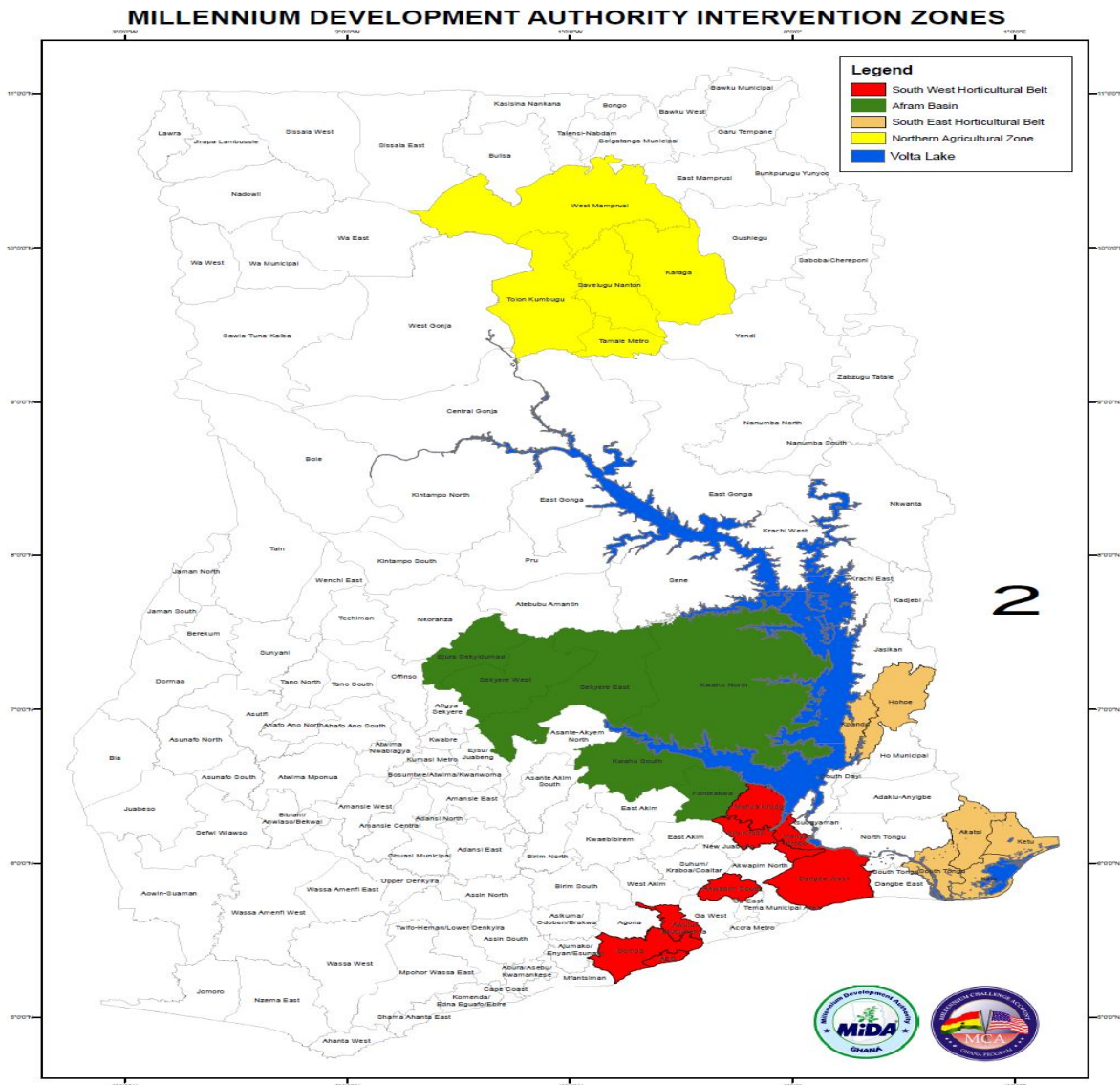
3. Preliminary Synopsis of Ghanaian Agrarian Poverty Reduction and MiDA Intervention Zones

Since Ghana's independence in 1957, many economic development policies and strategies have been put in place in the 1960s (Busia Administration), 1970s (Acheampong regime), and 1980s and 1990s (Economic Recovery Program and Structural Adjustment Programs) to strengthen the economy and improve living standards of Ghanaians.

Recently, the Ghana Poverty Reduction Strategy (GPRS I) (2003-2005) was launched as a precondition for economic aid allowing Ghana to be supported by Heavily Indebted Poor Countries (HIPC) initiative of the International Monetary Fund and the World Bank. The HIPC initiative is a joint project aimed at rural poverty reduction through the modernization of agriculture across 38 developing countries. Given its outcome, Ghana was granted funding for the Growth and Poverty Reduction Strategy (GPRS II) (2006-2009) to further focus on accelerated economic growth toward sustained poverty reduction and attainment of middle-income status. Meanwhile, the Ghanaian government instituted the Ghana Shared Growth and Development Agenda (GSGDA) (2010-2013) (a constitutional injunction within its '*Better Ghana Agenda*' for social and economic development) in hopes of fostering and increasing its macroeconomic stability and concurrently, commenced the Livelihood Empowerment Against Poverty (LEAP) Program, known as the flagship program of Ghana's National Social Protection Strategy (NSPS), in 2008 to enable the poorest families to obtain their basic nutrition, meet their substance demand, and help educate their children. GPRS II, GSGDA, and LEAP made clear that modernization of agriculture is one of the key policy targets. Currently, the Ghana Shared Growth and Development Agenda (GSGDA) (2014-2017) is fortifying operations in agriculture, fisheries, small and medium-scale enterprises, and sanitation, with special attention given to the dry savannah region in the north. Given that poverty reduction has been a major preoccupation for governments at the local, national, and supranational levels and a concern of international donors, the reduction of rural poverty through agricultural and rural development in a developing country like Ghana has naturally become crucial and needs immediate attention.

Before the 2007 MCC Compact, rural poverty rates were generally high in Ghana (GSS, 2000; 2008; 2012; Government of Ghana, 2005a; 2005b). In some regions including the northern, the central Afram Basin, and the southern horticultural belt in the southeastern region, the poverty rates were generally above 40 percent (IFAD, 2015; World Bank, 2015). Rural population in the northern region and parts of the Afram Basin region suffered poverty rates close to 90 percent with an average household income below \$2 a day (MiDA, 2007; IFAD, 2015). In spite of the incidence of poverty, Ghana has been politically stable. This qualified Ghana for the Compact grant from MCC given that MCC forms partnerships with poor countries to fight against poverty through the partners' commitment to good governance, economic freedom, and investment in their citizens. Various MCC programs targeting rural development operated in 30 districts across the northern region, the central Afram Basin region and the southern horticultural belt in the southeastern region (MiDA 2007; 2013).

Figure 1 indicates geographic classifications of the MiDA beneficiary districts. Ghana covers a total area of 238,537km² (92,100 square miles), bordering the Ivory Coast on the west, Togo on the east, Burkina Faso on the north and the Gulf of Guinea on the south. Its total population in 2014 reached 26,442,178 with approximately 47 percent living in rural areas. Approximately 38 percent of Ghanaians living in rural areas are poor (World Bank, 2015). From 2007 to 2012, four major intervention zones received MiDA resources. The 'yellow' zone, known as *Northern Agricultural Zone*, covers six districts with a total of 341 rural households. *Afram Basin*, the 'green' zone, covers nine districts with 310 rural households. The *South East Horticultural Belt* in 'beige' has seven districts with 481 rural households and, the 'red' zone, known as *South West Horticultural Belt*, amasses 401 rural households spread across seven districts. It is worth noting that the surrounding areas by the capital, Accra (or, Accra Metro), are assumed metropolitan or urban-like which is not a MiDA intervention target. Due to MiDA's primary goal to improve agricultural development and agrarian household income, most of the intervention zones are clustered around Volta Lake. MiDA originally covered 23 districts; some of which have been subdivided into independent districts due to population growth and density. Presently the division has increased the total number of districts to 30, and as indicated in the GLSS 6 dataset some of the districts do not actually include rural households (see Appendix A).



Source: MiDA (2013).

4. Analytical Methodology

Source of Data

The data for this study was obtained from the Ghana Living Standard Survey (GLSS) conducted by the Ghana Statistical Service (GSS) from 18th October 2012 to 17th October 2013 (GSS, 2014). A two-stage stratified sampling design was adopted. At the first stage, 1,200 enumeration areas (EAs) were selected to form the primary sampling units (PSUs). The survey covered a nationally representative sample of 18,000 households in 1,200 enumeration areas. The PSUs were allocated among the 10 regions using probability proportional to population size (PPS). At the second stage, 15 households from each PSU were selected systematically, summing to 18,000 households nationwide. Of all sample households, 16,772 were successfully enumerated leading to a response rate of 93.2 percent, of which 7,445 and 9,327 were sampled from urban and rural areas respectively. This national survey covered detailed information regarding rural households in and out of the MiDA intervention zones. Consumption expenditure and other aspects of household living conditions, such as gender/age/educational level of the householder, household size, and land ownership and other community characteristics are examined.

Table 1: Definition and Measurement of Variables

Variable Name	Measure	Definition
Dependent Variables		
Consumption expenditure	Continuous	Total annual household consumption expenditure
Household Characteristics		
Gender	Dummy	1 if household head is male, 0 otherwise
Age	Continuous	Years of household head
Education	Continuous	Years of schooling of household head
Household Endowments		
Household Size	Continuous	Number of household members
Land Ownership	Dummy	1 if household owns farm land, 0 otherwise
Community Characteristics		
Electricity	Dummy	1 if household has access to electricity, 0 otherwise
Transportation	Dummy	1 if household has access to public transportation, 0 otherwise
Water	Continuous	Proximity of household to water in kilometers

Research Question and Objective of the study

The objective of this study is to examine whether the well-being of the rural households in the MiDA intervention zones have improved. That is, whether rural households experienced reduction in poverty through the MiDA programs. If the answer is affirmative, which suggests MiDA initiatives are effective in improving Ghanaian rural welfare, it is recommended that a broader scale of MiDA programs may be feasible and beneficial. Nonetheless, if households in MiDA intervention zones do not experience significant welfare enhancement, re-evaluation of MiDA initiatives may be desired and alternative re-allocation of resources may be recommended.

Estimation Procedure

The propensity score matching approach is used to examine the impact of the MiDA intervention on rural household's well-being, measured by *total annual household consumption expenditure*. The household consumption expenditure includes the total annual expenditure for all goods and services consumed by the household. The method compares the well-being of households in MiDA intervention zones with their counterfactual groups that were not in MiDA coverage. The propensity score $P(X_i)$ is defined as the conditional probability of being in a MiDA intervention zone (beneficiary households) given pre-intervention characteristics. It is stated as:

$$P(X_i) \equiv \text{prob}(D_i = 1 / X_i) = E(D_i / X_i); P(X_i) = F(X_i) \quad (1)$$

Where (X_i) denotes a vector of pre-intervention characteristics of household i ; E is the expectation operator, and $F(X_i)$ represents logistic cumulative distribution frequency.

The propensity scores are predicted with the logit model (Wianaina et al., 2012). In estimating the effect of the intervention on rural poverty, the study adopted the procedure of Average Treatment Effect (ATE), Average Treatment Effect on Treated (ATT), and the Average Treatment Effect on the Untreated (ATU). ATE measures the effect of the intervention on the well-being of *all* rural households (i.e. those in MiDA zones and those outside the MiDA zones). ATT measures the effect of the intervention on households in the intervention zones, while ATU captures what the effect of the intervention would have been for the households outside the zones if they had actually been in the zones. According to Wianaina et al. (2012), the parameter of interest should be ATT.

However, Beck and Ichino (2002) argued that ATE and ATU should also be estimated since the effect of the intervention on rural households not in the intervention zones, as reflected in the ATU, would also be crucial. The three effects are to be attained by:

$$ATT = E[E\{Y_{1i} / D_i = 1, P(X_i)\} - E\{Y_{0i} / D_i = 0, P(X_i)\} / D_i = 1] \quad (2)$$

$$ATE = E[E\{Y_{1i} / D_i = 1, P(X_i)\} - E\{Y_{0i} / D_i = 0, P(X_i)\}] \quad (3)$$

$$ATU = E[E\{Y_{1i} / D_i = 1, P(X_i)\} - E\{Y_{0i} / D_i = 0, P(X_i)\} / D_i = 0] \quad (4)$$

Where Y_{1i} represent the two well-being counterfactual outcomes of rural households in the MiDA intervention zones and out of the MiDA intervention zone.

Positive ATE, ATT and ATU would mean that the MiDA intervention has improved the well-being of rural households. Moreover, the extent of the MiDA intervention welfare effect on those rural households is indicated by the respective magnitude of ATE, ATT and ATU. Although all these treatments can be economically meaningful to various studies, in this analysis the focus will be aimed at the ATT outcome (effect of MiDA intervention on households in the intervention zones).

5. Empirical Findings and Discussions

As indicated in Table 2, the results of the Maximum Likelihood (ML) estimation of the logit model used in estimating the propensity scores show that gender, age, and education of the householder, household size, land ownership, access to electricity, public transportation and the distance to water points are statistically significant in explaining the likelihood of rural households benefiting from the MiDA intervention. This implies that households in the MiDA intervention zones differ significantly from their counterparts, out of the zones, with respect to observable characteristics suggesting a process of self-selection. Comparing the households in and households out of the zones as they are would have resulted in biased estimates and thus the need to correct for selection bias through the use of propensity score matching. The likelihood ratio test of goodness of fit (i.e. *LR Chi2*) indicates that the model fits the data well. Pertaining to effects of the MiDA intervention on households, the likelihood of a household in the MiDA intervention zones benefiting reduces as a rural household is headed by an educated male, has more family members and owns land. On the other hand, the likelihood of a household benefiting from MiDA intervention rises when a rural household has no access to electricity, public transportation and a longer distance to water points. The joint significance of the explanatory variables as shown by the pseudo R-square suggests that the model cannot to be rejected before matching. About 48% of the variation in the model is explained by the explanatory variables.

Table 2: ML Estimates of the Logit Model Used in Estimating the Propensity Scores

Independent Variable	Coefficient	Standard Error	P-value
Gender	-0.1324**	0.0669	0.048
Age	0.0581***	0.0017	0.001
Education	-0.0276***	0.0073	0.000
Household Size	-0.0754***	0.0110	0.000
Land Ownership	-0.5682***	0.0574	0.000
Electricity	0.2306***	0.0585	0.000
Transportation	0.2780***	0.0797	0.000
Water	0.0786***	0.0275	0.004
Constant	-1.5896***	0.1637	0.000

*significant at 10% **significant at 5% and *** significant at 1%;

Pseudo R2 = 0.478; LR Chi2 (8) = 231.64; P value = 0.000

Table 3: Balancing Property for Propensity Score Matching Analysis

Independent Variables	P-value (Unmatched)	P-value (Matched)	Mean Absolute Bias (Unmatched)	Mean Absolute Bias (Matched)	Absolute bias Reduction (%)
Gender	0.001	0.357	14.2	3.4	75.8
Age	0.009	0.613	7.3	1.9	74.1
Education	0.001	0.971	8.3	0.1	99.8
Household Size	0.001	0.819	22.7	0.8	96.6
Land Ownership	0.003	0.744	30.9	1.2	96.2
Electricity	0.001	0.262	13.4	4.1	69.5
Transportation	0.058	0.661	12.3	5.4	48.2
Water	0.039	0.451	12.6	3.4	33.9

The results in Table 3 show that matching property was satisfied and implies that the distribution of the conditioning covariates did not differ across the treatment (i.e. rural households in the MiDA intervention zones) and the control group (i.e. rural households out of the MiDA intervention zones) over the matched samples. As comparing the p-value (unmatched) with the p-value (matched) columns, one can easily detect that almost all of the covariates reach high or sufficient p-values of matched, indicating the absolute bias of each individual variable has been significantly reduced (as shown in the last column).

In Table 4, the *chi* square test for joint significance of the covariates used in the logit model *before* and *after* matching is shown. The test *after* matching shows that the p-value of all the covariates in the logit model is not jointly significant. This confirms that there are no pre-treatment differences between households in and households out of the MiDA intervention zones; meaning that self-selection bias has been reduced, satisfying the matching requirement for computing treatment effects. Low pseudo R-square and the insignificant likelihood ratio tests further means that both beneficiary and non-beneficiary households have the same distribution in the covariates *after* matching. These results clearly show that the matching procedure is able to balance the characteristics in the treated and the matched comparison groups.

Table 4: Other Covariate Balances Indicators Before and After Matching

Before Matching	Pseudo R2	LR Chi2 (8)	P-value
	0.478	231.64	0.000
After Matching			
Matching Technique			
Nearness Neighbor	0.041	6.63	0.340
Radius	0.038	5.84	0.289
Kernel Based	0.034	2.94	0.198

The matching of rural households in and out of the MiDA intervention zones was undertaken within a region of common support in order to ensure that individual rural households with the same covariates have equal chances of benefiting from MiDA intervention. This takes care of possible selection bias in the sample by matching of both groups/households with similar characteristics before computing the effect of MiDA intervention on rural household well-being. The treatment effect was estimated using the *Nearest Neighbor*, *Radius* and *Kernel Based* matching techniques as shown in Table 5. Across all matching techniques, the MiDA intervention has a positive and significant effect on consumption expenditure of the rural households. The estimates of the average treatment effect on the treated (ATT), namely the MiDA beneficiary households, from the Kernel Based matching technique show that rural households in the MiDA intervention zones have a higher annual consumption expenditure of, on average, GH ₵455.75 (approximately about US\$120) than those outside the MiDA intervention zones.

This finding is consistently supported by the growth of annual consumption expenditures of GH ₵451.37 and GH ₵444.04 from the techniques of Nearness Neighbor and Radius matching, respectively. These empirical results corroborate the finding of the MCA Compact report by the MiDA (2013), MCC (2013) and the empirical findings by Agyekum (2013). However, this finding contradicts findings by ISSER (2012) probably because of the short time between the completion of the MiDA FBO training and the start of ISSER evaluation of the impact of the training. Although the result of ATT is the main focus of this study, it is worth-noting that across all three matching procedures, the results of ATU (namely, the average treatment effect on the untreated) and ATE (namely, average treatment effect) are also positive; it implies that the exercise of MiDA intervention appears to be meaningful with an affirmative welfare impact over all rural households in Ghana. Result of the ATU implies that the consumption expenditure of households out of the MiDA intervention zones would have increased if the households had been in the MiDA intervention zones. Result of the ATE implies that the consumption expenditure of the sample population of all rural households in both within and outside the MiDA intervention zones increased on the average.

Table 5: Treatment Effect of MiDA Interventions on Rural Household Consumption Expenditure

Matching Technique	Outcome Variable	Treatment Effects		Common Support (On Support)	
				Treated	Control
Nearness Neighbor	Real Household Consumption Expenditure	ATT	451.37 (1.73) *	728	1,022
		ATU	326.96		
		ATE	405.456		
Radius	Real Household Consumption Expenditure	ATT	444.04 (2.13) **	728	1,022
		ATU	394.13		
		ATE	423.28		
Kernel Based	Real Household Consumption Expenditure	ATT	455.75 (2.49) **	1,532	7,769
		ATU	132.74		
		ATE	402.55		

t statistics in parentheses * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

The propensity score matching model applied above assumes that the differences between the treatment and the control groups are attributed to their dissimilarity in observable variables in the data set (i.e. the conditional independence assumption). However, if the two comparison groups differ in unobservable characteristics, the conclusion of the positive effect of the MiDA intervention on household consumption expenditure may be questionable. To test the validity of this conditional independence assumption, the Rosenbaum bounds (rbounds) test, which tests the null hypothesis that *there is no change on the treatment effect for different values of unobserved selection bias*, was applied (Aakvix, 2001, Rosenbaum & Rubin, 1983).

The purpose of the sensitivity analysis is to examine whether inferences about treatment effects may be altered by factors not observed in the data set (i.e. the unobserved variables). Such sensitivity tests show how hidden biases might alter inferences about treatment effects but do not indicate whether biases are present or that their magnitudes are plausible.

Table 6: Sensitivity Analysis for Hidden Bias

Matching Technique	ATT	t-statistic	p-value	Gamma (γ) level
Nearness Neighbor	451.37	1.73	0.083	1.05-2.05
Radius	444.04	2.13	0.033	1.05-2.05
Kernel Based	455.75	2.49	0.013	1.05-2.05

The analytical results in Table 6 indicate the absence of hidden bias, suggesting that the computed ATT estimates is valid through the entire sample. That is, across all the matching techniques, the study is free of hidden bias with a lower bound $\gamma = 1.05$. The upper bound on the significance levels for $\gamma = 2.05$ also implies that the study is insensitive to a bias that would double the odds of benefiting from MiDA interventions by the households. It follows that benefiting from MiDA intervention is random and uncorrelated with rural household consumption expenditure, once we control for pre-intervention characteristics.

6. Conclusion and Policy Recommendation

As sustainable economic development and continual poverty reduction in African countries remain a desirable global focus, the preliminary success of Millennium Development Authority (MiDA) in Ghana has attested that governmental intervention can be an effective tool in bringing favorable rural welfare improvement. By employing a propensity score-matching approach based on cross-sectional data from the six round of the Ghana Living Standard Survey (GLSS6), this study found that the MiDA interventions on rural household poverty reduction had a positive and significant welfare effect via increased real annual household consumption expenditure.

While Ghanaian rural households under the MiDA scheme revel in their annual consumption growth, it is believed that the pilot administration by MiDA is instrumental in initiating and supervising developmental projects. As MiDA intervention continues in Ghana, it may also serve as a policy model for other policy makers. Relevant policy implications and emphases can be drawn below:

Intervention planning by targets Like the MiDA program has proceeded in Ghanaian rural poverty reduction, the intervention goal should be planned and set based on specified needs and coverage's, with desired time-horizons such as short-term, medium-term, and/or long-term targets. Each individual target should also be quantifiable and measurable so that once the intervention is completed the target outcome can be assessed and reviewed for further policy orientation.

Intervention implementation by stages Execution of the policy intervention should be structured in subsequent stages and properly reflected in defined stage goals. Each stage-task should be conducted and completed in a timely manner and with legal and ethical process, while applying necessary policy review to meet designated objectives.

Intervention monitoring and reinforcement with transparency Execution of the intervention program should constantly apply the system of checks and balances to ensure proper allocation of operative and administrative power. Meanwhile, transparency is crucial to invite communication and understanding, and to warrant openness and accountability in the course of implementation.

References

- Aakvix, A. (2001). Bounding a matching estimator; the case of a Norwegian training program. Working paper, University of Bergen.
- Agyekum, A. F. (2013). *Effect of MiDA intervention on productivity of maize farmers in the Afram basin of Ghana*. Unpublished master's thesis, University of Ghana, Legon, Accra, Ghana.
- Appiah, K., Demery, L. & Layea-Adjei, G. S. (2000). Poverty in a Changing Environment. In Ernest Aryeetey, Jane Harrigan and Machiko Nissanke, *Economic Reforms in Ghana*(pp. 304-320). Trenton, New Jersey: Africa World Press, Inc.
- Becker, S. O., & Ichino, A. (2002). Estimation of Average Treatment Effects based on propensity scores. *The Stata Journal*, 2(4), 358–377.
- Government of Ghana (2005a). *Reducing poverty through economic growth. Country proposal for MCA funding*. Retrieved from website:<http://mida.gov.gh/site/wpcontent/uploads/2010/09/GhanaProposal.pdf>

- Government of Ghana (2005b). *Growth and poverty reduction strategy II, 2006-2009*. Retrieved from website: <http://planipolis.iiep.unesco.org/upload/Ghana/PRSP/Ghana%20PRSP%20June%202006.pdf>
- GSS (2000). *Ghana living standards survey. Report of the fourth round*. Ghana Statistical Service (GSS), Accra, Ghana. Retrieved from website: <https://s3.amazonaws.com/ndpc-static/pubication/GLSS4+Main+Report.pdf>
- GSS (2008). *Ghana living standards survey. Report of the fifth round*. Ghana Statistical Service (GSS), Accra, Ghana. Retrieved from website: http://www.statsghana.gov.gh/docfiles/glss5_report.pdf
- GSS (2012). *2010 Population and Housing Census*. Ghana Statistical Service (GSS), Accra, Ghana. Retrieved from website: www.statsghana.gov.gh/docfiles/2010phc/2010_population_and_Housing_census_final_results.pdf
- GSS (2014). *Ghana Living Standards Survey: Main Report*. Ghana Statistical Service (GSS), Accra, Ghana. Retrieved from website: http://www.statsghana.gov.gh/docfiles/glss6/GLSS6_Main%20Report.pdf
- IFAD (2015). *Investing in rural people in Ghana*, International for Agricultural Development (IFAD), IFAD Country Office, Ghana.
- ISSER (2012). *An Impact Evaluation of the MiDA FBO Training. Final Report Submitted to Millennium Development Authority (MiDA)*. Institute of Statistics, Social and Economic Research (ISSER), University of Ghana, Legon, Ghana.
- MCC (2013). *Ghana Compact: Sowing the Seeds of Sustainable Growth, Millennium Challenge Corporation (MCC), Country Brief*. Retrieved from the website: <https://assets.mcc.gov/reports/countrybrief-2013002125101-ghana.pdf>
- MiDA. (2007). *Millennium Challenge Account Proposal: Reducing Poverty through Economic Growth. Ghana Proposal for MCA Funding*. Final Draft. Millennium Development Authority (MiDA), Accra, Ghana. Retrieved from the website: mida.gov.gh/site/wp-content/uploads/2010/09/ghanaproposal.pdf
- MiDA. (2013). *Millennium Challenge Account Ghana Program: Compact Completion Report* Millennium Development Authority (MiDA), Accra, Ghana. Retrieved from the website: <http://www.mida.gov.gh/compact2/wp-content/uploads/2014/08/MCA-Completion-Report.pdf>
- Nyanteng V. K. & Seini, W. (2000). Agricultural Policy and the Impact on Growth and Poverty 1970-1995. In Ernest Aryeetey, Jane Harrigan and Machiko Nissanke, *Economic Reforms in Ghana* (pp. 267-283). Trenton, New Jersey: Africa World Press, Inc.
- Rosenbaum, P., & Rubin, D. B. (1983). The Central Role of the Propensity Score in Observational Studies for Causal Effects. *Biometrika*, 70(1), 41-55.
- Tortoe C. & Amo-Awuah W. (2012). Development of business capacity and organization of commercial business of Farmer Based Organizations in the West Mamprusi district in the northern intervention zone in Ghana. *Third RUFORUM Biennial Meeting 24 - 28 September 2012, Entebbe, Uganda*
- Wainaina, P. W., Okello, J. J., & Nzuma J. (2012). *Impact of Contract Farming on Smallholder Poultry Farmers' Income in Kenya*. Selected Paper for Presentation at the International Association of Agricultural Economists (IAAE) Triennial Conference, Foz do Iguagu, Brazil.
- World Bank. (2015). *"World development indicators (WDI) an online database"*, Washington, DC: World Bank. Retrieved from the website: <http://data.worldbank.org/data-catalog/world-development-indicators>

APPENDIX A**DISTRICTS WITH RURAL HOUSEHOLDS IN THE MiDA ZONES FROM GLSS6 DATA**

Districts Covered on the Map: 23			
Northern Agricultural Zone	South East Horticultural Belt	South West Horticultural Belt	Afram Basin
Tamale West Mamprusi Karaga TolonKumbungu SaveluguNanton	South Tongu Akatsi Hohoe Ketu Keta Kpando	Akuapim South Dangbe West Awutu/Effutu Senya Gomoa YiloKrobo	Fanteakwa Kwahu North Kwahu South Ejura- Sekyeredumasi SekyereWest SekyereEast
District Enlargement after Divisions: GLSS6 Data			
Tamale North Tamale South Tamale Central* West Mamprusi Karaga TolonKumbungu SaveluguNanton	South Tongu Akatsi Hohoe Ketu North Ketu South Keta North Dayi (Kpando)	Akuapim South Dangbe West Effutu* Awutu Senya Gomoa East Gomoa West Upper Manya- Krobo Lower Manya- Krobo* YiloKrobo	Fanteakwa Kwahu North Kwahu South Kwahu East Ejura- Sekyeredumasi SekyereAfram- Plains Sekyere East Sekyere South Sekyere Central
Note: 1. Italic fonts indicate post-divided districts. 2. * The districts without rural households.			