

RANDOMIZED IMPACT EVALUATION OF AFGHANISTAN'S NATIONAL SOLIDARITY PROGRAMME – FINAL REPORT

PRE-ANALYSIS PLAN: HYPOTHESES, METHODOLOGY, AND SPECIFICATIONS

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I. Introduction

This pre-analysis plan specifies the methodologies and specifications to be employed in testing hypotheses pertaining to the short- and medium-term impacts of the National Solidarity Programme (NSP) on access to services, infrastructure, and utilities; economic welfare; local governance; political attitudes and state-building; and social norms. The plan was written prior to data analysis and pre-commits the authors to defined specifications for estimating impacts.¹

The plan is structured around five sections, one table, two appendices, and four sub-appendices: [Section II](#) provides an overview of the experimental design, detailing the nature of the treatment and associated interventions, the sample, and treatment assignment process; [Section III](#) describes the survey instrument that serve as the main data source for the study; [Section IV](#) lists the hypotheses for the study; [Section V](#) describes the methodology that will be employed to test hypotheses; [Table 1](#) lists the hypotheses and indicators for the study; Appendix A provides formal derivation of the estimator for the effect of the different types of development projects assuming that these are endogenous; [Appendix B](#) lists questions from the Endline, Midline, and Baseline Surveys that are to be used in the analysis; and the four [sub-appendices](#) ([FFG](#), [FHH](#), [MFG](#), [MHH](#)) provide formulae and codebooks used to construct Endline Survey indicators for each of the four questionnaires deployed in the survey.

II. Experimental Design

The impact evaluation of Afghanistan's National Solidarity Programme (NSP) is a multi-year randomized controlled trial designed to quantify impacts of the program on access to services, infrastructure, and utilities; economic welfare; local governance; political attitudes and state-building; and social norms. The evaluation compares changes in outcomes throughout the life-cycle of program implementation between 250 treatment villages mobilized by NSP and 250 control villages not yet participating in NSP.

The sections below provide background information on the treatment intervention (NSP), sample, and assignment of treatment across the sample. Section [II.i](#) describes the treatment intervention, NSP; Section [II.ii](#) reviews the sample; and Section [II.iii](#) details the methodology used to assign treatment.

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¹ In the event that the structure of the data or other unforeseen factors necessitate adjustments in the methodology and specifications to be employed in the analysis, such adjustments will be documented with reference to the original specifications in this note and accompanied by a justification of why such adjustments were necessary.

II.i. Treatment Intervention

The National Solidarity Programme (NSP) was conceived following the fall of the Taliban as a means to extend the administrative reach of the state, build representative institutions for local governance, and deliver critical services to the rural population. Since its inauguration in 2003, NSP has been implemented in over 29,000 villages across all 34 provinces of Afghanistan, making it the largest single development program in the country. The program is executed by the Government of Afghanistan, funded by the World Bank and a consortium of bilateral donors, and implemented by 28 NGOs (known as Facilitating Partners).

Program implementation is structured around two major interventions at the village level. The first seeks to build a structure for village governance centered on democratic processes and women's participation through the creation of a gender-balanced Community Development Council (CDC) through a secret-ballot, universal suffrage election. The second intervention aims to improve the access of rural villagers to critical services and infrastructure by disbursing 'block grants' - valued at \$200 per household up to a village maximum of \$60,000 - to support implementation of village-level projects designed and selected by CDCs in consultation with village community.

II.ii. Sample

The sample for the study comprises a sub-sample (to be selected based on accessibility given local security conditions) of 500 villages spread evenly across ten districts in Balkh, Baghlan, Daykundi, Ghor, Herat, and Nangarhar provinces. The ten districts were selected based on size, security conditions, and the constraint that no villages in the district had previously participated in NSP. In each of these ten districts, NSP Facilitating Partners were asked to select 50 villages which they deemed suitable for NSP implementation,² which in turn provided the sample of 500 villages.

Although the 500 sample villages cannot - by virtue of their clustering in only ten of 398 districts and the non-random selection of the ten districts in which they are located - provide a random sample of villages in Afghanistan, the 500 selected villages are representative of Afghanistan's geographic, ethnic, and economic diversity. An assessment of the demographic and economic characteristics of the 500 villages reveal few substantive differences with those of a random sample of villages surveyed by the 2007-08 National Risk and Vulnerability Assessment.³

II.iii. Assignment of Treatment

Of the 500 villages in the sample, 250 were randomly selected to receive NSP. In order to improve statistical balance between villages in the treatment and control groups, a matched-pair cluster randomization procedure was applied in four stages:

Village Clusters - To minimize the potential for spillovers between treated and untreated units, villages located within one kilometer were grouped in clusters. Across the sample, 107 villages were assigned to 41 village clusters.

Matched Pairs - In each district, the 50 sample villages were paired into 25 groups of two using an optimal greedy matching algorithm, which matched villages to ensure similarity based on background characteristics, subject to the constraint that villages were not in the same cluster.⁴

² The number of villages in the ten evaluation districts ranges from 66 to 273

³ See Section IV.1 of [Beath, Christia, Enikolopov & Kabuli \(2010\)](#)

⁴ Data for the matching consisted of demographic and geographic characteristics of villages obtained from the Household Listing Survey conducted by Afghanistan's Central Statistics Office between 2003 and 2004.

Assignment of Treatment - In each matched pair, a random number generator was employed to decide which of the two villages would receive NSP. In order to minimize the probability of spillovers biasing estimated impacts, clusters of villages were assigned the same status.⁵

Clustering Violations - In a few districts, the large number of clustered villages precluded the co-assignment of all the villages in the same village cluster to the same treatment status. For cases in which assignment of treatment status without a violation of the clustering restriction was not possible, the number of violations was minimized through a simulation approach.⁶

The procedure was implemented using a computer code in September 2007, at which time baseline data had been collected but not processed.

III. Data Sources

Data for the estimation of impacts associated with NSP is provided by a set of household and focus group surveys administered to men and women during three stages of survey activities:

Baseline Survey: Administered between August and September 2007 prior to any NSP activities in the sample villages;

Midline Survey: Administered between June and October 2009, following the election of CDCs and the start of project implementation;

Endline Survey: Administered between May and October 2011, following the completion of NSP activities in the 250 treatment villages, but prior to any NSP activities in the 250 control villages.

The surveys were structured around four survey instruments that ascertained key information from female (Section III.ii) and male (Section III.iv) villagers and female (Section III.i) and male (Section III.iii) village leaders, each of which is described below.

Questionnaires for all three surveys are available at the [NSP-IE website](#).

III.i. Female Focus Group Questionnaire (FFG).

The FFG questionnaire is administered to a group of between six and nine women, who are expected to be wives or other relatives of the village leaders and/or members of the village women's council. As with the MFG, Midline and Endline enumerators were not asked to explicitly seek the participation of those who took part in previous focus groups.

III.ii. Female Household Questionnaire / Female Individual Questionnaire (FHH / FI).

During the Baseline Survey, women who participated in the FFG questionnaire were invited to subsequently participate in an individually-administered Female Individual (FI) questionnaire. For the Midline and Endline Surveys, however, the FI questionnaire was dropped and a Female Household (FHH) questionnaire adopted instead. The FHH was administered to the wife of the MHH participant in each household, or to another senior woman in the same household.

III.iii. Male Focus Group Questionnaire (MFG).

⁵ It is important to note that although this feature of the randomization design makes the assignment of treatment status in neighboring villages interrelated, the unconditional probability of being assigned to a particular treatment status remains the same for all the villages, so that the main identifying assumption is not violated.

⁶ The clustering restriction was violated in 17 village clusters (covering 44 villages).

The MFG questionnaire is administered to a group of between six and nine key decision makers (which may include village leaders and/or members of the village council) convened at the request of the enumerator. Enumerators administering the Midline and Endline were not asked to specifically request the participation of those persons who took part in previous focus groups, although given the common method by which the focus groups were composed, some overlap in participants is expected.

III.iv. Male Household Questionnaire (MHH).

During the Baseline Survey, the MHH instrument was administered to ten randomly selected male heads-of-household in each sample village.⁷ For the Midline Survey, enumerators were provided with a list of the ten Baseline MHH interviewees and asked to administer the MHH questionnaire to this person or, if unavailable, to a male member of the same household. During the Endline Survey, enumerators were similarly provided with a list of the ten MHH interviewees from the Midline Survey and asked to administer the MHH questionnaire to this person or, if unavailable, to a male member of the same household. If a household surveyed during the Midline could not be located, enumerators were instructed to select a household surveyed in the Baseline, but not surveyed in the Midline. Finally, if it was not possible to find a household surveyed in either the Midline or Baseline, the enumerators were asked to apply the same procedure deployed at Baseline to randomly select a household.

IV. Hypotheses

The analysis is to be structured around a test of 50 hypotheses, which are grouped into five families ([Access to Utilities, Services, and Infrastructure](#); [Economic Welfare](#); [Local Governance](#); [Political Attitudes and State-Building](#); and [Social Norms](#)) and numerous groups within each section:

Family 1 – Access to Utilities, Services, and Infrastructure

Group A: Utilities

H1: **NSP improves access to clean drinking water;**

H2: **NSP improves access to electricity;**

Group B: Services

H3: **NSP improves access of women to counseling services;**

H4: **NSP improves access to education;**

H5: **NSP improves access to health services and health outcomes.**

Group C: Infrastructure

H6: **NSP improves access to irrigation;**

H7: **NSP improves village accessibility and mobility of rural population;**

Group D: General

⁷ Households were randomly sampled in the baseline survey based on a skip-pattern sampling method, which provided a straightforward procedure for enumerators to follow and a random sample of households in areas considered free of periodicity.

H8: **NSP satisfies the *ex-ante* project preferences of male villagers.**

Family 2: Economic Welfare

Group E: Perceptions

H9: **NSP improves perceptions of the local economy.**

Group F: Stocks and Flows

H10: **NSP increases household income security;**

H11: **NSP increases household consumption expenditure;**

H12: **NSP increases stocks of household assets;**

H13: **NSP reduces borrowing for food and medical needs;**

H14: **NSP reduces food insecurity.**

Group G: Production and Marketing

H15: **NSP improves agricultural productivity and access to markets;**

H16: **NSP increases non-agricultural productivity and access to markets.**

Group H: Migration

H17: **NSP reduces net migration of households from the village;**

H18: **NSP reduces net migration of household members from the village.**

Family 3: Local Governance

Group I: Structure

H19: **NSP increases dynamism in village leadership;**

H20: **NSP increases involvement of representative assemblies in village leadership;**

H21: **NSP increases involvement of women in local governance.**

Group J: Function

H22: **NSP increases the number of local governance services provided;**

H23: **NSP increases activity of village leaders;**

H24: **NSP increases involvement of representative assemblies in the provision of local governance services.**

Group K: Quality and Participation

H25: **NSP increases participation in local governance;**

H26: **NSP improves perceptions of the quality of local governance;**

H27: **NSP reduces informal taxation by village leaders;**

H28: **NSP increases preferences for representative assemblies to provide local governance services.**

Family 4: Political Attitudes and State-Building

Group L: Democratic Values

- H29: **NSP increases acceptance of democratic norms of governance;**
- H30: **NSP increases participation in national elections and political knowledge.**

Group M: State Legitimacy

- H31: **NSP increases acceptance of centralized government authority by male villagers;**
- H32: **NSP increases linkages between villages and central and sub-national government.**

Group N: Perceptions of Government

- H33: **NSP improves perceptions of central government;**
- H34: **NSP improves perceptions of sub-national government;**
- H35: **NSP improves perceptions of government-allied actors.**

Group O: Conflict

- H36: **NSP reduces violent incidents in and around villages;**
- H37: **NSP reduces informal taxation by insurgent groups;**
- H38: **NSP improves perceptions of local security.**

Family 5: Social Norms

Group P: Social Cohesion

- H39: **NSP reduces intra-village disputes and increases dispute resolution rates;**
- H40: **NSP improves interpersonal trust within villages.**

Group Q: Literacy & Computational Ability

- H41: **NSP improves literacy and mathematical ability.**

Group R: Happiness

- H42: **NSP increases happiness.**

Group S: Gender Attitudes

- H43: **NSP increases acceptance of female political participation;**
- H44: **NSP increases acceptance of female economic and social participation;**
- H45: **NSP relaxes cultural constraints to education of girls;**
- H46: **NSP increases acceptance of female participation in local governance.**

Group T: Gender Outcomes

- H47: **NSP increases women's involvement in local governance;**
- H48: **NSP increases social activity among women;**

H49: NSP increases women’s mobility;

H50: NSP increases women’s participation in economic activity and decision-making.

[Table 1](#) below lists the indicators that will be used to test each hypothesis and, for each indicator, the direction of the hypothesized effect, as well as the source of data, level, format, transformation (if any) of the indicator, and whether Midline Survey data exists to calculate short-term effects (see Section [V.i](#) below) and whether Baseline Survey data exists to conduct robustness checks.

[Appendix B](#) lists, for each indicator, the questions from the Endline and Midline Surveys that provide data for the respective short-term and medium-term indicators (see Section [V.i](#) below), as well as the questions from the Baseline Survey which provide data for the robustness checks (see Section [V.v](#) below), where applicable.

The four [sub-appendices](#) provide the codebooks and formulae used to construct Endline Survey indicators, including those referenced in Appendix B.

V. Methodology

The study seeks to test the aforementioned 50 hypotheses and, in so doing, determine whether, in the sample of villages under study, NSP has a statistically significant effect on access to services, infrastructure, and utilities; economic welfare; local governance; political attitudes and state-building; and social norms.

Indicators for testing these 50 hypotheses are to be generated using data collected in the Midline and Endline Surveys, which are grouped according to hypothesis. The aggregate effect of the intervention on each of these 50 indicator groups is estimated, via OLS, as the average of the effects for the constituent indicators, with standard errors estimated using 50 systems of seemingly unrelated regressions. Aggregate effects for the 20 groups and 5 families of hypotheses will be calculated using the same approach.

The following sections provide a description of the methodology to be employed in the estimation of impacts: Section [V.i](#) describes the benchmark specification for estimation of treatment effects for each indicator; Section [V.ii](#) describes the alternative specification for estimating effects of specific project types on relevant indicators (see [H1](#), [H2](#), [H6](#), and [H7](#)); Section [V.iii](#) describes the alternative specification for testing hypothesis [H9](#); Section [V.iv](#) details the aggregation of indicators and calculation of mean effects for each hypothesis; Section [V.v](#) describes robustness checks using data from the baseline survey; and Section [V.vi](#) covers procedures for addressing cases of missing data, attrition of villages, and questions with limited variation.

V.i. Estimation of Treatment Effect on Individual Indicators

For all hypotheses for which Midline Survey data exists (see [Table 1](#) below), treatment effects are to be estimated in both the short-run (during project implementation) and medium-run (following project completion). Data from the Midline Survey is used to identify the short-run effect, with data from the Endline Survey identifying the medium-run effect.

Where data for all constituent indicators in a hypothesis exist in both the Midline and Endline Surveys (denoted in column *f* in [Table 1](#) below), the following OLS regression is used to estimate the treatment effect for each indicator:

$$Y_{tvi} = \alpha + \beta_1 \cdot (T_v \times \tau_1) + \beta_2 \cdot (T_v \times \tau_2) + \varphi_p + \tau_2 + \varepsilon_{tvi} \quad (1)$$

where Y_{tvi} is the outcome of interest for household i in village v in the Midline (1) or Endline (2) Survey $t \in \{1,2\}$, T_v is the village treatment dummy (i.e. whether this is an NSP village or not), τ_t is the dummy for t , φ_p is the village-pair fixed effect, and ε_{tvi} is the error term. Where an indicator is constructed at the village level (e.g. indicators using outcomes constructed from the MFG or FFG) rather than the individual level, the outcome becomes Y_{tv} rather than Y_{tvi} .

In the above specification, the coefficient β_1 corresponds to the short-run effect of the program and the coefficient β_2 corresponds to the medium-run effect of the program.

Following [Bruhn & McKenzie \(2009\)](#), village-pair fixed effects are included to account for the use of pair-wise village matches in the allocation of treatment. Standard errors are clustered at the village-cluster level⁸ to account for correlation of residuals within village-clusters due to non-independence of assignment of treatment status.

For a number of indicators (denoted in column f in [Table 1](#) below), data is available only for the Endline Survey. For hypotheses for which Midline Survey data do not exist for at least one indicator, the specification simplifies to:

$$Y_{2vi} = \alpha + \beta \cdot T_v + \varphi_p + \varepsilon_{vi} \quad (2)$$

V.ii. Estimation of Effect of Specific Types of Projects on Individual Indicators

As noted in Section [0](#) above, NSP funds the implementation of development projects selected by the village community. For hypotheses [H1](#), [H2](#), [H6](#), and [H7](#), pertaining to the effects of specific types of projects (specifically, drinking water, electricity, irrigation, and roads), estimation of the overall treatment effects of the program is to be supplemented by estimation of the effect of implementation of the corresponding project type.

In order to do this, the endogenous choice of project type needs to be accounted for. In other words, we want to compare the villages from the treatment group that have chosen a project of a particular type to villages in the control group that would have chosen the project of the same type if they were given NSP. Formally, denote by C_v^j a dummy that indicates that a village v will choose the project of type j , if given a chance and the corresponding outcome of interest by Y_v^j . Denote by Y_{0v}^j and Y_{1v}^j potential outcomes Y in a village v without treatment and with it respectively. C_v^j is observable for treatment villages only. That is, we observe C_v^j for the subsample where $T_v = 1$ and the realized value of Y :

$$Y_v^j = \begin{cases} Y_{1v}^j & \text{if } T_v = 1 \text{ and } C_v^j = 1; \\ Y_{0v}^j & \text{otherwise.} \end{cases}$$

We need to estimate the treatment-on-treated effect, which is:

$$\tau_{TOT}^j = E[Y_{1v}^j - Y_{0v}^j | C_v^j = 1]$$

It can be shown that it can be estimated using an instrumental variable regression with C_i^j as an endogenous variable and T_i as the instrument (see Appendix A for the proof).

⁸ See Section [II.iii](#) above for description of village-clusters

Thus, to estimate the effect of a particular project type, the following OLS regression is used:

$$Y_{2vi}^j = \alpha + \tau_{IV}^j C_v^j + \varphi_p + \varepsilon_{vi} \quad (3)$$

where C_v^j is instrumented by T_v . As in the baseline specification, standard errors are clustered at the village cluster level.

V.iii. Estimation of Treatment Effect on Satisfaction of Ex-Ante Project Preferences

To test the hypothesis that NSP satisfies the ex-ante project preferences of male villagers ([H9](#)), we estimate the following conditional fixed effects logit model:

$$\begin{aligned} Pr(Pref_{tpvg} | Pref_{0pvg}, \alpha_p, \beta_t) & \quad (4) \\ & = \Lambda(\alpha_p + Pref_{0pvg} \times (T_v \times \tau_1) \times \beta_{1g} + Pref_{0pvg} \times (T_v \times \tau_2) \\ & \quad \times \beta_{2g} + Pref_{0pvg} \times \tau_1 \times \gamma_{1g} + Pref_{0pvg} \times \tau_2 \times \gamma_{2g}) \end{aligned}$$

where $Pref_{tpvg}$ is a dummy variable indicating whether project of type p is the most preferred project by group $g \in \{Male\ Villagers; Male\ Elite; Females\}$ in village v during the follow up $t \in \{1,2\}$; $Pref_{0pvg}$ is a dummy variable indicating whether project of type p was the most preferred by group g in village v during the baseline survey; T_v is the village treatment dummy (i.e. whether this is an NSP village or not), τ_t is the dummy for follow up t . Estimation is conducted for each group separately. Standard errors are clustered at the village-cluster level.

In this specification the coefficient β_{1g} corresponds to the short-run effect of the program on the stability of preferences and the coefficient β_{2g} corresponds to the medium-run effect of the program.

We test the hypothesis that $\beta_{1g} > 0$ and $\beta_{2g} > 0$ for all g , which means that the preferences are more likely to change in NSP villages both in the short- and in the long-run.⁹

V.iv. Estimation of Aggregate Treatment Effects (Hypothesis Testing)

With eight exceptions ([H2](#), [H3](#), [H8](#), [H17](#), [H18](#), [H21](#), [H27](#), [H37](#)), hypotheses are to be tested using multiple indicators. To provide a single measure for each of the hypotheses and to account for the general problem of testing multiple hypotheses, individual hypotheses will be tested by estimating the overall average treatment effect on all the indicators pertaining to that hypothesis. The overall average treatment effect is estimated by combining the effects on each of the constituent indicators using the approach in [Kling & Liebman \(2004\)](#).¹⁰

First, all the K indicators pertaining to a specific hypothesis are standardized by subtracting the mean and dividing by the standard error of the control group. If we denote by \mathbf{Y}_k the vector of observations related to outcome k and by Y_k^i its elements, then:

$$\tilde{\mathbf{Y}}_k = \frac{\mathbf{Y}_k - \frac{1}{n} \sum_i Y_k^i}{Var(Y_k^i | T_v = 0)} \quad (5)$$

⁹ It is not clear whether short-run effect should be smaller. In NSP villages they may change their preferences immediately which will lead to large effect in the short-run. But in the long-run the preferences in the control villages will also change, so that the difference may decrease.

¹⁰ This approach is also followed in [Casey, Glennerster, and Miguel \(2011\)](#)

Next, all regressions are estimated using these standardized indicators to obtain K standardized treatment effects $\tilde{\tau}_k$, where the regression equation is the same as (1), which in vector form, can be written as:

$$\tilde{\mathbf{Y}}_k = \mathbf{X}\boldsymbol{\beta} + \mathbf{T}\tilde{\tau}_k + \boldsymbol{\varepsilon}_k = \mathbf{W}\boldsymbol{\theta}_k + \boldsymbol{\varepsilon}_k \quad (6)$$

The overall coefficient for the hypothesis is the mean of these standardized treatment effects:

$$\tilde{\tau} = \frac{1}{K} \sum_{k=1}^K \tilde{\tau}_k \quad (7)$$

The standard error for the overall coefficient is estimated by running a system of seemingly unrelated regressions for the K outcomes and then testing the cross-equation hypothesis that the average of K coefficients equals zero. That is, we estimate the system:

$$\tilde{\mathbf{Y}} = (\mathbf{I}_K \otimes \mathbf{W})\boldsymbol{\theta} + \mathbf{E} \quad (8)$$

where $\tilde{\mathbf{Y}} = (\tilde{\mathbf{Y}}'_1, \tilde{\mathbf{Y}}'_2, \dots, \tilde{\mathbf{Y}}'_K)'$, \mathbf{I}_K is a K -dimensional identity matrix, \mathbf{W} is vector of independent variables (same for all outcomes) and $\boldsymbol{\theta}$ is a vector of coefficients which includes $\tilde{\tau}_k$.

From this estimation, using the elements of the variance-covariance matrix that relate to $\tilde{\tau}_k$ elements of $\boldsymbol{\theta}$, we estimate standard errors for the overall coefficient for the hypothesis as:

$$\text{Var}(\tilde{\tau}) = \text{Var}\left(\frac{1}{K} \sum_{k=1}^K \tilde{\tau}_k\right) = \frac{1}{K^2} \sum_{l=1}^K \sum_{k=1}^K \text{Cov}(\tilde{\tau}_l, \tilde{\tau}_k) \quad (9)$$

V.v. Robustness to Controlling for Baseline Characteristics

For indicators for which Baseline Survey data is available (see column “rc” in [Table 1](#) below), the Baseline Survey data is to be used to test the robustness of the hypothesis test to pre-treatment variation.

The robustness check is conducted by adding the Baseline Survey data for the respective indicator as an additional control variable to the baseline specification:

$$Y_{tvi} = \alpha + \beta_1 \cdot (T_v \times \tau_1) + \beta_2 \cdot (T_v \times \tau_2) + \gamma Y_{0vi} + \varphi_p + \tau_2 + \varepsilon_{tvi} \quad (10)$$

where Y_{0vi} is the corresponding indicator from the baseline survey. Thus, we are using Analysis of Covariance (ANCOVA) estimation, which accounts for random variation between treatment and control groups pre-treatment and has better power properties than the standard difference-in-difference estimator, especially when the autocorrelation for the outcomes of interest is low ([McKenzie \[forthcoming\]](#)).

In some cases, although a particular indicator is not available in the Baseline Survey dataset, there is a closely related indicator either at the individual or at the village level. In these cases, we use these indicators \tilde{Y}_{0vi} (or \tilde{Y}_{0i}) as controls instead of Y_{0vi} .

V.vi. Procedures for Addressing Missing Data and Questions with Limited Variation

The following sections detail the procedures for addressing cases of missing data, attrition of villages, or questions with limited variation.

Missing Data

No imputation of missing data will be performed. However, checks will be conducted to explore correlation between treatment status and incidents of missing data and between treatment status and the numbers of FFG, FHH, MFG and MHH respondents interviewed in each village. The results of these tests will be reported in a statistical appendix and noted in the text.

Attrition of Villages

Some of the 500 villages in the sample may not be able to be surveyed due to non-permissive security conditions, transportation difficulties, or other reasons. In such cases and for all samples, the counter-part matched pair of the village will be excluded from the analysis in order to preserve the internal validity of the experiment.

Questions with Limited Variation

In order to limit noise caused by indicators with minimal variation, the power of all indicators listed in Table 1 below will be tested using the control sample and all indicators that do not attain at least 80 percent power in this test will be excluded from the analysis and will not be included in any hypothesis tests.¹¹ In the event that this results in the exclusion of all indicators for a hypothesis, the hypothesis will not be tested.

¹¹ The control (rather than the full) sample is used in order to eliminate what would otherwise be a source of publication bias. Note that the respective control samples differ for each of the three hypotheses.

Table 1: Constituent Indicators for Hypotheses

This table lists constituent indicators for the 50 hypotheses to be tested. For each indicator, the number(s) of question(s) used to construct the indicator is listed, along with the method of calculation, if applicable. In addition to the group and hypothesis for each indicator, additional information is provided in the right-most seven columns. A description of the contents of these columns is provided in the footnote. [Appendix B](#) lists, for each indicator, the questions from the Endline and Midline Surveys that provide data for the respective short-term and medium-term indicators, as well as the questions from the Baseline Survey which provide data for the robustness checks, where applicable.

Group	Hypothesis	Indicator	dir	so	lev	for	tr	st	rc
Family 1: Access to Utilities, Services, and Infrastructure									
Utilities (A)	Drinking Water (1)	Primary Source of Drinking Water is Protected Source	+	F	H	B		*	*
		Estimated Hours Spent Collecting Water in Past Week	-	F	H	R		*	*
Seasons in Past Year Water Was of Poor Quality		-	F	H	I		*	+	
Seasons in Past Year Water Was Not Available		-	F	H	I		*	+	
	Electricity (2)	Hours of Electricity in Past Month	+	M	H	R		*	*
Services (B)	Counseling (3)	Women Are Able to Avail Counseling Services in the Village	+	F	H	B		*	
	Education (4)	Days that School-Age Boy Attended School in Past Week	+	F	I	I			+
		Days that School-Age Girl Attended School in Past Week	+	F	I	I			+
		Girl Completed Basic Calculation Correctly	+	F	H	B			+
	Health (5)	Child Suffered Diarrhea in Past 2 Weeks	-	F	I	B			+
		Child Visited Doctor in Past Year	+	F	I	B			+
		Most Recent Born Was Alive After 12 Months	+	F	H	B		*	
		Episodes of Prenatal Care in Most Recent Pregnancy	+	F	H	I		*	*
		Most Recent Birth Attended by Medical Professional	+	F	H	B		*	+
		Most Recent Birth Delivered at Medical Facility	+	F	H	B		*	+
Mother Received Tetanus Injection during Most Recent Pregnancy		+	F	H	B		*	+	
Most Recent Illness or Injury Treated by Medical Professional	+	F	H	B		*	+		
Most Recent Illness or Injury Treated at Medical Facility	+	F	H	B		*	+		
Infrastructure (C)	Irrigation (6)	Participant's Land Is Sufficiently Irrigated	+	G	I	B			+
	Transport (7)	Proportion of Land Cultivated in Spring 2011 Sufficiently Irrigated	+	M	H	R		*	+
Months During Which Road Nearest Village Was Not Useable in Past Year		-	G	V	I		*	*	
Cost of Transporting 50 kg. of Wheat to District Center or Nearest Bazaar		-	M	H	\$		*	*	
Duration of Most Recent Trip to District Center or Nearest Bazaar		-	M	H	I		*	*	
		Trips Made to District Center in Past Month	+	M	H	I		*	*

^{dir} **Direction of Hypothesized Effect:** +: positive, -: negative

^{so} **Source of Indicator:** F: female household questionnaire; G: male focus group questionnaire; M: male household questionnaire; W: female focus group questionnaire

^{lev} **Level of Indicator:** H: household; I: individual (sub-household); L: village decision-maker; P: project; V: village

^{for} **Format of Indicator:** B: binary; I: integer; R: real number; \$: U.S. dollar value (converted from local currency)

^{tr} **Transformation of Indicator** (if any): *: Indicator is transformed into natural logs and *winsorized* at 1 percent; (blank): no transformation

st **Estimation of Short-Term Effects:** *: midline data for indicator exists and short-term effects will be calculated; (blank): midline does not exist and no short-term effects will be calculated

^{rc} **Robustness Check with Baseline Data:** *: baseline data for identical (or similar) indicator will be used to check robustness of effects; +: baseline data for comparable (but not identical) indicator will be used to check robustness (includes indicators from other questionnaires); N: not applicable as indicator incorporates baseline data; (blank): no comparable baseline data for indicator exists.

General (D)	Preferences (8)	Proportion of Respondents Who Preferred Project at Baseline Still Prefer at Endline	-	M	P	R	*	N
Family 2: Economic Welfare								
Perceptions (E)	Change (9)	Economic Situation Has Improved in Past Year	+	F	H	B	*	+
		Economic Situation Has Improved in Past Year	+	M	H	B	*	*
		Expects Village Economy to Improve in Next Year	+	F	H	B	*	+
		Expects Village Economy to Improve in Next Year	+	M	H	B	*	+
Stocks & Flows (F)	Income (10)	Income Earned in Past Year	+	M	H	\$	*	* * *
		Seasons in Which Income Was Earned	+	M	H	I		* *
		Sources of Income Include Sectors Other than Subsistence Agriculture	+	M	H	B		* *
	Consumption (11)	Annual Expenditure	+	M	H	\$	*	* *
		Ratio of Food Expenditure to Total Expenditure	-	M	H	R		* *
	Assets (12)	Principal Component of Livestock Assets (<i>Aggregate</i>)	+	M	H	R		* *
Principal Component of Household Assets (<i>Aggregate</i>)		+	M	H	R		* *	
Debt (13)	Amount Borrowed in Past Year	-	M	H	\$	*	* *	
	Borrowed for Food or Medical Needs in Past Year	-	M	H	B		* *	
Food Security (14)	Daily Caloric Intake Per Household Member During Past Week	+	F	H	R	*	* *	
	Months in Past Year Household Faced Food Shortage	+	F	H	I		+	
	Household Experienced Hunger On At Least One Day in Past Week	+	F	H	B		* *	
Production & Marketing (G)	Agriculture (15)	Yield of Most Recent Harvest (mt)	+	M	H	I	*	*
		Agricultural Productivity of Most Recent Harvest (mt / ha)	+	M	H	R	*	*
		Proportion of Most Recent Harvest Sold	+	M	H	R		* *
		Revenue from Most Recent Harvest	+	M	H	\$	*	* *
	Non-Agriculture (16)	Household Sold Handicrafts in Past Year	+	F	H	B		* *
		Revenue from Handicraft Sales in Past Year	+	F	H	\$	*	* *
Household Sold Animals or Animal Products in Past Year	Household Sold Animals or Animal Products in Past Year	+	M	H	B		* *	
	Revenue from Sales of Animals or Animal Products in Past Year	+	M	H	\$	*	* *	
Migration (H)	Household (17)	Net Migration of Households	+	G	V	I	*	* *
	Individual (18)	Net Migration of Household Members	+	F	H	I	*	
Section 3: Local Governance								
Structure (I)	Continuity (19)	Village Decision-Maker Identified in Baseline Survey Identified by At Least One Respondent at Endline	-	M	L	B	*	N
		Village Decision-Maker Frequently Identified in Baseline Survey Identified by At Least One Respondent at Endline	-	M	L	B	*	N
		Village Decision-Maker Infrequently Identified in Baseline Survey Identified by At Least One Respondent at Endline	-	M	L	B	*	N
	Affiliation (20)	Most Important Decision-Maker is Elder or Council Member	+	F	H	B		* *
Most Important Decision-Maker is Elder or Council Member		+	M	H	B		* *	
Institutions (21)	At Least One Woman is a Member of At Least One Council	+	M	H	B		* *	
Function (J)	Service Provision (22)	There Exists an Entity to Mediate Disputes of Property Claimed by Female Villagers	+	F	H	B	*	+
		There Exists an Entity to Notarize Documents	+	M	H	B	*	
		There Exists an Entity to Mediate Disputes	+	M	H	B	*	*
		There Exists an Entity to Distribute Assistance among Villagers	+	M	H	B		+
Activities (23)	Weighted Average of Services Provided for Women by Village Assembly (<i>Aggregate</i>)	+	F	H	R		* *	
	Weighted Average of Services Provided by Village Assembly (<i>Aggregate</i>)	+	M	H	R		* *	

		Weighted Average of Services Provided by Headman (<i>Aggregate</i>)	-	M	H	R	*	+
		Weighted Average of Services Provided by Mullah and/or Religious Scholar (<i>Aggregate</i>)	-	M	H	R	*	+
		Weighted Average of Services Provided by Commander (<i>Aggregate</i>)	-	M	H	R	*	+
		Village Assembly Meets Regularly	+	M	H	B	*	+
	Division of Authority (24)	Mediator of Women's Property Dispute is Elder or Council Member	+	F	H	B	*	+
		Notarizer of Documents is Elder or Council Member	+	M	H	B	*	+
		Mediator is Elder or Council Member	+	M	H	B	*	*
		Distributor of Aid is Elder or Council Member	+	M	H	B		+
Quality & Participation (K)	Participation (25)	Meetings of Village Assembly Attended in Past Year	+	M	H	I	*	* +
		Desired Change in Decision of Influential Villagers in Past Year	+	F	H	B		* +
		Desired Change in Decision of Influential Villagers in Past Year	+	M	H	B		* +
	Perception of Quality (26)	Perceives that Village Leaders Act in Interest of All	+	F	H	B		* +
		Perceives that Village Leaders Act in Interest of All	+	M	H	B		* *
		Perceives that Village Leaders Are At Least Moderately Responsive to Needs of Women	+	F	H	B		* +
		Perceives that Headman Acts in Interest of All	+	M	H	B		* +
		Perceives that Dispute Resolution is Always Fair	+	M	H	B		+
		Perceives that Theft Resolution is Always Fair	+	M	H	B		+
		Expects Neediest Villagers to Benefit from Allocation of Assistance by Village Leaders	+	M	H	B		* +
		Satisfied with Work of Village Leaders in Past Year	+	F	H	B		* +
		Satisfied with Work of Village Leaders in Past Year	+	M	H	B		* *
Taxation (27)	Disagreed with Decision(s) of Village Leaders in Past Year	-	F	H	B		* +	
	Disagreed with Decision(s) of Village Leaders in Past Year	-	M	H	B		* *	
Preferences over Division of Authority (28)	Agricultural Tax Paid to Village Leader	-	M	H	B		+	
	Prefers Representative Assembly or Villagers to Resolve Marriage Disputes	+	M	H	B		*	
	Prefers Representative Assembly or Villagers to Resolve Land & Irrigation Disputes	+	M	H	B		*	
	Prefers Representative Assembly or Villagers to Select & Manage Projects	+	M	H	B		*	
	Prefers Representative Assembly or Villagers to Inform Government About Village Situation	+	M	H	B		*	
	Suggests Representative Assembly or Villagers as Recourse for Unjust Mediation of Dispute	+	F	H	B		*	
Suggests Representative Assembly or Villagers as Recourse for Unjust Mediation of Dispute	+	M	H	B		*		

Section 4: Political Attitudes and State-Building

Democratic Values (L)	Opinion (29)	Prefers All Villagers to Participate in Important Decisions	+	F	H	B		+
		Prefers All Villagers to Participate in Important Decisions	+	M	H	B		+
		Prefers Election to Select Headman	+	F	H	B		* +
		Prefers Election to Select Headman	+	M	H	B		* +
		Prefers Selection of President by Secret Ballot Election	+	M	H	B		+
		Prefers Selection of Provincial Governor by Election	+	M	H	B		* +
		Believes it Appropriate to Discuss Governance Issues in Public	+	M	H	B		+
	Participation (30)	Named At Least One Member of Provincial Delegation to <i>Wolesi Jirga</i> (Parliament)	+	F	H	B		*
		Named At Least One Member of Provincial Delegation to <i>Wolesi Jirga</i> (Parliament)	+	M	H	B		* *
		Voted in 2010 Parliamentary Election	+	F	H	B		
Voted in 2010 Parliamentary Election	+	M	H	B		*		

State Legitimacy (M)	Acceptance of State Authority (31)	Identifies Predominantly as Afghan (As Opposed to Member of Ethnic Group)	+ M H B	
		Prefers that Government / Police Prosecute Criminals (<i>Indirect Question</i>)	+ M H B	* +
Prefers that Government (Not Local Authorities) Prosecute Village Crimes (<i>Direct Question</i>)		+ M H B	* +	
Prefers that Central Government (Not Religious or Tribal Leaders) Set Curriculum		+ M H B	+	
Prefers Centralized Government to Federated State		+ M H B	+	
Prefers People to Have Identification Cards and Register Life Events with Government		+ M H B	* +	
Prefers that Income Earners Pay Tax to Government		+ M H B	* *	
Linkages with Government (32)	Village Visited by District Government In Past Year	+ G V B	*	
	Village Visited by Central Government Officials in Past Year	+ G V B	*	
	Village Visited by Afghan National Security Forces in Past Year	+ G V B	*	
Perceptions of Government (N)	Central Government (33)	Perceives that President Acts in Interest of All	+ M H B	* *
		Perceives that <i>Wolesi Jirga</i> (Parliament) Members Act in Interest of All	+ M H B	* *
		Perceives that Central Government Officials Act in Interest of All	+ M H B	* *
		Perceives that Government Judges Act in Interest of All	+ M H B	* +
		Perceives that Police Act in Interest of All	+ M H B	* +
		Perceives that Army Soldiers Act in Interest of All	+ M H B	+
		Perceives that Living Standards Have Improved Greatly in Past 9 Years	+ F H B	+
		Perceives that Living Standards Have Improved Greatly in Past 9 Years	+ M H B	*
	Sub-National Government (34)	Perceives that District Governor Acts in Interest of All	+ M H B	* *
		Perceives that Province Governor Acts in Interest of All	+ M H B	* *
Allied Actors (35)	Perceives that NGO Employees Act in Interest of All	+ M H B	* *	
	Perceives that NATO / ISAF / US Soldiers Act in Interest of All	+ M H B	* +	
	Believes that Government Will Control All of District Once Foreign Forces Leave	+ M H B	+	
Conflict (O)	Attacks (36)	Village Experienced Attack in Past Year	- G V B	* +
		Village Experienced Attack in Past Year	- M H B	* +
	Extortion (37)	Agricultural Tax Paid to Insurgent Group	- M H B	+
	Perception (38)	Perceives Improvement in Past 2 Years in Safety of Women Working for NGOs or Government or Attending Courses	+ F H B	* +
		Perceives Improvement in Past 2 Years in Safety of Girls Attending School or Socializing	+ F H B	* +
Perceives Improvement in Past 2 Years in Local Security Situation		+ M H B	* +	
Reports Personal Impact in Past Year of Local Insecurity	- M H B	* +		
Section 5: Social Norms				
Social Capital (P)	Disputes (39)	Intra-Village Dispute in Past Year	- G V B	* *
		Intra-Village Feud in Past 2 Years	- M H B	* +
		Dispute With Other Villager in Past Year	- M H B	* +
		Proportion of Past Year's Disputes Resolved	+ G V P	* +
	Trust (40)	Willing to Ask Non-Family Member to Collect Money	+ F H B	* +
		Willing to Ask Non-Family Member to Collect Money	+ M H B	* *
		Non-Family Member Has Collected Money for Respondent	+ F H B	* +
		Non-Family Member Has Collected Money for Respondent	+ M H B	* *
		Believes Villagers Are Always Willing to Help Others	+ M H B	* *
		Paid Zakat and/or Paid Agricultural Tax to Villagers or Needy Subset	+ M H B	* +

Literacy & Computational Ability (Q)	Literacy and Computational Ability (41)	Completed Calculation Correctly	+ F H B * +
		Completed Calculation Correctly	+ M H B * *
		Read Basic Sentence	+ F H B * +
		Read Basic Sentence	+ M H B * *
Happiness (R)	Happiness (42)	Happy or Very Happy With Life	+ F H B * +
		Happy or Very Happy With Life	+ M H B * *
		Unhappy or Very Unhappy with Life	- F H B * +
		Unhappy or Very Unhappy With Life	- M H B * *
Gender Attitudes (S)	Political Participation (43)	Believes it Appropriate for Women to Vote in National Elections	+ M H B * +
		Prefers Women to Be Involved in Selection of Provincial Governor	+ M H B * +
		Believes it Appropriate for Women to Seek National Elected Office	+ F H B +
		Believes it Appropriate for Women to Seek National Elected Office	+ M H B +
		Perceives that Majority of Men Believe It Appropriate for Women to Seek National Office	+ F H B +
	Employment and Health (44)	Agrees with Women Working in Government & NGOs	+ F H B * +
		Agrees with Women Working in Government & NGOs	+ M H B * +
		Perceives that Majority of Men Agree with Women Working in Government & NGOs	+ F H B +
		Willing to Allow Female Relative to See Male Doctor	+ M H B * +
		Willing to Be Seen by Male Doctor	+ F H B * +
Girls' Education and Aspirations (45)	Girl Aspires to Work in Professional Occupation	+ F H B +	
	Girl Prefers to Be Educated Up to University	+ F H B +	
	Girl Wants to Live in City	+ F H B +	
	Believes Girls Should be Educated to Same or Higher Level than Boys	+ M H B +	
	Believes Girls Should be Educated Up to University	+ F H B +	
	Men Believe Girls Should be Educated Up to University	+ F H B +	
	Prefers Equal Number of Male and Female Births or More Female Than Male Births	+ F H B *	
Local Governance Attitudes (46)	Prefers Women To Be Involved In Selecting Headman	+ F H B * +	
	Prefers Women To Be Involved In Selecting Headman	+ M H B * +	
	Prefers Women To Be Members of Village Council	+ F H B * +	
	Prefers Women To Be Members of Village Council	+ M H B * *	
	Perceives that Majority of Men Prefer Women Should Be Members of Council	+ F H B +	
	Prefers Women to Participate in Dispute Resolution	+ M H B +	
Gender Outcomes (I)	Local Governance Outcomes (47)	Woman in Village Well-Respected by All	+ F H B * +
		Woman in Village Well-Respected by All	+ M H B * +
		Women Involved in Resolution of Most Recent Dispute	+ F H B +
		Women Involved in Resolution of Most Recent Dispute	+ M H B +
		Women Participate in Dispute Resolution	+ F H B +
		Women Participate in Dispute Resolution	+ M H B *
		Women's Views Considered in Allocating Food Aid	+ F H B +
		Women's Views Considered in Allocating Food Aid	+ M H B +
	Socialization (48)	Socializes With Other Women in the Village	+ F H B * +
		Knows At Least One Household in Neighboring Village	+ F H B +
Discussed Marriage, Birth or Family Issues with Villager in Past Week		+ F H B +	

	Discussed Disputes or Local Governance Issues with Villager in Past Week	+ F H B * *
Mobility (49)	Trips Outside Compound in Past 30 Days	+ F H I * * +
	Regularly Leaves Compound Alone or Accompanied Only By Small Child	+ F H B * +
	Never or Only Sometimes Wears <i>Chadori</i> (Burqa) When Walking outside Compound,	+ F H B * +
	Visited Nearest Village in Past Year	+ F H B * +
	Visited District Center in Past Month	+ F H B * +
	Village Women Held Meeting with Women from Other Villages in Past 12 Months	+ W V B *
	Village Women Held Meeting with District Government in Past 12 Months	+ W V B *
Economics and Household Decision-Making (50)	Generated Income for Household in Past Year	+ F H B * +
	Exerts Control over Income Earned	+ F H B * +
	Owns At Least One Type of Asset	+ F H B * +
	Exerts Full or Partial Control Over Decisions Pertaining to the Sale or Use of Income Generated by Assets	+ F H B * +
	Women Are Consulted or Responsible for Children's Marriage and Education and Procreation	+ F H B * +
	Women Are Consulted or Responsible for Decisions on Purchases of Food, Clothes, and Medicine	+ F H B * +

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Appendix A

Let Y be a measure of the quality of life in a village which depends directly on a particular type of development project. For example, for drinking water projects it could be the share of villagers who use protected sources of water. Then, let Y_{0v} and Y_{1v} denote the levels of Y in a village v without treatment and with it respectively.

Since the choice of projects is endogeneous, denote by C_v a dummy which indicates that a village v will choose this type of project if given a chance. C_v is observable for treatment villages only. The probability of $C_v = 1$ can be predicted from observable variables (our propensity score estimation) but we do not need it here.

Let T_v be an indicator of the village v 's treatment status. Because of randomized assignment, $(Y_{0v}, Y_{1v}, C_v) \perp\!\!\!\perp T_v$.

We observe C_v for the subsample where $T_v = 1$ and the realized value of Y :

$$Y_i = \begin{cases} Y_{1v}, & \text{if } T_v = 1 \text{ and } C_v = 1; \\ Y_{0v}, & \text{otherwise.} \end{cases}$$

We need to estimated treatment-on-treated effect, which is:

$$\begin{aligned} \mathbb{E}[Y_{1v} - Y_{0v} \mid C_v = 1] &= \mathbb{E}[Y_{1v} \mid C_v = 1] - \mathbb{E}[Y_{0v} \mid C_v = 1] \\ &= \mathbb{E}[Y_{1v} \mid C_v = 1, T_v = 1] - \mathbb{E}[Y_{0v} \mid C_v = 1] \quad (\text{by randomized assignment}) \\ &= \mathbb{E}[Y_v \mid C_v = 1, T_v = 1] - \mathbb{E}[Y_{0v} \mid C_v = 1]. \end{aligned}$$

To transform the second term, we can use LIME:

$$\begin{aligned} \mathbb{E}[Y_{0v}] &= \mathbb{E}[Y_{0v} \mid C_v = 0] \mathbb{P}\{C_v = 0\} + \mathbb{E}[Y_{0v} \mid C_v = 1] \mathbb{P}\{C_v = 1\} \\ &= \mathbb{E}[Y_v \mid T_v = 1, C_v = 0] \mathbb{P}\{C_v = 0 \mid T_v = 1\} + \mathbb{E}[Y_{0v} \mid C_v = 1] \mathbb{P}\{C_v = 1 \mid T_v = 1\}. \end{aligned}$$

Inthesametime,

$$\mathbb{E}[Y_{0v}] = \mathbb{E}[Y_v \mid T_v = 0].$$

Hence,

$$\mathbb{E}[Y_{0v} \mid C_v = 1] = \frac{\mathbb{E}[Y_v \mid T_v = 0] - \mathbb{E}[Y_v \mid T_v = 1, C_v = 0] \mathbb{P}\{C_v = 0 \mid T_v = 1\}}{\mathbb{P}\{C_v = 1 \mid T_v = 1\}}.$$

From this formula, we derive the treatment-on-treated effect which can be consistently estimated from observables:

$$\begin{aligned} \mathbb{E}[Y_{1v} - Y_{0v} \mid C_v = 1] &= \\ &= \mathbb{E}[Y_v \mid C_v = 1, T_v = 1] - \frac{\mathbb{E}[Y_v \mid T_v = 0] - \mathbb{E}[Y_v \mid T_v = 1, C_v = 0] \mathbb{P}\{C_v = 0 \mid T_v = 1\}}{\mathbb{P}\{C_v = 1 \mid T_v = 1\}}. \end{aligned}$$

Rearranging the terms and using LIME of the following form:

$$\begin{aligned}\mathbb{E}[Y_{0v} | T_v = 1] &= \mathbb{E}[Y_{0v} | C_v = 0, T_v = 1] \mathbb{P}\{C_v = 0 | T_v = 1\} \\ &+ \mathbb{E}[Y_{0v} | C_v = 1, T_v = 1] \mathbb{P}\{C_v = 1 | T_v = 1\},\end{aligned}$$

we get the result:

$$\mathbb{E}[Y_{1v} - Y_{0v} | C_v = 1] = \frac{\mathbb{E}[Y_v | T_v = 1] - \mathbb{E}[Y_v | T_v = 0]}{\mathbb{P}\{C_v = 1 | T_v = 1\}}.$$

Thus, we can estimate the treatment-on-treated effect surprisingly easily by dividing the different between treatment and control groups by the share of projects selected in the treatment group, i.e.

$$\Delta \equiv \hat{\mathbb{E}}[Y_{1v} - Y_{0v} | C_v = 1] = \frac{\bar{Y}^T - \bar{Y}^C}{\bar{C}^T},$$

where bars are sample averages and superscripts T and C refer to treatment and control samples.

Now, let's show that this estimate can be calculated easily as an IV estimator in a special regression. Consider an observable variable:

$$\tilde{C}_v = \begin{cases} C_v, & \text{if } T_v = 1; \\ 0, & \text{if } T_v = 0 \text{ (and } C_v \text{ unobservable)}. \end{cases}$$

Then, $\mathbb{E}[\tilde{C}_v | T_v = 1] = \mathbb{P}\{C_v = 1 | T_v = 1\}$ and $\mathbb{E}[\tilde{C}_v | T_v = 0] = 0$. Therefore, we can rewrite the treatment-on-treated effect as following:

$$\mathbb{E}[Y_{1v} - Y_{0v} | C_v = 1] = \frac{\mathbb{E}[Y_v | T_v = 1] - \mathbb{E}[Y_v | T_v = 0]}{\mathbb{E}[\tilde{C}_v | T_v = 1] - \mathbb{E}[\tilde{C}_v | T_v = 0]}$$

The sample analog of this expression is exactly the IV estimator in the regression of Y_v on \tilde{C}_v and a constant with T_v as a binary instrument, sometimes called the Wald estimator.