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Measuring Intermediate Outcomes of Liberia's DDRR Program

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Abstract:

This paper analyzes data from a survey of ex-combatants in Liberia conducted in 2006 by Pugel (2006, 2007), with the goal of determining the effect that Liberia's Demobilization, Disarmament, Rehabilitation and Reintegration program had on participants' income and chances of finding employment. I estimate the effects on educational and geographic cohorts. As individuals did not enter or complete the program randomly, these estimates are biased. I use propensity score matching to obtain a more precise estimate. While the results indicate an increase in employment for those who complete the program, there is consistently no effect on income. These results have implications for both evaluating the outcomes in Liberia as well as assessing the integrated approach to ex-combatant reintegration that the program embodied.

Keywords: civil war, vocational training, post-conflict reintegration

JEL: D74, O15, O17

1 Introduction

It has now become standard practice for the post-conflict reconstruction process to include Demobilization, Disarmament and Reintegration (DDR) programs as a way of reintegrating combatants. The programs typically take a holistic approach, and concentrate on decreasing the likelihood that ex-combatants will return to violence or engage in other peace-spoiling activities by facilitating economic, social and political reintegration. This paper analyzes outcomes from one such program: the Demobilization, Disarmament, Rehabilitation and Reintegration (DDRR) program in Liberia. Specifically, this paper examines how the DDRR program affected employment rates and income.

While most previous empirical studies have concentrated on the overall effectiveness of DDR programs to facilitate reintegration and to contribute to peace in the region, this paper focuses specifically on the effectiveness of the job training component of the DDRR program. Ultimately, reintegration as a means of rebuilding a society and preventing conflict should not be ultimately judged by any one factor. However, as economic reintegration is a vital part DDR, the success of the programs in reaching the intermediate goal of improving the economic situation of participants, usually through job-training programs, is necessary in determining the overall effectiveness of these programs in post-conflict reintegration.

This paper re-analyzes survey data on ex-combatants in Liberia, collected in 2006 by Pugel (2006; 2007). The goal of this exercise is to determine the effect that the DDRR training had on participants' daily wages and employment status, looking at effects within educational and geographic cohorts and accounting for selection bias. The results indicate that the program, on the whole, unlikely had any significant effect on employment status or income. This is true for all educational cohorts. The effect of training did, however, have a significant impact in certain regions of Liberia. This may be attributable to differences in the quality of training provided across regions, to availability of training or to heterogeneity in employment opportunities.

This suggests that any success in reintegration achieved by the Liberian DDRR program may not have hinged on job training. In post-war Liberia and similar settings, where employment opportunities are extremely limited, job training may be of little value to participants—even when it is of high quality, which is often not the case.

Measuring the effect of job training is challenging because unobserved personal characteristics can play a large role in determining both whether an individual will participate in a training program and that individual's income level independent of the job training. This problem is particularly difficult when unemployment is high and in developing countries

where many individuals earn income in the informal sector. This analysis attempts to correct for this selection bias using propensity-score matching. However, this technique is far from perfect. If the effect of future programs is to properly measured and understood, more careful study is needed. While DDR programs are poor candidates for randomized control trials, more resources should be dedicated to measuring the effects of job training programs for ex-combatants to ensure that the quality of the programs is adequate. In the absence of higher wages and employment level, it may make more sense to spend money on other types of reintegration and employment generating programs.

While these conclusions are not odds with previous analyses of this and other reintegration programs, this exercise contributes to the debate by showing that, at least in this instance, the evaluation of the general approach taken towards reintegrating ex-combatants should take into account that the program, as a whole, failed to significantly improve the participants' chances of being employed or of having a higher income. This means that shortcomings of the program may result from poor execution of its components rather than a flaw in the overall approach (of course, demonstrating the programs were ineffective in this way does not rule out the possibility that the approach is flawed.) Conversely, any success that program has had does not seem to rely on the programs' effect on ex-combatants income—at least in some areas of the country.

This paper begins by introducing the DDR concept, reviewing relevant literature and discussing the effectiveness of the approach. Sections two and three, describe the data used and the methodology employed, respectively. Section four presents outcomes and section five concludes.

2 Background: the Liberian conflict and post-conflict reintegration

This paper deals with the DDRR program in Liberia that began in 2003, which followed the end of over a decade of civil war. The program followed from the Comprehensive Peace Agreement that was brokered by international and regional actors in 2003. Since this time, there has been relative peace in the country, although several violent incidents involving ex-combatants have occurred and poverty and lack of infrastructure continue to be serious problems. The Comprehensive Peace Agreement included a provision requesting that the UN send troops to support the transitional government. This included a mandate to aid in the reconstruction of the country, including the reintegration of former combatants. To this end, the United Nations Mission in Liberia (UNMIL) was established in 2003 under UN Security

Council resolution 1509 (UNDDR 2011). UNMIL's mandate was to demobilize, disarm and provide training and reintegration support to former soldiers for the two main factions, the Liberians United for Reconciliation and Democracy (LURD) and the Movement for Democracy in Liberia (MODEL), as well as the Armed Forces of Liberia (AFL). This included women and children.

The issue of training and reintegrating former combatants into the workforce has been a goal of most post-conflict development programs in recent history. Both feedback from practitioners in the field and academic work has established that there is a connection between the economic conditions of combatants and their willingness to fight or lay down arms. To this end, Demobilization Disarmament (Rehabilitation) and Reintegration (DDR or DDRR) programs have become more or less standard practice in UN-negotiated peace agreements since 1989 Humphreys and Weinstein (2007) and are "part of the United Nations (UN) system's multidimensional approach to post-conflict peace-building and reconstruction" (UNDDR 2011). To date, there have been around sixty DDR programs in Asia, Africa the Caribbean and South America (Muggah 2009). These programs represent a holistic approach to reintegrating combatants into civil life, based on a multi-dimensional understanding of reintegration. In other words, successful reintegration depends on an individual's simultaneous progress in all relevant aspects of transition to civilian life, including economic and social.

DDR might serve only certain groups of former combatants—for example only those from the non-government factions—or they might be available to soldiers from government forces as well. This paper concentrates on aspects of DDR intended for adults, specifically job training, although DDR can include minors and even the families of former combatants (UNDDR 2011).

As an integrated approach to peacekeeping and peace-building, DDR serves several purposes. Special attention might be given to the most vulnerable groups, such as female and child combatants because those individuals are in need of the most assistance in reintegrating. On the other hand, the ultimate goal in post-conflict settings is to reduce the chances that violence will reoccur, and to this end, training programs are devised to help combatants who may turn to peace-spoiling activities if they fail to reintegrate.

After units are demobilized, combatants typically enter a program by turning in a weapon—the "disarmament" phase of the program—and receive an ID card that allows the individual to participate in other aspects of the program.

Rehabilitation and Reintegration usually consists of financial and social support offered to demobilized combatants. The goal of such programs is to increase the chances that ex-combatants will transition into the peacetime economy and become economically self-sufficient. In Liberia, eligible participants were allowed to register for a job training program of their choice (UNDDRR 2011). These programs were divided into four main categories: agricultural training programs, civil works programs, vocational training and formal education.

The Liberian DDDR program was divided into two main stages: the first phase, or “DD” phase, consisted of disarming and demobilizing combatants. Initially, combatants were required to turn in serviceable weapons (or ammunition of a certain amount) in order to register for the program, although this restriction was relaxed in later phases of demobilization. Upon doing so, each individual was given US \$300 and an ID card that allowed him or her to register for further benefits, including training.

The program got off to a rocky start as there were some misconceptions over the distribution of payments and unease among combatants. Initially, the United Nations Mission in Liberia paid individuals half of their payments as a first installment, with the other half to be administered at the end of a three week demobilization program (Alusula 2008). This raised tensions among ex-combatants at demobilization centers, who were often ill-informed on the procedures to be employed. In addition, problems ensued when the UN staff decided to begin disarming and distributing payments among government soldiers first (Jaye 2009). Further rounds of disarmament and demobilization went more smoothly, however, and by the end of the program, 101,495 combatants had been demobilized, of whom 60%, 28% and 12% had fought for the AFL, LURD and MODEL, respectively (UNDDRR Resource Centre 2011).

The “RR” portion of the program mainly consisted of job training. Participants were given the choice to enter formal education programs (for which funding was provided to cover school fees, related costs and a stipend for up to three years) and vocational training programs that were provided by contracted partners. During the RR phase of the program, each student was given a stipend of \$30 a month plus in-kind support from the contracted training institutions Alusula (2008). The vocational programs prepared participants for careers in masonry, tailoring, agriculture and other fields. Most of those who demobilized, around 90%, registered for training benefits, although not all of those individuals completed training programs (UNDDRR Resource Centre 2011).

Although some have considered Liberia's DDRR program to be a general success--a view supported by sustained peace--the program has many faults that have been noted both by researchers studying the process and by officials in the field (Alusula 2008).

Recently, events in the region have highlighted the threat to peace and stability that ex-combatants who have not successfully reintegrated may pose. Credible reports indicate that Liberian mercenaries have played a part the violence in Ivory Coast following Laurent Gbagbo's refusal to give up power after losing the 2010 presidential elections. Harrison S. Kamwea Sr., Liberia's interior minister linked the ex-combatants' involvement in the conflict with employment opportunities: "when people have been used to living on violence, they have got no profession to earn their living on" (Akam 2011).

In general, employment opportunities in post-war Liberia have been very poor and this may be the most serious restraint to the ability of training programs targeted at ex-combatants to produce results. According to the World Bank, only 65.7% of the Liberian population over 15-years old was employed in (2006 World Bank 2011). This is reflected in a very low level of development (the 2007/2008 Human Development index ranked Liberia 169th of the 182 countries ranked).

3 Review of literature

This section review literature on both DDR and on ex-combatants in Liberia. Despite a recent increase in the study of economic elements of civil war (Blattman and Miguel 2010) and the fact that DDR has been the modus operandi of international peacekeeping for more than two decades, there remain relatively few analytical studies that concentrate on clearly demonstrating the precise effectiveness of the programs in terms of measurable outcomes (Muggah 2009). There are, however, several notable exceptions.

Restrepo and Muggah (2009) study the effects of a DDR program in Columbia by comparing levels of violent incidents in time periods and areas in which the program was active and in which it was not. They conclude that the number of violent incidents in a given area in a given period did in fact decline as a result of the program.

There have been a few surveys of ex-combatants in post-conflict countries that measure economic and social outcomes and include analysis of DDR programs. This paper deals with data from one such surveys conducted in Liberia by Pugel (2007, 2009). This project was based on methodology employed in a previous survey of ex-combatants by Humphreys and Weinstein in 2004 in Sierra Leone (Humphreys and Weinstein 2007).

Humphreys and Weinstein (2009) are generally skeptical that the DDR program in Sierra Leone was effective. They use propensity matching to condition those who entered and didn't enter Sierra Leone's DDR program (Humphreys and Weinstein 2007). The economic dimension was measured in binary outcomes, for example whether the individual was employed. They come to the conclusion that there is no effect in any dimension of reintegration measured. Interestingly, they indicate that combatants from a higher socio-economic background had a harder time reintegrating, including finding employment (Humphreys and Weinstein 2007, 2009).

Pugel (2009) comes to similar conclusions about data from the 2006 UNDP study in Liberia, upon which this analysis is based, although he notes that those who completed the DDRR program displayed some indications that they were economically better off than those who did not, and that those who did not enroll were overall in worse economic condition. However, this claim does not account for potential selection bias, as the program was voluntary, nor for bias due to attrition, as a fairly large number of those who joined did not complete the program.

Humphreys and Weinstein (2009) point out that DDR may be important despite its effectiveness ultimate effectiveness in facilitating reintegration as the program "enabled faction leaders to sell their soldiers on a peace deal." However, the failure of this and other programs at the micro level might also suggest that demobilization and disarmament be delinked from economic development. One problem potential explanation for the failures of these programs to increase employment is that there is generally a lack of jobs available and the economic situation is difficult for all in post-conflict economies. The lack of any significant effect in this regard would therefore be the result of the general economic situation and not a specific failure of the program. If this is the case, it may be better for effort and aid to be spent on job creation and development in general, and specifically linked to the reintegration of ex-combatants.

However, the situation may also be that the job training portions of DDR have been extremely ineffective and have not led to positive results for even those who managed to find employment. In this case, it may be too early to do away with the integrated approach. The solution may be to simply improve the quality of job training associated with DDR programs.

Willibald (2006) reviews theoretical and empirical evaluations of the effectiveness of cash transfers to demobilized combatants.

There are a number of studies, from several academic fields, specifically devoted to the Liberian conflict and its aftermath, including some that focus on issues facing ex-combatants

and the success of the DDRR program. Jennings (2007), for example, uses qualitative fieldwork with ex-combatants to identify issues that continue to face this population. She concludes that the process (both in Liberia and generally) should do more to account for local conditions, argues that demobilization and disarmament should not necessarily be linked with rehabilitation and reintegration and suggests that post-conflict job training might be targeted towards ex-combatants while being open to the general population (Jennings 2007). Boas and Hatloy (2008) describe the results of a survey-based study conducted in Monrovia, which included a high percentage of participants who had been through the DDRR program who were unable to find work.

In addition, several reports issued by development agencies and research institutes analyze the Liberia's DDRR program, including Alusula (2008) and Hill, Taylor and Tamin (2008) among others.

This paper contributes to the literature by examining the effects of the DDRR program in Liberia simply in regards to returns to income--in other words as an ordinary job training program would be analyzed. As previously mentioned, the goal of DDR programs is not simply to help ex-combatants attain higher incomes, but to facilitate reintegration in order to prevent peace-spoiling activities and further violence. However, understanding how effective the programs were in terms of this one dimension should contribute to the broader debate on the effectiveness of DDR.

4 Data

The data for the Libneria project was gathered in a UNDP-supported country-wide survey of 590 ex-combatants in 2006 by Pugel (2007a). The questionnaire was administered to ex-combatants who had participated in some way in the conflict in that country. The study included questions on basic biographical information, the individuals experience in the war (which faction they fought in, locations of fighting and rank for example).

The respondents were asked about their participation in the DDRR program, which consisted of several phases. Participation in the program components forms the key variables for this analysis. Firstly, units were demobilized combatants entered the DDRR program by turning in serviceable weapon and registering with the DDRR program. The individuals were then given an identification card that allowed them to participate in other portions of the program. Of the sample of ex-combatants in this analysis, 88.3% of respondents demobilized. 50% or respondents registered for training benefits, while around 43% of respondents

enrolled in DDRR-sponsored training programs. Around 15% of the sample had completed DDRR training at the time of the survey.

Around sixteen percent of respondents both entered and completed a DDRR training program. Table 1 reports characteristics of those who participated in the various phases of the program, dropping observations for those who are over 65 years of age, those who reported an income of 700 LRD a day or more (i.e. more than three standard deviations from the mean), disabled individuals and students. This brings the total number of observations to 565.

The individuals entering DDRR job training programs could choose between programs in civil works, agricultural training, vocational skills/apprenticeships and formal education. Slightly more than half of those who enrolled in a job training program chose vocational skills.

The formal education provided to ex-combatants as part of the Liberian DDRR program has been considered a success by some authors (Daboh, Fatoma and Kuch 2010). While around 14% of survey respondents registered for the formal education program, only 1.3% had completed the program. This means that a large percentage of the respondents may have been currently attending classes connected to the DDRR program. Overall, around seventeen percent of respondents considered their primary occupation to be “student.”

One interesting feature of the data set is that employment was actually lower for those who had completed junior high than it was for those with no school or for those who had completed only elementary school. This is consistent with findings by the author of this survey (Pugel 2007b, 2009) and findings from Sierra Leone data (Humphreys and Weinstein 2009) that ex-combatants with higher socio-economic status had a harder time reintegrating. Those ex-combatants who finished DDRR training had slightly higher levels of education than those who did not.

The capital city, Monrovia, was a destination for many combatants after the conflict (Pugel 2007a). Although mean daily income for those residing in Monrovia, which is in Montserrado county, were higher than the country-wide average the employment rate was lower. Pugel (2007a) notes in a report on the survey results that those who had not returned to where they had lived before the war had a harder time reintegrating. Table 1 shows the regional composition of program participants by county.

Only 33% of the sample left their respective faction as officers. Surprisingly, these individuals do not seem to have a higher income on average. Around half (48.0%) of the respondents were members of the Taylor (government) faction when the conflict ended in 2003, with 25.2% and 16.1% belonging to the LURD and MODEL respectively, and the

remaining 10.7% of respondents belonging to no faction at the end of the conflict, usually indicating that they were not active during this time. The vast majority of the respondents were active in combat (84.1%).

5 Methodology and estimation results

I model the results of the DDRR program components in terms of two dependent variables: natural log of daily income and employment. Daily income results from individuals' responses to the question "how much money do you get in a day?" and employment as determined by five questions on the UNDP survey. I count an individual as employed if the survey classified him or her as "employed," an "employer," or "self-employed."

The key variables of interest are the those designating whether an individual has participated in a given phase of the DDRR program, namely "reintegration registered," which is equal to one if an individual registered for reintegration benefits and DDRR. There are not enough observations for the other training programs (civil works, agriculture and formal education) to draw meaningful conclusions. This somewhat limits the overall analysis. All specifications exclude those currently in training.

I firstly use ordinary least squares as a baseline for estimating the effects of the program components on daily income, and probit analysis to estimate the effect on one's chances of being employed at the time of the survey. Both of these approaches, however, do not account for self-selection into training programs. I use propensity-score matching to account for self-selection on observable characteristics, which produces a more accurate estimate.

Ordinary Least Squares and Probit

A basic OLS model serves as an orientation point in understanding the effects of the DDRR program components on daily income. The model is a basic Mincer equation:

$$(1) \quad \ln(\text{dailyincome})_{ij} = \delta_0 + \delta_1 X_i + \delta_2 E_i + \delta_3 C_j + \delta_4 \text{DDRR}_i + \varepsilon_i .$$

Where natural log of individual i in county j is given by X , a vector of personal characteristics that consists of age, age squared and dummy variables that equal one if the person is single, female, faction without being an officer, and from the Kpelle tribe, E_i is individual i 's highest level of education completed and C_j is The DDRR term includes a

dummy for finishing the program as well as a variable that indicates registering for training benefits and education is measured by dummy variables that indicate the highest level of education achieved and ε is an error term.

Results from the basic OLS model are given in table 2. Education, unsurprisingly, affects earnings significantly, although age does not. This may indicate that age is a poor proxy for experience for this group of ex-combatants. DDRR was not significant at the 90% level in any of the specifications. Model 4 restricts the sample to employed individuals only. This accounts for the fact that daily income is a misleading measure of earnings for those who are not employed. The effect of DDRR is not significant in this specification either.

An analogous probit model serves as a baseline measure determinates of employment:

$$(2) \quad employed_{ij} = \delta_0 + \delta_1 X_i + \delta_2 E_i + \delta_3 C_j + \delta_4 DDRR_i + \varepsilon_i .$$

Table 3 reports results. The effect of completing high school significantly increases chances of employment, although lower levels of schooling are not significant. Single individuals were less likely to be employed, as were those living in Lofa, Montserrado and Nimba counties. In contrast to the OLS model, we see significant and relatively strong effects on completing DDRR. This is in line with conclusions of Pugel (2007; 2009).

There are a couple potential explanations for the discrepancy between effects on income and employment. It could be the case that the DDRR program was successful in terms of employment but that employment opportunities are low paying. It may also be the result of selection bias: those with no DDRR had a higher average income than the general population, which most likely indicates that these high-earning individuals needed less help reintegrating economically. Pugel (2007a) notes that those at both the top and the bottom of the income distribution were more likely to be non-participants in DDRR training, which supports this interpretation. A more skeptical view is that the employment result is driven by selection bias and that those who are more motivated to work or better suited to find employment were also more likely to complete DDRR training.

Propensity-score matching

Given the lack of randomization in assignment to the treatment groups, lack of good instrumental variables and the cross-sectional nature of the data, there are no good options for identification strategies. To obtain a better estimate of the effects of the DDRR program, I

employ propensity-score matching to estimate the effects of reintegration benefits and completing DDRR training on both daily income and employment. This does not solve the identification problem, as it does not account for self-selection on unobservable characteristics, however, propensity score matching does account for the influence of observable variables on selection into the treatment group, and can therefore provide a more accurate assessment of the treatment effect than simple OLS and probit.

The explanatory variables for employment and income are most likely not independent of participation in the various DDRR program components. Table 4 reports results from a probit regression on program variables, which demonstrates that several personal characteristics, including age, ethnic group and region of residence are significant in determining whether an individual enrolls and completes DDRR. Model 4 from table 4 is used to estimate the propensity score—the probability that an individual is assigned to the treatment group. Rosenbaum and Rubins (1984) show that by matching observations with propensity scores, the effect of a treatment can be calculated despite selection into the treatment group that is conditional on explanatory variable (Blundell and Costas 2008).

To estimate the propensity score and match observations, I use the method developed by Becker and Ichino (2008). This algorithm divides the data into blocks and tests whether the balancing property is satisfied within in each block. This is the case if the mean propensity score and means of each characteristic do no differ between treated and control units within a given block (Becker and Ichino 2008). The data is divided initially into 5 blocks, then further divided in blocks in which the balancing property is not satisfied. For the propensity score for completing the DDRR program, the final number of blocks is 6.

The pseudo r-squared of the propensity score model is around 0.19, although the goal is not to perfectly predict treatment, but rather to provide a score for matching individuals who are similar in terms of the explanatory variables (Caliendo and Kopeinig 2005).

Propensity score matching can only produce estimates of the treatment effect for individuals for whom there is common support, in which there is an overlap in characteristics for treated and untreated individuals. For this sample, the region of common support is sufficiently large, including 382 individuals, or 75% of the sample, and the analysis is restricted to the area of common support for the matching estimates.¹

I use three matching techniques, after by Becker and Ichino (2008). Each method has pros and cons, and the results of each are considered in order to obtain robust results. Firstly, the

¹ Results are robust to including observations outside the area of common support.

stratification matching compares the outcome variable between treated and untreated individuals in each block in which the balancing property is satisfied. The stratification method has a potential drawback that blocks in which no treated or no control observations are observed are not counted. This is solved by the nearest-neighbor method, which matches each treated observation with the control observation that has the closest propensity score. The drawback of this method, however, is that the nearest match may have a drastically different propensity score. Finally, the kernel-density method matches all treated units with a weighted average of all controls. The weight for each control is inversely proportional to its distance from the treated observation and is calculated using a kernel-density function. The kernel-density matching method is advantageous in that it reduces variability of the ATT estimator, although it introduces bias at the edges of the $p(X)$ distribution (Blundell and Costa 2008).

Table 5 lists the estimations of the ATT and boot-strapped 95% confidence intervals for the effects of receiving reintegration benefits and completing a DDDR training program on log of daily income. The ATT estimate ranges between 0.08 and -0.03, although the bootstrapped 95% confidence intervals include zero for all three matching techniques. When considering only the sub-set of the sample that is employed, the ATT estimate produced by the nearest-neighbor method is negative, and while the others are positive, the standard errors are large and 95% confidence intervals include 0.

Table 6 reports results from matching on employment. Although the nearest-neighbor method produces a confidence interval that overlaps with 0, the stratification and kernel-density methods produce ATT's of 0.14 and 0.16 that are statistically different than 0 at the 95%-confidence level.

Again, these estimates are likely more precise than simple OLS, but are still biased by unobservable characteristics that influence selection to the treatment group.

Interaction effects

Next, I add interactions between DDDR participation and education level to the OLS model (1) in order to test the possibility that the program had an effect on some cohorts, even though the overall effect was not significant.

$$(3) \quad \ln(\text{dailyincome})_{ij} = \delta_0 + \delta_1 X_i + \delta_2 E_i + \delta_3 C_j + \delta_4 DDDR_i + \delta_5 E_i * DDDR_i + \varepsilon_i .$$

Similarly, (4) adds interactions between DDRR completion and level of education to (4), the probit model on employment:

$$(4) \quad employed_{ij} = \delta_0 + \delta_1 X_i + \delta_2 E_i + \delta_3 C_j + \delta_4 DDRR_i + \delta_5 E_i * DDRR_i + \varepsilon_i .$$

Results are reported in table 7. In the OLS regressions, DDRR remains insignificant, as are the interaction terms with all levels of education. In the probit regressions, adding the education interaction terms results in a significant but *negative* coefficient, without controlling for registering for benefits, and a positive but insignificant coefficient when the registration control is added. As discussed above, education level independently affects chances of completing the program and employment, and this may account for the strong effects observed on employment in (2).

The survey results indicate that DDRR participation varied greatly by region, which also affects employment and income independently. Regional interactions are added to (1) and (2) and analyzed using OLS and probit, respectively:

$$(5) \quad \ln (dailyincome)_{ij} = \delta_0 + \delta_1 X_i + \delta_2 E_i + \delta_3 C_j + \delta_4 DDRR_i + \delta_5 C_j * DDRR_i + \varepsilon_i .$$

$$(6) \quad employed_{ij} = \delta_0 + \delta_1 X_i + \delta_2 E_i + \delta_3 C_j + \delta_4 DDRR_i + \delta_5 C_j * DDRR_i + \varepsilon_i .$$

Results are reported in table 8. While we see a strong positive effect of DDRR on employment, there is a strong negative effect on income. The coefficients for the interaction between DDRR and Montserrado county—where around 65% of those in the sample who finished DDRR training live—have the opposite signs, however. This may reflect different economic circumstances in the capital and the rest of the country, a difference in quality or availability in DDRR training or both.

6 Discussion

This analysis has shown that it is unlikely that the DDRR program had any significant effect on the daily income of participants. It is, however, possible that the program increased the chances that participants would find employment, as the results seem to indicate an increase in the employment rate for those who completed DDRR training in all of the models except those that control of interactions with education. It is likely that program helped

certain types of individuals find jobs, but that those jobs were not particularly high-paying. This result is consistent with other studies on job-training programs, which have a particularly poor record in developing and transition countries (Betcherman et al 2004, Puerta 2010).

However, these results should be taken with a grain of salt, since there are unobservable characteristics that likely influence both the chances that an individual enrolls in the DDRR program and the chances that he or she is employed. This is a general problem associated with measuring the effects of job training in the absence of any randomized method for assigning individuals into the treatment group (Heckman et al 2006, Blundel et al 2001).

limited employment opportunities, even high-quality training may be of little use to participants.

While it is not politically feasible to provide training to ex-combatants randomly, there may be some arrangements for future DDR programs that can provide a better opportunity for assessing the effects of job training, and therefore the approach as a whole.

While DDR should be ultimately be judged on its overall ability to reintegrate individuals for the sake of preventing future conflict, the linked approach depends on the economic portion of the programs actually functioning. Authors such as Muggah (2009) suggest that this approach needs to be reconsidered in light of failures to deliver real results. If DDR has been ineffective in facilitation economic reintegration for former combatants, the reason may be that the programs approach the problem in the wrong way, and job training will not be effective in given economic situations. This would imply that effort and funds should be spent on general development rather than specifically targeting ex-combatants. This paper has attempted to demonstrate that the DDRR job training in Liberia was not necessarily effective and that possible the problem lies in the effectiveness in job training, rather than the linked approach to the reintegration of ex-combatants.

While most studies have—rightfully—concentrated on the overall impacts of DDR programs, this paper adds to this discussion by noting that, at least in Liberia, the job training programs might have failed to produce intermediate economic outcomes. Any measure success or failure in terms of more generalized outcomes of successful reintegration should be tempered with a healthy dose of skepticism over whether the training portions of the programs were of sufficient quality to really make a difference.

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TABLE 1 – SUMMARY STATISTICS

Variable	Mean							
	All	No DDDR	Demobilized	registered for DDDR benefits	enrolled in training program	enrolled, did not finish	still in training	DDRR training finished
age	26.47 (6.17)	28.14 (7.31)	26.25 (5.98)	25.80 (5.49)	25.47 (5.04)	27.14 (4.94)	24.02 (4.78)	27.12 (4.83)
education (years)	6.98 (3.89)	7.95 (3.70)	6.85 (3.90)	7.92 (3.22)	8.18 (2.98)	7.86 (2.71)	8.04 (2.89)	8.49 (3.21)
daily income	168.65 (120.53)	200.23 (133.74)	164.48 (118.20)	173.02 (119.86)	172.82 (117.98)	148.88 (97.04)	169.73 (121.83)	185.96 (118.20)
employed	0.57	0.58	0.57	0.57	0.58	0.45	0.56	0.65
student	0.15	0.14	0.15	0.18	0.19	0.17	0.24	0.11
single	0.55	0.58	0.55	0.64	0.67	0.55	0.75	0.59
male	0.79	0.85	0.79	0.82	0.82	0.90	0.77	0.87
Monrovia	0.42	0.53	0.40	0.60	0.62	0.59	0.65	0.59
officer at end of conflict	0.33	0.36	0.32	0.30	0.28	0.38	0.24	0.31
<i>County</i>								
Bomi	0.07	0.18	0.05	0.04	0.04	0.00	0.06	0.02
Bong	0.10	0.11	0.10	0.04	0.03	0.10	0.00	0.06
Grand Bassa	0.04	0.00	0.04	0.05	0.05	0.07	0.08	0.01
Grand Cape Mt.	0.04	0.02	0.04	0.01	0.01	0.00	0.01	0.02
Grand Gedeh	0.10	0.00	0.12	0.13	0.13	0.14	0.09	0.19
Lofa	0.07	0.02	0.07	0.02	0.00	0.03	0.00	0.00
Montserrado	0.49	0.68	0.46	0.66	0.70	0.62	0.74	0.65
Nimba	0.07	0.00	0.07	0.03	0.03	0.03	0.02	0.04
Sinoe	0.03	0.00	0.04	0.03	0.00	0.00	0.01	0.00
Number of Observations	565	66	499	280	240	29	128	83

Notes: Robust standard errors in brackets. All regressions exclude students, those currently in DDDR training at the time of the survey, individuals 65 or older, those who reported they were disabled, respondents with one or more missing relevant response and those with daily incomes of 700 LRD or higher.

TABLE 2 – OLS ON DAILY INCOME

Explanatory Variable	Ordinary Least Squares				
	Dependent variable: Ln daily income				
	(1)	(2)	(3)	(4) ^a	(5)
reintegration registered	-	-	0.02 (0.10)	0.12 (0.13)	-0.01 (0.10)
Finished DDDR	-	0.05 (0.09)	0.01 (0.12)	-0.11 (0.14)	0.06 (0.12)
age	0.01 (0.04)	0.01 (0.04)	0.01 (0.04)	0.04 (0.04)	0.01 (0.03)
age ²	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
elementary	0.16 (0.12)	0.16 (0.11)	0.15 (0.11)	0.21 (0.14)	0.20** (0.10)
junior high	0.27** (0.12)	0.26** (0.13)	0.26** (0.12)	0.22 (0.15)	0.30*** (0.10)
senior high	0.43*** (0.14)	0.41*** (0.14)	0.43*** (0.14)	0.40** (0.16)	0.43*** (0.13)
some university	0.41* (0.24)	0.46* (0.24)	0.41* (0.24)	0.45** (0.22)	0.44* (0.23)
voc. Training	0.54** (0.24)	0.46* (0.25)	0.52** (0.24)	0.53* (0.27)	0.37** (0.18)
single	-0.15* (0.09)	-0.16* (0.09)	-0.16* (0.09)	-0.15 (0.10)	-
non-officer	0.11 (0.09)	0.10 (0.09)	0.11 (0.09)	0.16 (0.10)	-
female	0.12 (0.09)	-0.22** (0.11)	0.12 (0.09)	0.28** (0.11)	-
Kpelle	0.26** (0.13)	0.25* (0.13)	0.26* (0.14)	0.16 (0.15)	-
Bomi	0.34** (0.16)	0.28* (0.16)	0.34** (0.17)	0.48*** (0.17)	-
Bong	-0.16 (0.18)	-0.16 (0.18)	-0.15 (0.18)	-0.02 (0.20)	-
Grand Cape Mt.	0.20 (0.18)	0.15 (0.18)	0.21 (0.18)	0.20 (0.18)	-
Grand Gedeh	-0.11 (0.20)	-0.13 (0.20)	-0.11 (0.20)	0.01 (0.22)	-
Lofa	0.31** (0.14)	-0.30** (0.14)	-0.30** (0.15)	-0.32* (0.19)	-
Montserrado	0.15 (0.15)	0.28* (0.16)	0.14 (0.15)	0.32** (0.16)	-
Nimba	-0.10 (0.20)	-0.11 (0.20)	-0.10 (0.21)	-0.32* (0.18)	-
constant	4.36*** (0.59)	4.54*** (0.59)	4.39*** (0.60)	3.70*** (0.68)	4.34*** (0.53)
R ²	0.13	0.14	0.13	0.18	0.07
Root mean square error	0.66	0.66	0.66	0.63	0.67
Observations	381	381	381	252	381

Notes: Robust standard errors in brackets. All regressions exclude students, those currently in DDDR training at the time of the survey, individuals 65 or older, those who reported they were disabled, respondents with one or more missing relevant response and those with daily incomes of 700 LRD or higher.

^a Employed only

*** Significant at the 1 percent level,

** Significant at the 5 percent level,

* Significant at the 10 percent level.

TABLE 3 - PROBIT
DEPENDENT VARIABLE: EMPLOYED

Explanatory Variable	Probit			
	(1)	(2)	(3)	(4)
reintegration registered	-	-	-0.30 (0.22)	-0.28 (0.19)
Finished DDDR	-	0.57*** (0.19)	0.80*** (0.25)	0.44* (0.23)
age	0.02 (0.08)	-0.01 (0.08)	0.00 (0.08)	0.06 (0.07)
age ²	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
elementary	0.15 (0.22)	0.11 (0.23)	0.11 (0.23)	0.18 (0.18)
junior high	0.35 (0.24)	0.35 (0.24)	0.35 (0.24)	0.14 (0.19)
senior high	0.76** (0.30)	0.77** (0.30)	0.72** (0.30)	0.27 (0.23)
some university	0.17 (0.60)	0.07 (0.61)	0.00 (0.60)	-0.47 (0.54)
single	-0.72*** (0.17)	-0.79*** (0.17)	-0.78*** (0.17)	-
non-officer	-0.01 (0.19)	-0.04 (0.19)	-0.05 (0.19)	-
female	-0.40** (0.19)	-0.39** (0.19)	-0.42 (0.19)	-
Kpelle	-0.12 (0.28)	-0.18 (0.28)	-0.15 (0.29)	-
Bomi	-0.71 (0.53)	-0.70 (0.54)	-0.83 (0.57)	-
Bong	-0.85 (0.54)	-0.81 (0.54)	-0.92 (0.57)	-
Grand Cape Mt.	-0.46 (0.58)	-0.52 (0.59)	-0.63 (0.62)	-
Grand Gedeh	-0.73 (0.54)	-0.81 (0.54)	-0.82 (0.56)	-
Lofa	-1.75*** (0.50)	-1.73*** (0.50)	-1.81 (0.53)	-
Montserrado	-1.66*** (0.48)	-1.78*** (0.49)	-1.83 (0.51)	-
Nimba	-2.35*** (0.53)	-2.40*** (0.54)	-2.48 (0.56)	-
constant	1.60 (1.29)	2.04 (1.31)	2.04 (1.34)	-0.82 (1.05)
Pseudo R ²	0.20	0.21	0.21	0.02
Log likelihood	-196.51	-192.69	-191.74	-239.11
Observations	380	380	380	380

Notes: Robust standard errors in brackets. All regressions exclude students, those currently in DDDR training at the time of the survey, individuals 65 or older, those who reported they were disabled, respondents with one or more missing relevant response, individuals with daily incomes of 700 LRD or higher, and individuals with vocational training as their reported highest level of schooling, which perfectly predicts success.

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

TABLE 4 – PROBIT ON PROGRAM VARIABLES

Dependent variable	Probit			
	Registered for benefits	Enrolled in training	Finished DDDR	Finished DDDR
Explanatory Variable	(1)	(2)	(3) ^a	(4) ^a
age	0.17*	0.32**	0.34***	0.48
	0.09	0.13	0.12	0.15
age ²	0.00*	-0.01**	-0.01***	-0.01***
	0.00	0.00	0.00	0.00
elementary	0.22	0.28	0.66***	0.22***
	0.20	0.21	0.24	0.27
junior high	0.08	0.26	0.72***	-0.04
	0.21	0.22	0.24	0.29
senior high	-0.15	0.09	0.90***	0.02
	0.24	0.26	0.26	0.32
some university	-0.03	0.34	1.52***	0.54
	0.48	0.47	0.52	0.56
single	0.24	0.25	-	0.29
	0.15	0.15	-	0.19
non-officer	-0.04	-0.08	-	0.06
	0.15	0.15	-	0.20
female	-0.14	0.00	-	-0.29
	0.16	0.17	-	0.23
Kpelle	0.48	0.49*	-	0.73**
	0.29	0.28	-	0.34
Bomi	-0.96***	-0.31	-	0.84
	0.33	0.34	-	0.53
Bong	-1.42***	-1.07***	-	0.36
	0.38	0.37	-	0.59
Grand Cape Mt.	-1.08***	-0.66	-	0.98*
	0.39	0.41	-	0.52
Grand Gedeh	0.14	0.50*	-	1.92***
	0.28	0.29	-	0.43
Lofa	-1.30***	-1.54***	-	-
	0.33	0.47	-	-
Montserrado	0.13	0.51*	-	1.76***
	0.26	0.27	-	0.42
Nimba	-0.68*	-0.19	-	1.15**
	0.37	0.39	-	0.54
constant	-2.29*	-4.82***	-6.08***	-9.10***
	1.29	1.73	1.72	2.09
Pseudo R ²	0.16	0.19	0.07	0.19
Log likelihood	-278.29	-260.99	-179.64	-152.97
Observations	479	479	382	382

Notes: Robust standard errors in brackets. All regressions exclude students, individuals 65 or older, those who reported they were disabled, respondents with one or more missing relevant response and those with daily incomes of 700 LRD or higher.

^a excluding individuals currently enrolled in training.

*** Significant at the 1 percent level,

** Significant at the 5 percent level,

* Significant at the 10 percent level.

TABLE 5 – MATCHING ON DAILY INCOME

Dependent Variable: log daily income						
	nearest-neighbor matching (1)	stratification matching (3)	kernel-density matching	nearest-neighbor matching (5) ^a	stratification matching (6) ^a	kernel-density matching (7) ^a
average treatment effect on treated	-0.03	0.07	0.08	-0.06	0.08	-0.01
standard error	0.13	0.09	-	0.15	-	-
Bootstrapped standard error	0.13	0.08	0.10	0.21	0.10	0.15
95% confidence interval						
<i>normal</i>	-0.38	-0.08	-0.11	-0.47	-0.11	-0.32
	0.32	0.22	0.27	0.36	0.28	0.30
<i>percentile</i>	-0.14	-0.08	-0.10	-0.31	-0.10	-0.23
	0.41	0.22	0.24	0.46	0.26	0.44
<i>bias corrected</i>	-0.18	-0.08	-0.13	-0.33	-0.10	-0.23
	0.20	0.22	0.25	0.46	0.34	0.50
number treated	74	72	74	54	53	54
number control	59	214	308	41	134	140
Number of observations	382	382	382	252	252	252

Notes: All models exclude students, individuals 65 or older, those who reported they were disabled, respondents with one or more missing relevant response and those with daily incomes of 700 LRD or higher. Excluding observations that fall outside the region of common support.

^a Employed individuals only.

TABLE 6 – MATCHING ON EMPLOYED

Dependent Variable: employed			
	nearest-neighbor matching (5)	stratification matching (7)	kernel-density matching (8)
average treatment effect on treated	0.06	0.14	0.16
standard error	0.09	0.07	-
Bootstrapped standard error	0.13	0.07	0.07
95% confidence interval			
<i>normal</i>	-0.20	0.00	0.01
	0.31	0.27	0.30
<i>percentile</i>	-0.09	0.01	0.02
	0.43	0.26	0.29
<i>bias corrected</i>	-0.13	-0.05	0.03
	0.27	0.26	0.31
number treated	74	74	74
number control	59	214	214
Number of observations	382	382	382

Notes: All models exclude students, individuals 65 or older, those who reported they were disabled, respondents with one or more missing relevant response and those with daily incomes of 700 LRD or higher. Excluding observations that fall outside the region of common support.

^a Employed individuals only.

TABLE 7 – INTERACTIONS WITH DDDR AND EDUCATION

Explanatory Variable	OLS			Probit	
	Dependent Variable: log daily income			Dependent variable: employed	
	(1)	(2)	(3) ^a	(4)	(5)
reintegration	-	0.02 (0.10)	0.12 (0.13)	-	-0.29 (0.22)
Finished DDDR	0.11 (0.30)	0.09 (0.31)	-0.14 (0.35)	-0.17*** (0.74)	0.08 (0.76)
age	0.01 (0.04)	0.01 (0.04)	0.04 (0.04)	-0.02 (0.08)	-0.01 (0.08)
age ²	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
elementary	0.15 (0.12)	0.15 (0.12)	0.21 (0.15)	0.12 (0.24)	0.12 (0.24)
DDRR*elementary	0.01 (0.34)	0.02 (0.34)	0.07 (0.38)	0.50 (0.80)	0.46 (0.79)
junior high	0.29** (0.13)	0.29** (0.13)	0.23 (0.16)	0.25 (0.25)	0.25 (0.25)
DDRR*junior high	-0.14 (0.33)	-0.13 (0.33)	0.00 (0.35)	0.95 (0.81)	0.90 (0.80)
senior high	0.43*** (0.16)	0.43*** (0.16)	0.40** (0.19)	0.59* (0.32)	0.55* (0.32)
DDRR*senior high	-0.07 (0.36)	-0.07 (0.36)	0.02 (0.40)	1.46 (0.93)	1.44 (0.93)
some univeristy	0.70*** (0.26)	0.70*** (0.26)	0.33* (0.18)	0.45 (0.90)	0.35 (0.90)
DDRR*some uni.	-0.58 (0.46)	-0.58 (0.46)	0.43 (0.35)	-0.14 (1.36)	-0.11 (1.35)
voc. Training	0.40 (0.36)	0.40 (0.36)	0.48 (0.38)	-	-
single	-0.16* (0.09)	-0.16* (0.09)	-0.17 (0.11)	-0.80* (0.17)	-0.80 (0.17)
female	0.11 (0.09)	0.11 (0.09)	0.26 (0.11)	-0.37* (0.19)	-0.40*** (0.20)
Kpelle	0.26* (0.14)	0.26* (0.14)	0.17 (0.16)	-0.18 (0.28)	-0.15** (0.29)
county	X	X	X	X	X
constant	4.43***	4.43***	3.83***	2.17	2.17
R ²	0.59	0.60	0.70	1.33	1.33
Root mean square	0.13	0.13	0.18	-	-
Pseudo R ²	0.66	0.66	0.62	-	-
Log liklihood	-	-	-	-	-
Observations	381	381	252	380	380

Notes: Robust standard errors in brackets. All regressions exclude students, those currently in DDDR training at the time of the survey, individuals 65 or older, those who reported they were disabled, respondents with one or more missing relevant response and those with daily incomes of 700 LRD or higher.

^a Employed only

*** Significant at the 1 percent level, ** Significant at the 5 percent level, * Significant at the 10 percent level.

TABLE 8 – INTERACTIONS WITH DDRR AND COUNTY

Explanatory Variable	OLS			Probit	
	Dependent Variable: log daily income			Dependent variable: employed	
	(1)	(2) ^a	(3)	(4)	(5)
reintegration	-	0.05 (0.10)	0.17 (0.13)	-	-0.17 (0.24)
Finished DDRR	-0.50*** (0.18)	-0.53*** (0.19)	-0.55*** (0.22)	3.73*** (0.48)	3.81*** (0.50)
age	0.00 (0.04)	0.00 (0.04)	0.03 (0.04)	0.02 (0.09)	0.03 (0.09)
age ²	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
single	-0.18** (0.09)	-0.18** (0.08)	-0.17 (0.10)	-0.88*** (0.20)	-0.88*** (0.20)
female	0.13 (0.09)	0.14 (0.09)	0.31*** (0.11)	-0.26 (0.23)	-0.28 (0.23)
Kpelle	0.32** (0.14)	0.32** (0.14)	0.22 (0.16)	-0.20 (0.33)	-0.18 (0.33)
bomi	0.48*** (0.14)	0.50*** (0.14)	0.59*** (0.16)	-	-
IDDRXbomi_1	0.04 (0.27)	0.03 (0.27)	-0.13 (0.28)	-	-
bong	0.01 (0.16)	0.01 (0.17)	0.13 (0.19)	-	-
IDDRXbong_1	0.03 (0.20)	0.02 (0.20)	-0.14 (0.25)	-	-
gr_cape_mt	0.26* (0.15)	0.27* (0.15)	0.25 (0.17)	1.19** (0.57)	1.15** (0.58)
IDDRXgr_c~1	1.31*** (0.33)	1.29*** (0.33)	0.98*** (0.29)	-4.95*** (1.05)	-4.87*** (1.06)
grand_gedeh	0.01 (0.22)	0.01 (0.22)	0.12 (0.24)	-	-
IDDRXgran~1	0.58** (0.29)	0.58** (0.29)	0.43 (0.32)	-	-
montserrado	0.23* (0.12)	0.23** (0.12)	0.32** (0.14)	-0.48 (0.31)	-0.49 (0.31)
IDDRXmont~1	0.62*** (0.20)	0.62*** (0.20)	0.56** (0.24)	-3.28*** (0.51)	-3.24*** (0.52)
nimba	0.13 (0.19)	0.13 (0.19)	-0.17 (0.17)	-1.12*** (0.40)	-1.14*** (0.41)
IDDRXnimb~1	-0.02 (0.25)	-0.04 (0.25)	0.25 (0.25)	-2.95*** (0.86)	-2.90*** (0.86)
education	X	X	X	X	X
constant	4.36*** (0.61)	4.37*** (0.62)	3.86*** (0.73)	0.02 (1.33)	0.00 (1.35)
R ²	0.14	0.14	0.19	-	-
Root mean square	0.66	0.66	0.62	-	-
Pseudo R ²	-	-	-	0.17	0.18
Log likelihood	-	-	-	-143.75	-143.50
Observations	381	381	252	380	380

Notes: Robust standard errors in brackets. All regressions exclude students, those currently in DDRR training at the time of the survey, individuals 65 or older, those who reported they were disabled, respondents with one or more missing relevant response and those with daily incomes of 700 LRD or higher.

^a Employed only

*** Significant at the 1 percent level,

** Significant at the 5 percent level,

* Significant at the 10 percent level.

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