Causal Inference
Katja Della Libera
Minerva Schools at KGI
CS112 Knowledge: Information Based Decisions
Prof. Diamond
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(1) Debugging

(a) https://gist.github.com/diamonaj/2e5d5ba5226b7b9760f5d1bf1e7bf765

To fix this code, we need to define mout using the Match function (genout as the Weight.matrix) and use it in the MatchBalance function instead of genout. In addition, we should import the Matching library and lalonde dataset, attach the dataset, and define the variables we want to match on (leaving out re78, since it is the outcome).

(b) https://gist.github.com/diamonaj/3b6bc83d040098486634184d99fc4c55

A petty critique of this code would change the pop.size to a bit more than 16, but the real problem is in running GenMatch and Match with different arguments. For functions with the same defaults (e.g. estimand) that is not a problem, but for example exact=TRUE is not a default, which should be removed from GenMatch since it does not make sense to do Genetic Matching trying to be exact.

(c) https://gist.github.com/diamonaj/a88cb40132ed8584e5182b585e1c84c8

In this piece of code, the MatchBalance function is finding the balance of the variables in determining the outcome variable re78 instead of the treatment/control group. We need to change that to treat.

(2) Replicate figure 8 in https://gking.harvard.edu/files/counterf.pdf

EXCEPT that this figure considers the implications of adding an interaction term (wardur * untype4) to the basic model. I want you to consider the implications of adding a different interaction term to the basic model -- the interaction term I want you to consider is (logdead*untype4).
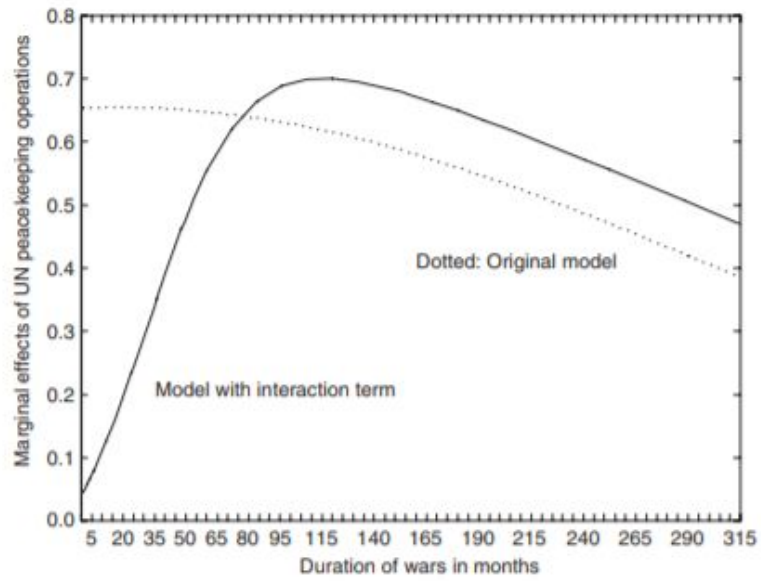
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0

5 20 35 50 65 80 95 115 140 165 190 215 240 265 290 315

Marginal effects of UN peacekeeping operations

Dotted: Original model

Model with interaction term

Duration of wars in months

FIG. 8. Causal Effect of Multidimensional UN Peacekeeping Operations

Figure 1: The original figure from the paper

Marginal effects of UN peacekeeping operations

Dotted: Original model

Model with interaction term

0 50 100 150 200 250 300

Duration of wars in months

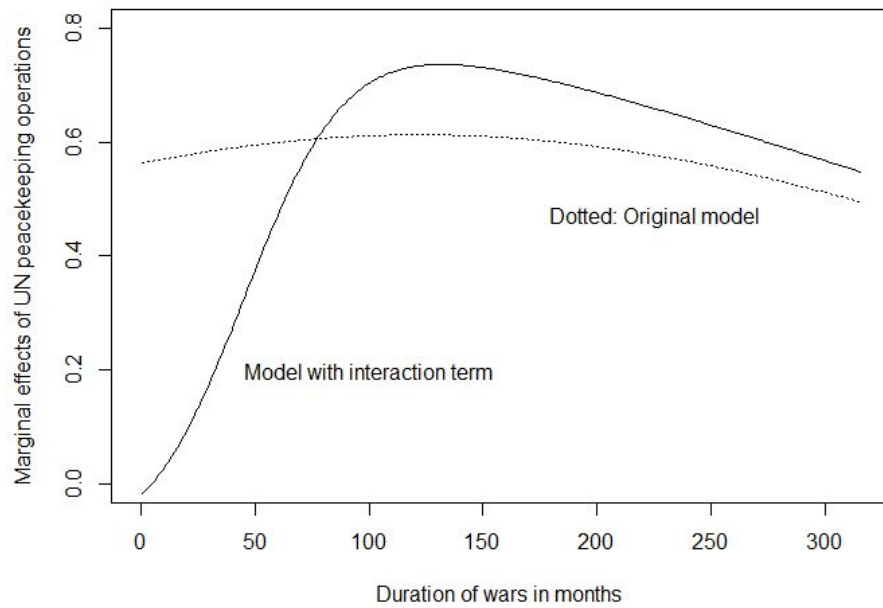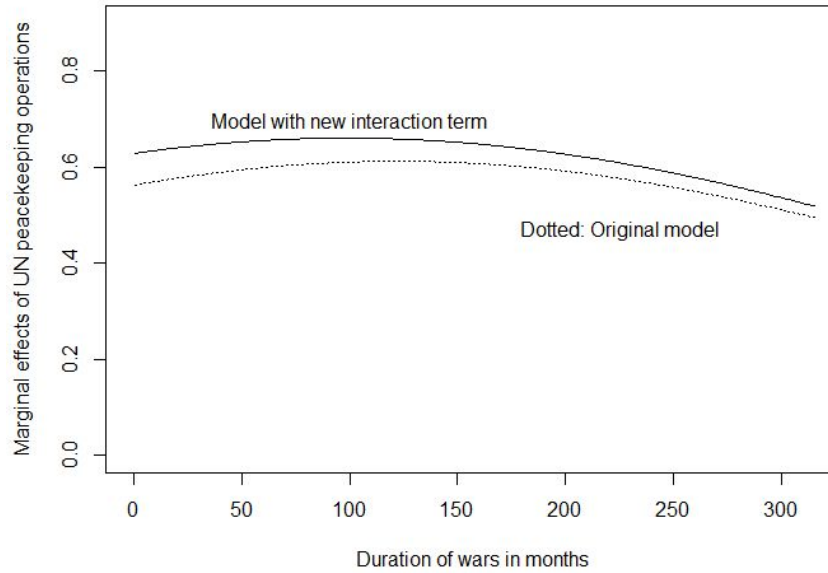*Figure 2: Replication of Figure 1 (8 in the paper)*

Figure 3: Replication of Figure 1 (8 from the paper) with a new interaction term: logdead*untype4 keeping the x-axis as war duration
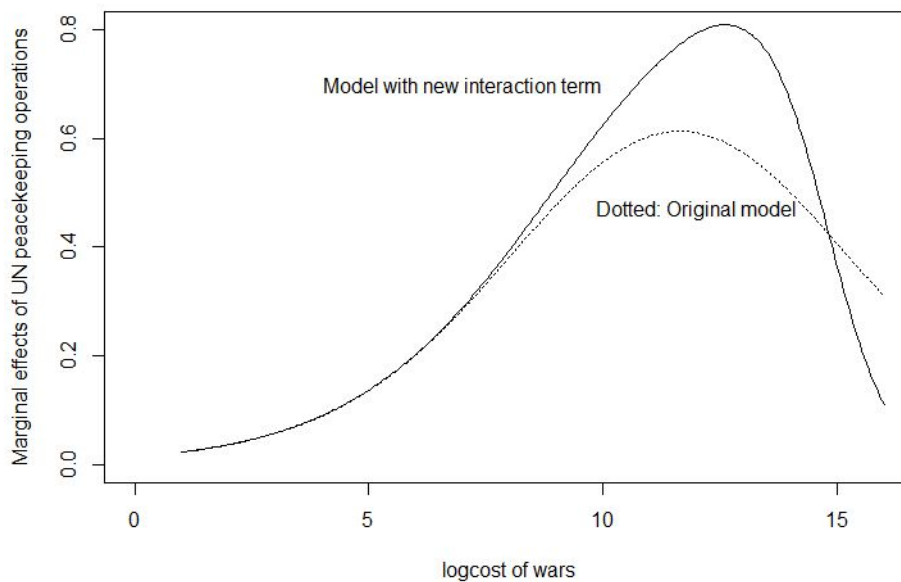

Figure 4: The original model and model with interaction term with logcost as independent variable.[1]

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[1] #dataviz: I followed several possible interpretations of the instructions, including one that changes the independent variable and made professional and convincing visualizations of the effect of interaction terms

(3) New treatment variable

Define treatment as below:
Tr <- rep(0, length(foo$uncint))
Tr[which(foo$uncint != 0 & foo$uncint != 1)] <- 1
What does this mean? What is "treatment"?
The treatment group is all the units where uncint was neither 0 nor 1, the control group is all other units. Looking at the relevant section in the codebook, we see that the variable corresponds to the type of UN operation, 0 being the least intrusive and 4 the most intrusive. The exact encoding shows that 0 and 1 are either no intervention or merely mediation efforts, like submitting a proposal to end the fighting and promote reconciliation. 2 -4 consists of on-the-ground missions like observers, military and civilian personnel or even peace enforcement through the UN or a UN-sanctioned mandate.
Tr=0 corresponds to no on-the-ground intervention
Tr=1 corresponds to an on-the-ground intervention

(4) Effect of treatment on lenient peacebuilding success 2 and 5 years after the war

(a) The causal Question

What is the effect of an on-the-ground intervention on the lenient peacebuilding success (no recurrence and no violence) after 2 or 5 years compared to no or only minimal intervention?

(b) SUTVA violation

It is likely that there is both spatial and temporal dependence between the treatment and control units since a country's outcome is likely affected by treatments received by neighboring countries as well as during previous or later wars within its own borders.
The spatial component of the violation is difficult to control for, but we can use the "restrict" argument in GenMatch and Match to make sure wars are not matched with other wars in the same country.[2]

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[2] #networks: I explain how the spatial connection of the countries to each other or to themselves will have an impact, since they are not completely isolated, but form a local network.

(c) simple logistic regression, propensity score matching, and genetic matching

(i) table of Results:

The effect of intrusive peacekeeping on recurrence of war 2 and 5 years later			
	Tmt effect (bias adj)	Tmt effect (no bias adj)	P-value (from MatchBalance)
Logistic regression:			
Lenient success 2 years	NA*	-0.0178	0.0001
Lenient success 5 years	NA*	-0.0233	0.0001
P-score matching***			
lenient success 2 years	NA**	NA**	0.0108
Lenient success 5 years	NA**	NA**	0.0108
Genetic matching****			
Lenient success 2 years	-0.344**	-0.303**	0.404
Lenient success 5 years	-0.198**	-0.182**	0.43

Table 1: The effect of on-the-ground intervention on lenient peacebuilding success.
*No need to provide bias-adjusted results for logistic regression--only for matching estimates.
** Only if leximin p-value is above 0.10. Otherwise NA
*** The functional form of the propensity score model is
  treat ~ wartype + logcost + wardur + factnum + factnum2 + trnsfcap + exp + decade + untype4 + I(wartype^2) + I(logcost^2) + I(wardur^2) + I(wardur*untype4) + I(factnum*wardur)
**** The variables that were genetically matched on were wartype, logcost, wardur, factnum, factnum2, trnsfcap, exp, and decade and those same variables were used in the MatchBalance function

(ii) Executive summary and conclusion of a decision memo

Executive summary:
Dear Tijjani Muhammad Bande,
As head of the Special Committee on Peacekeeping Operations, you are aware of the importance of learning from past experiences of such missions, not only logistically, but also when making policy. To facilitate this, I have analysed the UN-peacekeeping missions' lenient success in the 2 or 5 years after the end of a civil war, defined by the absence of recurrence of war or violence, where any on-the-ground intervention was considered as treatment, including Peacekeeping Operations but also observers and enforcement. The three methods considered, logistic regression, p-score matching, and genetic matching showed little or no significant effect with genetic matching being the only method to achieve significant balance and showing a small negative effect of the missions.

Conclusion:
No significant effect was found in the logistic regression or p-score matching analysis, which considered the effect of on-the-ground UN-intervention on the recurrence of war or violence, in the 2 or 5 years after a civil war. While genetic matching did find a small significant effect, it was negative. This means for policy that Peacekeeping Operations should be carefully considered and less freely applied to fulfill the UN's central mission of maintaining international peace and security.[3] However, there should be more analysis done on the different effects of observers, PKOs, or enforcement and different models considered. Other method suggestions include synthetic matching for individual countries and restricting matches in p-score matching or genetic matching so countries cannot be matched with other civil wars in the same country.

Link to code:

https://github.com/katjadellalibera/CS112/blob/master/Causal%20Inference/Causal_Inference.R

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[3] #purpose: I connect the relevance of the analysis back to the purpose and mission of the UN and therefore make the analysis more pertinent for my audience.