Berge, Erling et al.

Research Report

Malawian land tenure and social capital: Behaviour in trust games in 18 Malawian villages in 2007

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MALAWIAN LAND TENURE AND SOCIAL CAPITAL

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Erling Berge, Tomas Moe Skjølsvold, Henrik Wiig, Sverre Bjørnstad, Daimon Kambewa, Alister Munthali

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Date: December 2020

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At the start of the fieldwork, 16 June 2007 *© Erling Berge*

Department of property and Law
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Malawian Land Tenure and Social Capital Project 2007-8.

Erling Berge[1], Tomas Moe Skjølsvold[2], Henrik Wiig[3], Sverre Bjørnstad[4], Daimon Kambewa[5], Alister Munthali[6]

Two papers preparing for a study of *Behaviour in trust games in 18 Malawian villages in 2007*

Based on data collected for the Malawian Land Tenure and Social Capital project, 2007

CLTS REPORT
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Preface

This report presents two papers developed in order to study behaviour in trust games in 18 Malawian villages in 2007. In 2007-2008 the Malawian land tenure and social capital project[7] interviewed households on many subjects deemed relevant to land tenure and social capital. The data collection is documented in Berge et al. (2009). Interviews were conducted in villages selected with 6 in each of the regions North, Central, and South. They included 13 questions about trust, trustworthiness, and social capital (Berge et al. 2009, 115-118). The goal was to get 15 household interviews in each village. That should add up to 270 interviews. Adding some key informer interviews led to a total of 283 household interviews. The period of interviewing ended with a session of trust games with monetary payoffs as a kind of gratitude for the time and effort given by the participants (Berge et al. 2009, 147-176). In two villages we did not get to play 15 games. In one village we found only 14 households, and in another there was a funeral in a neighbouring village leaving participants for only 13 games. We ended with playing a total of 267 trust games.

After the return to Norway in 2008, Tomas Moe Skjølsvold and Sverre Bjørnstad started out on an exploration of the results from the trust games. They wanted to report on this in a paper in Norwegian. The bulk of their work was done during the summer of 2008 when they were employed as research assistants by the project. A first draft of the paper appeared in the summer of 2009 and a second one in 2010. By then the idea of using factor analysis to develop indices indicating trust and social capital both at household and village level had taken hold.

The main author of the current papers was to assist in the development of indexes by principal factor analysis. However, at the end of 2010, this author moved from NTNU to what now is known as NMBU (The Norwegian University of Life Sciences) and its department of property rights and law, where I in 2011 got a position as professor of property rights and institutional theory. Teaching obligations, other research interests, and lack of tools for data analysis kept me away from the Malawi data until retirement in 2016, and only in 2019 were the tools for data analysis ready for the study of the factor structure of trust and social capital in the Malawian villages that is reported on here.

The data may seem old, but the problem of finding a pattern in how people answer questions designed to tap into unobservable personality and cultural characteristics is not old. The hope is that a report on the situation in Malawi in 2007 will be of interest. The first paper uses factor analysis to study the 78 variables that came out of the 13 questions about trust, trustworthiness, and social capital (Berge et al. 2009, 115-118). The intention is to develop indexes that may be used to study outcomes from the trust games. The second paper details the adaptation of the data that were needed in order to link the game results to the interview data. We ended with 204 games that could be linked to interview data.

Erling Berge, December 2020.

Acknowledgements
At the early stages of the Malawian Land Tenure and Social Capital project Dr. Stanley Khaila contributed significantly to the collection of data and the development of questions we here try to investigate. We also appreciate the support of the National Statistical Office of Malawi, and Statistics Norway during the data collection process.

[7] Financed by Norwegian research council, see Berge et al. (2009)

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List of tables Unobserved dimension in answers to questions related to trust, trustworthiness, and social capital

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MALAWIAN LAND TENURE AND SOCIAL CAPITAL
Behaviour in trust games in 18 Malawian villages in 2007

Unobserved dimension in answers to questions related to trust, trustworthiness, and social capital

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Introduction

Trust, trustworthiness and social capital are complex concepts. Each concept requires many questions tailored to the context of the individual that gets to answer the question. Thus we asked many questions about various aspects of the activities of people in order to discover how they behave in relation to diverse aspects of these concepts. The concepts trust and trustworthiness are closely related. Trust in "someone" (the trustee) means that the trustee is judged to be trustworthy by the trustor. In a population, the distribution of variable strength opinions about trustworthiness will make it difficult to see the configuration of forces shaping the activities of the individuals. To simplify the picture one may stipulate that the many different answers to questions about both trust and social capital are manifestations of unobservable personality traits shaped by a local culture. A factor analysis of the responses may then reveal some evidence of these unobservable forces and possibly provide a better measurement of their strength.

The start assumption is that an individual will have perceptions of the trustworthiness of someone else. A relationship between two individuals is based on trust if both see the other partner as trustworthy, meaning that the other, the trustee, is believed to not wilfully exploit oneself, the trustor.

A group of people will as a collective have some social capital, meaning that each member can draw some important support from other members in given situations that may assist in securing something of value (material or immaterial) to the person. It seems reasonable to think that trust among the group members will be related to social capital. Social capital is accumulated by participation in collective activities, including work.

In this paper data from the Malawian Land Tenure and Social Capital study in 2007 (Berge et al. 2009) will be investigated to discover unobservable dimensions of trust and social capital. The unobserved dimensions will affect the observed responses in a way that make them correlated in systematic ways. Hence, exploration of the covariances among the observed responses may be used to reveal the number and nature of the unobserved characteristics. To explore the covariances factor analysis will be used. The variables used will be normalized so that correlations are the same as covariances.

Some basics of factor analysis

The basic ideas of factor analysis were developed in psychology. Already in 1904 Spearman (1904) outlined ideas about how unobserved characteristics of the mind could be assumed to explain correlations among observed characteristics. The ideas were formalised among others by Thurstone (1947). By then the ideas had been taken up in political science and sociology in order to develop smaller numbers of indexes that might characterize voting districts or communities (Janson 1969). The methodological sophistication grew rapidly (Bollen 1989). An accessible introduction is provided by Kim and Mueller (1978)[8].

The varieties of factor analysis can be divided into confirmatory and exploratory. The present paper is exploratory in its approach. The basic assumption is that there are a few unobservable characteristics (called factors) of interviewed persons that can explain correlations among observed answers (variables). In our case this means that we believe the 78 variables describing trust and social capital in principle can be explained by a smaller number of factors. At the outset it is not known how many factors there are. The analysis starts by

[8] In Norwegian there are few suitable texts for introduction to factor analysis. The best one known to the authors is probably Ulleberg and Nordvik (2000). Hellevik (1991, 276) has only a short reference to factor analysis.

exploring outcomes from analyses where the number of factors varies. Given a specified number of factors the analysis tries to reproduce the observed correlations among the observed variables. One investigates the link between variables and factors by looking at the correlations between variables and factors (called factor loadings).

An exploratory factor analysis will usually start out with what is called a principal components approach. This means that the computations assume there will be as many factors as there are variables. But the matrix of correlations between variables and factors is rotated so that the factors are uncorrelated among themselves (called simple structure). One then usually will find that most of the factors either correlate only with one variable or have very low correlations with many or most variables. Rather few factors have correlations with variables that may indicate that variable values may be seen as the linked to the factors. This is interpreted as an indicator of the kind of unobserved characteristic that affects the observed variable. One example taken from table 3 below is that Factor 1 is defined as "trust in people outside the family" because the data set variables that correlates with this factor are "trust in people" respectively "in own village", "outside village", "same ethnic group", "outside ethnic group" and "not same church/mosque", se description below.

The questions about trust, trustworthiness, and social capital available for analysis
Some of the questions in the household questionnaire ask for personal trust attitudes towards groups and particular persons seen as filling certain roles in the local or national culture. Other questions ask about acts based on trust such as lending tools or money to people of certain types within as well as outside the village. Questions about collective activities will be taken to indicate activities that build social capital. In the interpretation of the answers, it is worth keeping in mind that a village in Malawi for the most part will be defined by family and kin, not by geography as we are used to think; and more so in the north and south than in the central region.

The household questionnaire (see appendix A and B) contained 13 questions (labelled K, L and M questions; see Appendix A) on trust and social capital, providing 78 variables. Even so, the large number of variables available is not considered exhaustive in relation to the concepts. It seems reasonable to assume that certain aspects of the concepts are only weakly present or are left out entirely. The K questions involve actions based on belief in trustworthiness, such as lending out money and tools. M questions ask about perceptions of trustworthiness of various institutions and groups of people. L questions ask about participation in groups both in terms of membership and in terms of activities. The L questions are assumed to target social capital in cooperative relations. The K, M, and L questions resulted in 78 variables, 56 were dichotomous and 22 ordinal scale.

The questionnaire was used in collecting data in 18 villages and from 283 respondents as representative for a household. However, with only 283 cases, 78 variables cannot be used simultaneously in causal modelling, for example of outcomes in a trust game. A regression model using stepwise regression to model outcomes in the trust game would either break down or provide inconclusive answers.

The variables are not independent of each other. They correlate in clusters, and it seems reasonable to assume, as Grootaert et al. (2004) does, that there must be a small number of more difficult to observe personality traits that, in interaction with the local culture, can account for the pattern of answers. One may question the use of personality traits as the origin of the observed answers. It may be more appropriate to use the local culture as the source of

the answers. In talking about, and evaluating, the various experiences with trusting actions and trustworthy actors in the local community, the various individuals form opinions and attitudes that shape the answers to our questions. While there is no indication the personality traits varies systematically with geography it is a fact that the cultural characteristics varies significantly from south to north.

The goal of this paper is to use the observations to synthesize a small number of factors that are able to account for most of the systematic variation of the 78 variables. We want to determine factors of trust and social capital and determine factor scores that can be entered in subsequent studies of trust experiments and land tenure decision. The study is exploratory in its approach. No hypotheses will be put forth about what kind of trust factors or social capital factors we expect to find.

The 13 questions, or 78 variables, in Appendix A are of 3 types: ordinal scale, dichotomous responses, and time use estimates. Most of the questions are binary of the yes/no type. But for 22 of the variables (from questions M2 and M3) about trust we ask for gradations ranging from "trust in all" to "trust in none" by way of "trust in most", "trust in some", and "trust in only a few". "Do not know" is also a valid answer. Tentatively, such ordinal scale questions can be said to approach a measurement scale sufficiently for entry into an ordinary linear factor analysis. They will be analysed separately.

The 56 remaining variables are binary. Binary or dichotomous variables create problems in a linear factor model (Brown [n.d.] 2000 [ca], O'Connor [n.d.] 2002 [ca], Kubinger 2003). One solution to this is to use tetrachoric correlations (Christoffersson 1975). This approach to factoring binary variables is provided by LISREL 8.72/PRELIS 2.72 and later versions.

***Excluding variables due to missing information*[9]**

Some of the interviewed informants did not answer all questions in the questionnaire. Thus the dataset has missing information for some of the 78 variables (see Appendix B). In an actual factor analysis all cases with missing information for a variable will be excluded. In a small data set like we have here we cannot afford to lose many cases. Thus we chose to exclude all variables with 15 or more cases with missing (more than 5% missing. There are 22 such variables leaving us with 56 variables for the study.

There are also 3 variables without variation. To be useful, variables have to have variation. Binary variables with very few cases in the smallest category will also present technical problems. Hence, variables with 5 or fewer cases in the smallest category will be excluded. There are 6 such variables. Fortunately, most such variables had 15 or more cases missing. Only one additional variable (L8e) was excluded due to lack of variation, leaving 55 variables for this study. The table below summarizes the technical qualities of the variables.

[9] More detailed information than what is presented below can be found in Supplementary tables 1 Tables for descriptive and missing data (Berge 2020).

Table 1 Summarizing the technical evaluation of variables (see appendix b)				
Variables	K questions (trust)	L questions (social capital)	M questions (trust)	Sum
# variables	**12**	**43**	**23**	**78**
# ordinal scale	0	0	22	22
# binary scale	12	43	1	56
# with more than 15 cases missing	**2**	**14**	**6**	**22**
# without valid variation	0	2	0	2
# with 5 or fewer valid cases in the smallest category	1	5	0	6
# with 5 or fewer valid cases in the smallest category and with 15 or fewer cases missing	**0**	**1**	**0**	**1**
# variables included	10	28	17	55
# variables excluded	**2**	**15**	**6**	**23**

Table 2 below provides details about the 23 variables excluded from the factor analysis for these technical reasons. We see that all variables based on questions L4 and L5 on the usage of sanctions against non-cooperating people in the village have to be dropped due to the many missing observations. It is noteworthy that question M2 asking about what one may call modern leaders also produces too many missing. It would seem reasonable to conclude that people found it difficult to answer both questions about trust in leaders of the modern state and the usage of sanctions against non-cooperating people in the village. We will keep this in mind in the analysis.

Table 2 Variables excluded from the factor analysis for technical reasons (see appendix b)					
Var	Variable name/ category	N	Missing & Do not know	0=no	1=yes
K1	**People often lend money to each other. Did you or anybody else in this household lend out money to anybody in these groups during the last 12 months?**				
K1f	Other	283	107	175	1
K2	**People often lend tools like axes, hoes, etc. and other tools to each other. Did you or anybody else in this household lend out tools to anybody in these groups during the last 12 months?**				
K2f	Other	283	124	151	8
L1	**Are you or anybody in your household a member of the following groups and clubs?**				
L1i	Other	283	67	201	15
L4	**What type of people participate in collective agricultural work through work exchange**				
L4a	Only kin and/or close friends?	283	38	73	172
L4b	Only people living in the villages?	283	64	104	115
L4c	Also people living outside the village?	283	71	162	50
L5	**When people do not comply in the cooperative agricultural work, what types of sanctions are used against them?**				
L5a	Gossip	283	56	169	58
L5b	Confiscate tools, products, etc.	283	56	225	2
L5c	Fine	283	56	170	57
L5d	Cast a spell	283	56	226	1
L5e	Punish physically	283	56	221	6
L5f	Threaten the person with no help in future	283	56	188	39
L5g	Not threaten openly, but do not give help in the future	283	56	154	73
L5h	Discriminated when there are handouts in the village	283	56	225	2
L5i	Eviction from the village	283	56	227	0
L5j	Do nothing	283	56	166	61
L8	**Which of the following types of projects have you or anybody in your household participated in over the last 12 months?**				
L8e	Mosque	283	0	283	0

M2	In general, do you trust the leaders and officials in this country? Would you say you trust all, most, some, just a few or none in the following groups	N	Missing & Do not know	1 = None	2 = Only a few	3 = Some	4 = Most	5 = All
M2a	Government officials	283	19	16	51	76	41	80
M2b	Councillors	283	44	63	53	64	21	38
M2c	Local assembly staff	283	51	35	54	68	23	52
M2g	Courts	283	19	10	53	72	31	98
M2h	Army	283	48	5	15	47	57	111
M2i	Leaders of NGOs	283	29	15	38	69	53	79

Questions L3 and L8 provide, besides information on participation or not in diverse activities, also number of days used by those who participated in some activity (Berge et al. 2009, 116-117). One of the variables, L8e (mosque) was excluded since no one had participated in activities here. For the other 17 variables we might have used number of days per year, used for different common or collective activities, instead of the binary yes/no response. But mixing binary and scale variables proved difficult and it was decided to use the binary responses in this case.

In a preliminary study PRELIS 2.72/ LISREL 8.82 was used to explore if the use of binary/ dichotomous variables might lead to biased conclusions. The conclusion was that the meaning of the extracted factors did not change (see below).

For the rest of the study SPSS 26 will be used to extract factors (principal components) based on covariances.

First analysis of 55 variables available for analysis[10]

At this point we are left with 55 variables for analysis. With 283 observations we arguably are at the lower bound of number of observations per variables one could analyse (Schumacker and Lomax 2010, 42). Of these 55 there are 39 binary variables and 16 ordinal scale variables (M2- and M3-variables) that we may enter into the factor analysis.

An initial test of how these 55 variables work out in a an ordinary principal factor extraction shows that we are left with 209 cases after listwise[11] deletion of missing cases, and 12 extracted factors with eigenvalues above 1. One interesting result is that none of the variables from question L1 about membership in groups or clubs correlates with any of the extracted factors. Memberships like this are assumed to be related to social capital. It may also suggest that social capital is not closely related to trust in general. However, whatever the reason for this, these variables cannot contribute to our understanding the factor structure of the other variables and can be left out of the analysis. This leaves 47 variables for the next test run. In this factor extraction, we find 221 cases and 10 factors. Four of the 10 factors are one-variable factors (M2j Trust in police; M2k Trust in traders; M2n Trust in religious leaders; M3b Trust in kin) where the variables also load moderately on some other factor. In a new factor extraction where the number of factors is specified to 6 these 4 variables contribute to factor definitions. In this analysis the variables from question L8 do not contribute to the factor structure. In the 10 factor solution variables L8a-d defined a factor of their own while L8f-l did not contribute to any of the factors. In the 6 factor solution L8a, L8b, and L8d load weakly on the same factor, while the rest of the L8-variables does not contribute to any factor.

Dropping the 11 L8-variables leaves us with 36 variables. A new factor extraction shows 234 valid cases and 8 components with eigenvalues above 1. In this solution we note that 2 variables, M2j Trust in Police and M2k Trust in Traders, just as they did in the 47-variable, 10 factor solution, define factors all of their own. Seven variables, K2c, K2d, K2e, L3a, L3b, L3c, and M1 do not load meaningfully on any factor. A six factor extraction shows 4 well defined factors, a fifth one consists of the 2 variables Trust in police and Trust in traders, and one is weakly related to trust in people from the church/ mosque. The same 7 variables as before (K2c, K2d, K2e, L3a, L3b, L3c, and M1) do not load meaningfully on any factor. These variables, except M1 will be dropped. M1 is of particular interest since it is supposed to measure the general level of trust.

[10] More detailed information than what is presented below can be found in Supplementary tables 2 Tables for Factors of trust and trustworthiness and social capital based on 55 mixed scale variables (Berge 2020).

[11] "Listwise deletion" means that cases where there is one missing observation will be left out of the analysis (Schumacker and Lomax 2010, 20).

Table 3 Table 3 Factor analysis of 30 scale and binary variables on 235 cases, defining 5 factors.
Yellow indicate questions with factor loading above 0.5, and grey above 0.4, related to the factors (rescaled components) 1-5.

	Rescaled component				
	1	2	3	4	5
K1a Lending money to family members	-.074	.581	-.039	.065	-.238
K1b Lending money to kin	-.041	.582	-.016	.054	-.162
K1c Lending money to people in your own village	-.026	.529	.067	.077	-.139
K1d Lending money to people outside the village	.032	.327	.067	-.063	.001
K1e Lending money to people from the same mosque/ church	-.086	.329	.101	-.017	-.174
K2a Lending tools like axes, hoes etc. to family members	-.107	.391	-.082	-.091	-.175
K2b Lending tools like axes, hoes etc. to kin outside the household	-.012	.336	-.133	-.120	-.011
L2 Participated in cooperative agricultural work	.018	.392	.022	-.001	.096
L3d Participated last 12 months in cooperative work of weeding	-.004	.260	.027	.008	.076
L3e Participated last 12 months in cooperative work of harvesting	.041	.314	-.016	-.049	.110
L3f Participated last 12 months in cooperative work of other agriculture work	.166	.510	.052	-.064	.015
L6 Participation in other exchange work than agriculture	-.001	.499	-.075	-.064	-.100
L7 Participated in unpaid public work during the last 12 months	-.189	-.524	-.034	.037	-.040
M1 Most people can be trusted (1) or you cannot be too careful (0)	.374	.268	.164	.011	.103
M2d Trust in Traditional Authorities	.201	-.179	.216	.824	.009
M2e Trust in group village headmen	.261	-.086	.200	.858	.052
M2f Trust in village headmen	.197	.000	.381	.759	.146
M2j Trust in police	.292	.086	.081	.507	.620
M2k Trust in traders	.255	-.266	.311	.078	.762
M2l Trust in teachers	.128	-.267	.570	.400	.279
M2mTrust in school administrators	.151	-.186	.576	.363	.389
M2n Trust in religious leaders	.161	.010	.636	.318	.110
M3a Trust in family members	.276	.221	.605	.148	-.041
M3b Trust in kin	.302	.433	.688	.041	.105
M3c Trust in people in own village	.558	.174	.447	.219	.188
M3d Trust in people outside the village	.711	.173	.074	.157	.246
M3e Trust in people of same ethnic group	.827	-.024	.201	.220	-.009
M3f Trust in people outside ethnic group	.830	.016	.163	.158	.126
M3g Trust in people from same church/ mosque	.473	-.247	.570	.177	-.122
M3h Trust in people not from same church/ mosque	.812	-.225	.188	.132	.048

Extraction Method: Principal Component Analysis of covariances with 5 factors.
Rotation Method: Varimax with Kaiser Normalization.

Dropping the 6 variables K2c, K2d, K2e, L3a, L3b, L3c increases the number of valid cases to 235 and there are 7 principal components with eigenvalues above 1. There are now 4 well defined factors, 2 are defined by 2 variables and one is defined by one, M3b Trust in kin. M1 is still not strongly related to any of the factors; neither are the variables K1d, K1e, K2a, K2b, L2, L3d, L3e, L3f, and L7. Repeating the analysis with 6 factors we see 4 well defined factors and 2 defined by 2 variables each. The nine variables (K1d, K1e, K2a, K2b, L2, L3d, L3e, L3f, L7) that did not contribute to the 7 factor solutions do not contribute here in the 6 factor

solution *either*. They do not load strongly on any factor. The analysis is repeated with 5 factors. The varimax rotated component matrix is presented in table 3.

In the interpretation of a variable's link to a factor we set the lower limit of the factor loading to 0.5 or above. This means that the factor can explain 25% of the variation in the observed variable. In selecting a factor pattern one has to test out factor solutions based on a variable number of factors. The results presented in table 3 started out with 12 factors and 55 variables. The number of factors was rapidly reduced to 7, then 6 and finally 5 factors based on 30 variables.

Two of the 9 variables (L3f and L7) that did not contribute to the pattern in the 6 factor solution now contribute to a factor together with the variable, L6. L6 now loads with 0.499 to the factor where it in the 6 factor solution loaded above 0.5. The factors we see here can be described by the variables with high loadings on the factor.

Factor 1: **Trust in people outside the family**
The five variables defining the factor are questions about trust in people that focus more on non-family members even if also family members may be included in the group.

- M3c Trust in people in own village
- M3d Trust in people outside the village
- M3e Trust in people of same ethnic group
- M3f Trust in people outside ethnic group
- M3h Trust in people not from same church/ mosque

The factor is weakly related to the question about general trust (M1 Most people can be trusted) and Trust in people from same church/ mosque (M3g).

Factor 2: **Trusting family and other people with money**
Six variables define the main trust of the factor. But they do not contribute very clearly to its definition. The largest coefficient is 0.582 for the variable of lending money to kin. However, the 7 variables from K1d to L3e that do not contribute much to the definition of any factor have their highest coefficient for this factor.

- K1a Lending money to family members
- K1b Lending money to kin
- K1c Lending money to people in your own village
- L3f Participated last 12 months in cooperative work of other agriculture work
- L6 Participation in other exchange work than agriculture
- L7 Participated in unpaid public work during the last 12 months

Factor 3: **Trust in family and local authorities**
There are six variables with reasonably high loading on this factor. They all refer to trust either in family or in local authority figures such as teachers. The loading of 0.447 of the variable “M3c Trust in people in own village” support the interpretation.

- M2l Trust in teachers
- M2m Trust in school administrators
- M2n Trust in religious leaders
- M3a Trust in family members
- M3b Trust in kin
- M3g Trust in people from same church/ mosque

Factor 4: **Trust in traditional authorities**
The four variables defining this factor suggest trust in traditional authorities as the main dimension. The high loading of trust in the police and the loading of 0.4 by trust in teachers support this.

- M2d Trust in Traditional Authorities
- M2e Trust in group village headmen
- M2f Trust in village headmen
- M2j Trust in police

Factor 5: **Trust in modern authorities such as traders and police**
The factor is weakly defined with only 2 variables with loading above 0.5. One of the variables is trust in the police who also loaded on the previous factor, Trust in traditional authorities. This suggests that the police may have an ambiguous position in the life of villagers.

- M2j Trust in police
- M2k Trust in traders

To summarized the study so far: these five factors have emerged based on a pool of 55 variables including 39 binary (K and L variables) and 16 ordinal scale variables (M variables). During the analysis 25 variables were dropped. From table 3 it is seen that 4 of the 5 factors are defined by the 16 scale variables from the M2 and M3 questions. No scale variable has dropped out during the analysis. Of the original 39 binary variables, 25 have dropped out, and of the 14 variables left, 6 define only one factor and the other 8 (including M1) do not contribute meaningfully to any factor.

This raises the question if it is appropriate to pool binary and ordinal scale variables as we have done here. We shall explore this question by analysing the binary and ordinal scale variables separately to see if we can reproduce factors similar to the ones found in table 3.

Trust expressed as attitude towards groups and persons[12]
There are 2 questions (M2 and M3) about what we here call trust attitudes. They resulted in 22 scale variables. Question M2 asks: "In general, do you trust the leaders and officials in this country? Would you say you trust all, most, some, just a few or none in the following groups:" (then 14 institutions are named). The coding of the variable is for each institution: 5=trust all, 4=trust most, 3=trust some, 2=trust only a few, 1= trust none, and 998=do not know/ "."=missing. Thus, increasing variable values mean higher degree of trust. Six institutions listed resulted in no answer from more than 15 households. As advised above the 6 variables defined by these 6 questions were removed from the principal component analysis. The 6 variables are asking about trust in: ”Government officials”(M2a), ”Councillors”(M2b), ”Local assembly staff”(M2c), ”Courts”(M2g), ”Army”(M2h), and ”Leaders of NGOs”(M2i). It is worth noting that all 6 variables concern trust in institutions in society that not all members of a village might have experienced.[13]

[12] More detailed information than what is presented below can be found in Supplementary tables 3 Tables for Factors of trust and trustworthiness and social capital based on 16 scale and binary variables (Berge 2020).
[13] Looking at the regional distribution of missing answers on these variables we see that for trust in NGO leaders, trust in the municipal administration (local assembly staff), and trust in local politicians (councillors) the missing answers are concentrated in the central region (76-86%). For two others, trust in government officials and trust in the court system there is also a majority of missing in the central region (53%), while for the last one, trust in the army, most of the missing answers are in rural villages (75%; but with regional variation from 67% to 100%). The concentration of missing answers to the central region may suggest an interviewer effect. The exception, trust in the army, may be seen as a special case. It is, according to table 24 in Khaila and Chibwana (2005), the public institution with highest trust, but probably it also is the institution least visible in the rural parts of Malawi.

Table 4
Factors based on questions M2 and M2: 16- and 30-variables analysis compared

	Factors from 16 variables 4 factors				Factors from 30 variables 5 factors			
	1	2	3	4	1	3	4	5
M2d Trust in Traditional Authorities	.168	.800	.210	.108	.201	.216	.824	.009
M2e Trust in group village headmen	.183	.878	.188	.133	.261	.200	.858	.052
M2f Trust in village headmen	.155	.783	.260	.246	.197	.381	.759	.146
M2j Trust in police	.391	.409	.480	-.108	.292	.081	.507	.620
M2k Trust in traders	.364	.161	.402	.020	.255	.311	.078	.762
M2l Trust in teachers	.091	.208	.820	.105	.128	.570	.400	.279
M2m Trust in school administrators	.150	.185	.773	.195	.151	.576	.363	.389
M2n Trust in religious leaders	.169	.212	.534	.359	.161	.636	.318	.110
M3a Trust in family members	.107	.119	.114	.705	.276	.605	.148	-.041
M3b Trust in kin	.183	.134	.130	.842	.302	.688	.041	.105
M3c Trust in people in own village	.564	.176	.170	.507	.558	.447	.219	.188
M3d Trust in people outside the village	.675	.114	.140	.189	.711	.074	.157	.246
M3e Trust in people of same ethnic group	.795	.267	.062	.096	.827	.201	.220	-.009
M3f Trust in people outside ethnic group	.800	.165	.033	.126	.830	.163	.158	.126
M3g Trust in people from same church/ mosque	.570	.050	.355	.299	.473	.570	.177	-.122
M3h Trust in people not from same church/ mosque	.779	.046	.266	.047	.812	.188	.132	.048

[a] Extraction Method: Principal Component Analysis of covariances. Rotation Method: Varimax with Kaiser Normalization.

Factoring of 16 ordinal scale variables

Using only M2- and M3-variables reduces the deleted cases, increasing the number of valid cases to 244. A principal components extraction of factors with eigenvalues above 1 produces 4 factors explaining 64% of the variation. In table 4 the varimax rotated components from the 16 variables are compared to 4 of the 5 factors defined by the same variables in table 3 above. Factor 2 in the 30 variable analyses, Helping family and other people, in table 3, is defined by K and L variables with a weak loading from M3b, Trust in kin. Hence, it can be left out of the comparison here in table 4.

Interpretation of the M2 and M3 trust variables

The four orthogonal components from the analysis of the 16 scale variables as presented in table 4 can be interpreted to represent Trust in four different sectors of society:

- Factor 1 represents Trust in people outside village
- Factor 2 represents Trust in traditional authorities
- Factor 3 represents Trust in modern authorities
- Factor 4 represents Trust in family and people from the village

We see that factors 1 in both analyses are similar. Factor 2 in the 16 variable analysis is similar to factor 4 in the 30 variable analysis. Factors 3 and 4 in the 16 variable analysis seems to be joined into factor 3 in the 30 variable analysis. The exception is that variables M2j Trust in police and M2k Trust in traders make up their own factor 5 in the 30 variable analysis. Even so Trust in police loads on factor 4 (Trust in traditional authorities) in the 30 variable analysis. It would seem that in the mind of many villagers the police hold an intermediate position between traditional and modern authorities. However, mostly we see the same factors are emerging. We may conclude that both approaches will produce meaningful factors. The 16-variable analysis will however be preferred since it is based on 244 cases rather than 235.

Factoring of 14 binary variables[14]

The 14 binary variables included in the 30-variable analysis can then be analysed separately. The principal component analysis of 271 cases shows 4 factors with eigenvalues above 1. However, one factor is defined by a single variable: "M1 Most people can be trusted (1) or you cannot be too careful (0)"; and another factor by two variables, the K2a and K2b questions about lending tools. Two variables, L6 and L7 do not load strongly on any factor (but are close to doing so).

A second analysis with number of factors specified to 2 provides the result in table 5. The 14 variables on 271 cases now define 2 factors while in the 30-variable, 5 factor solution, they define only one. Factors 3-5 from the 30-variable study are left out of the table since they, like factor 1, are defined by M2-M3 variables.

One of the 2 factors from the 14 binary variables is about lending money or tools (K-variables), the other about participation (L-variables) with M1 about trust in general also contributing to this.

Table 5
Factors based on binary questions from K1, K2, L2, L3, and L6; 14- and 30-variable analysis compared

	14 variables 2 factors		From 30 variables 5 factors[b]	
	1	2	1	2
K1a Lending money to family members	.862	.044	-.074	.581
K1b Lending money to kin	.803	.167	-.041	.582
K1c Lending money to people in your own village	.725	.285	-.026	.529
K1d Lending money to people outside the village	.454	.282	.032	.327
K1e Lending money to people from the same mosque/ church	.470	.207	-.086	.329
K2a Lending tools like axes, hoes etc. to family members	.632	.013	-.107	.391
K2b Lending tools like axes, hoes etc. to kin outside the household	.548	.068	-.012	.336
L2 Participated in cooperative agricultural work	.147	.823	.018	.392
L3d Participated last 12 months in cooperative work of weeding	.237	.515	-.004	.260
L3e Participated last 12 months in cooperative work of harvesting	.029	.704	.041	.314
L3f Participated last 12 months in cooperative work of other agriculture work	.194	.601	.166	.510
L6 Participation in other exchange work than agriculture	.426	.459	-.001	.499
L7 Participated in public works without payment during the last year	-.216	-.495	-.189	-.524
M1 Most people can be trusted (1) or you cannot be too careful (0)	-.021	.531	.374	.268

[a] Extraction Method: Principal Component Analysis of covariances. Rotation Method: Varimax with Kaiser Normalization.
[b] The highest loading of these variables on the other 3 factors was K1a with -0.238 on factor 5

[14] More detailed information than what is presented below can be found in Supplementary tables 4 Tables for Factors of trust and trustworthiness and social capital based on 14 binary variables (Berge 2020).

Factoring of 39 binary variables[15]

In the analysis presented as the 30-variable analysis above, we left out 25 binary variables due to no contribution to the factor pattern. With the 16 scale variables left out we should revisit the left out variables to see if they will emerge as meaningful indicators in an analysis of only binary variables.

In the 39 binary-variable principal component analysis there are 241 valid cases and we find 11 components with eigenvalues above 1. However, 4 factors turn out to be defined by one variable (L1g, L6, L8a, M1), and another one by two variables (L8c, L8h). In a new factor extraction with 6 factors specified, the two strongest one-variable factors are defined by M1, Most people can be trusted, and L1g, Member of religious groups. Clearly, they do not belong among the other variables. Dropping these two variables and redoing the analysis on 243 valid cases gives 10 factors. There are in this case 10 variables with no meaningful loadings on any factor (L1b-c-d-e-f-h, L3c, L8f, L8j, L8l). Removing these and redoing the analysis, now on 27 variables and 254 valid cases, we find 7 factors with eigenvalues above 1. Only one variable, L1a, has no meaningful loading on any factor.

Dropping L1a and redoing the analysis, now on 257 valid cases, provides 7 factors with eigenvalues above 1 explaining 65.1 % of the variation in the variables. The rotated component matrix is presented in table 6.

Table 6
Factors based on binary questions from K1, K2, L2, L3, L6, L7, and L8: 26 variables and 7 factors extracted based on 257 cases

Factor	1	2	3	4	5	6	7
K1a Lending money to family members	-.012	.747	-.051	.434	.062	-.026	-.151
K1b Lending money to kin	.071	.822	.019	.265	-.059	-.111	-.060
K1c Lending money to people in your own village	.231	.817	.066	.113	-.002	-.081	-.069
K1d Lending money to people outside the village	.291	.531	.336	-.086	-.053	.052	.022
K1e Lending money to people from the same mosque/ church	.186	.510	.350	-.029	.047	.056	-.060
K2a Lending tools like axes, hoes etc. to family members	.012	.150	.151	.809	.046	-.018	-.136
K2b Lending tools like axes, hoes etc. to kin outside the household	.048	.120	.339	.681	-.178	.003	.082
K2c Lending tools like axes, hoes etc. to people in your own village	.085	.187	.553	.476	.018	.047	.065
K2d Lending tools like axes, hoes etc. to people outside the village	.056	.115	.830	.046	-.024	-.001	.070
K2e Lending tools like axes, hoes etc. to people from the same mosque/ church	-.034	.048	.762	.230	.123	.070	.083
L2 Participated in cooperative agricultural work	.886	.115	.016	.143	.000	-.137	-.013
L3a Participated last 12 months in cooperative work of preparing a garden	.723	.072	.042	-.040	.064	-.041	-.235
L3b Participated last12 months in cooperative work of planting	.437	.061	.038	-.003	-.008	.036	.204
L3d Participated last 12 months in cooperative work of weeding	.644	.120	.240	.031	.124	-.016	-.131
L3e Participated last 12 months in cooperative work of harvesting	.683	.103	-.087	.068	-.127	-.178	.201
L3f Participated last 12 months in cooperative work of other agriculture work	.471	.191	-.221	.284	-.356	-.186	.135
L6 Participation in other exchange work than agriculture	.409	.236	-.067	.506	.094	.043	-.064
L7 Participated in public works without payment during the last year	-.290	-.182	.189	-.245	.517	.479	.123
L8a Participated in school project over the last 12 months	-.010	.090	.127	-.145	.766	.100	.239
L8b Participated in road project over the last 12 months	-.058	-.053	.097	.054	.289	.806	.191
L8c Participated in bridge project over the last 12 months	.088	-.236	.032	.190	.612	.132	.100
L8d Participated in church project over the last 12 months	.070	-.069	.065	-.070	.325	.094	.700
L8g Participated in health centre project over the last 12 months	.027	-.065	.190	.047	.141	.143	.458
L8h Participated in irrigation project over the last 12 months	.020	.159	-.097	.013	.525	-.033	.189
L8i Participated in borehole project over the last 12 months	-.045	-.113	-.056	-.084	.125	.093	.849
L8k Participated in graveyard clearing project over the last 12 months	-.154	-.013	-.024	.009	-.050	.901	.128

Extraction Method: Principal Component Analysis of covariances. Rotation Method: Varimax with Kaiser Normalization.

[15] More detailed information than what is presented below can be found in Supplementary tables 5 Tables for Factors of trust and trustworthiness and social capital based on 39 binary variables (Berge 2020).

The 7 factors can be interpreted to mean

Factor 1: Participation in cooperative work
L2 Participated in cooperative agricultural work
L3a Participated last 12 months in cooperative work of preparing a garden
L3b Participated last12 months in cooperative work of planting
L3d Participated last 12 months in cooperative work of weeding
L3e Participated last 12 months in cooperative work of harvesting
L3f Participated last 12 months in cooperative work of other agriculture work
L6 Participation in other exchange work than agriculture

Factor 2: Trusting known people with money
K1a Lending money to family members
K1b Lending money to kin
K1c Lending money to people in your own village
K1d Lending money to people outside the village
K1e Lending money to people from the same mosque/ church

Factor 3: Trusting non-family with tools
K2c Lending tools like axes, hoes etc. to people in your own village
K2d Lending tools like axes, hoes etc. to people outside the village
K2e Lending tools like axes, hoes etc. to people from the same mosque/ church

Factor 4: Trusting family with tools
K2a Lending tools like axes, hoes etc. to family members
K2b Lending tools like axes, hoes etc. to kin outside the household
L6 Participation in other exchange work than agriculture

Factor 5: Participation in public work
L7 Participated in public works without payment during the last year
L8a Participated in school project over the last 12 months
L8c Participated in bridge project over the last 12 months
L8h Participated in irrigation project over the last 12 months

Factor 6: Participation in traditional development work
L8b Participated in road project over the last 12 months
L8k Participated in graveyard clearing project over the last 12 months

Factor 7: Participation in modern development work
L8d Participated in church project over the last 12 months
L8i Participated in borehole project over the last 12 months

The 7 factors seem reasonably defined with at least 2 loadings above 0.5 and one in the range of 0.4-0.5. Yet, factors 5 and 7 do not seem to be substantially different. Specifying 6 factors for the extraction, makes factors 7 and 5 in the 7 factors solution merge into factor 3 in the 6 factors solution defining a joint factor of "Participation in public work".

Another characteristic of table 6 is that the 10 variables on lending (money or tools) define 3 factors while the 16 variables on participation in various activities define 4 factors. Only one

participation variable contributes to a factor from the lending variables. This is variable L6, Participation in other exchange work than agriculture. The same pattern is repeated in the 6 factors solution. In a 5 factors solution the separation into different factors of the K and L variables disappears, but reappears in a 4 factor solution as seen in table 7. Here we see 4 clearly defined factors, 2 based on participation and 2 based on lending money or tools.

Table 7
Factors based on binary questions from K1, K2, L2, L3, L6, L7, and L8:
26 variables and 4 factors extracted based on 257 cases

Factor	1	2	3	4
K1a Lending money to family members	,007	-,142	,841	,143
K1b Lending money to kin	,117	-,176	,824	,104
K1c Lending money to people in your own village	,248	-,086	,788	,055
K1d Lending money to people outside the village	,250	,069	,441	,195
K1e Lending money to people from the same mosque/ church	,149	,074	,452	,234
K2a Lending tools like axes, hoes etc. to family members	,029	-,152	,372	,565
K2b Lending tools like axes, hoes etc. to kin outside the household	,067	-,125	,243	,664
K2c Lending tools like axes, hoes etc. to people in your own village	,087	,068	,250	,709
K2d Lending tools like axes, hoes etc. to people outside the village	,063	,107	,014	,699
K2e Lending tools like axes, hoes etc. to people from the same mosque/ church	-,032	,204	,032	,746
L2 Participated in cooperative agricultural work	,864	-,002	,172	,084
L3a Participated last 12 months in cooperative work of preparing a garden	,646	-,020	,114	,005
L3b Participated last12 months in cooperative work of planting	,411	,172	,053	,031
L3d Participated last 12 months in cooperative work of weeding	,584	,089	,149	,200
L3e Participated last 12 months in cooperative work of harvesting	,714	-,012	,097	-,037
L3f Participated last 12 months in cooperative work of other agriculture work	,513	-,267	,230	-,019
L6 Participation in other exchange work than agriculture	,371	,008	,415	,213
L7 Participated in public works without payment during the last year	-,417	,668	-,170	,021
L8a Participated in school project over the last 12 months	,020	,699	,086	-,026
L8b Participated in road project over the last 12 months	-,325	,696	,075	,137
L8c Participated in bridge project over the last 12 months	,075	,505	-,096	,121
L8d Participated in church project over the last 12 months	,134	,658	-,126	,005
L8g Participated in health centre project over the last 12 months	,038	,427	-,088	,187
L8h Participated in irrigation project over the last 12 months	,085	,405	,187	-,117
L8i Participated in borehole project over the last 12 months	,038	,587	-,200	-,087
L8k Participated in graveyard clearing project over the last 12 months	-,475	,476	,097	,035

Extraction Method: Principal Component Analysis of covariances. Rotation Method: Varimax with Kaiser Normalization.

Factor 1: Participation in cooperative work
L2 Participated in cooperative agricultural work
L3a Participated last 12 months in cooperative work of preparing a garden
L3b Participated last12 months in cooperative work of planting
L3d Participated last 12 months in cooperative work of weeding
L3e Participated last 12 months in cooperative work of harvesting
L3f Participated last 12 months in cooperative work of other agriculture work

Factor 2: Participation in public work
L7 Participated in public works without payment during the last year
L8a Participated in school project over the last 12 months
L8b Participated in road project over the last 12 months
L8c Participated in bridge project over the last 12 months
L8d Participated in church project over the last 12 months
L8g Participated in health centre project over the last 12 months
L8h Participated in irrigation project over the last 12 months
L8i Participated in borehole project over the last 12 months
L8k Participated in graveyard clearing project over the last 12 months

Factor 3: Trusting people with money
K1a Lending money to family members
K1b Lending money to kin
K1c Lending money to people in your own village
K1d Lending money to people outside the village
K1e Lending money to people from the same mosque/ church
L6 Participation in other exchange work than agriculture

Factor 4: Trusting people with tools
K2a Lending tools like axes, hoes etc. to family members
K2b Lending tools like axes, hoes etc. to kin outside the household
K2c Lending tools like axes, hoes etc. to people in your own village
K2d Lending tools like axes, hoes etc. to people outside the village
K2e Lending tools like axes, hoes etc. to people from the same mosque/ church

Factors indicating building of social capital[16]
Above we have found 2-3 factors defined by some of the L variables. The 8 L-questions resulted in 43 variables having to do with membership in organisations and participation in activities. Fifteen of the 43 were excluded from the analysis due to technical quality (many missing, little variation). To see how the remaining 28 variables relate to each other they were subjected to a principal factor analysis. The first test resulted in 8 components based on 246 cases explaining 68% of the variation. Nine variables do not load on any factor (L1b, L1c, L1d, L1e, L1f, L3c, L8f, L8j, L8l). Three factors were basically defined by only one variable, and another factor was weakly defined by two and seemingly bipolar. Dropping the 9 variables that did not contribute and running a model with 6 factors, now based on 254 cases, there are still two components defined by only one variable, and 3 variables (L1a, L1h, L8h) that do not contribute to the interpretation of the factors. Dropping also these 3 variables and running an analysis based on 16 variables and 259 cases we find 5 factors with eigenvalues above 1, explaining 66% of the variation. There are still 2 factors defined by only one variable, one factor is based on L1g (Member of religious groups) and the other on L6 (Participation in other exchange work than agriculture). We also see one variable that do not contribute to any factor, L8c Participated in bridge project over the last 12 months. Rerunning the analysis with L8c left out gives 5 factors on 260 cases. The two one variable factors are unchanged (defined by L1g and L6). Restricting the number of factors to 3 based on 260 cases explaining 54% of the variation gives the result presented in table 8. Factor 1 relates to participation in cooperative work, factor 2 to participation in modern public work, and factor 3 to participation in traditional public work.

[16] More detailed information than what is presented below can be found in Supplementary tables 7 Tables for Factors of trust and trustworthiness and social capital based on 28 L-variables of participation (Berge 2020).

Table 8 **Factors based on binary questions from L1, L2, L3, L4, L5. L6, L7, and L8:** **15 variables and 3 factors extracted based on 260 cases**			
L1g Member of religious groups	.173	-.131	.748
L2 Participated in cooperative agricultural work	.908	-.010	-.063
L3a Participated last 12 months in cooperative work of preparing a garden	.642	-.047	-.084
L3b Participated last12 months in cooperative work of planting	.410	.143	.036
L3d Participated last 12 months in cooperative work of weeding	.604	.083	-.109
L3e Participated last 12 months in cooperative work of harvesting	.694	-.047	-.008
L3f Participated last 12 months in cooperative work of other agriculture work	.560	-.307	.100
L6 Participation in other exchange work than agriculture	.570	-.102	.336
L7 Participated in public works without payment during the last year	-.393	.700	.069
L8a Participated in school project over the last 12 months	.085	.751	-.112
L8b Participated in road project over the last 12 months	-.166	.638	.481
L8d Participated in church project over the last 12 months	.087	.666	-.001
L8g Participated in health centre project over the last 12 months	.051	.425	.076
L8i Participated in borehole project over the last 12 months	-.039	.620	-.024
L8k Participated in graveyard clearing project over the last 12 months	-.307	.382	.695

The last L1 variable, L1g Member of religious groups, is mainly related to work on the graveyard. This suggests that it belongs to the dimension we in table 6 called "Participation in traditional development work". It strengthens the aspect of "tradition" and one might more accurately call it a dimension of traditional public work contrasting it to the modern public work such as building or maintaining the school. The L6 variable shifts to load on factor related to cooperative work.

We note that the other variables based on question L1 about membership in diverse groups and clubs did not contribute in any way. We gradually dropped variables L3c, L8f and L8c. Variable L3c indicates participation in works on irrigation systems. This particular activity does not concern very many. Only 6 answered yes. Neither do other variables with little variation, L8f (work in kindergarten) with 12 answering yes, and L8j (work on dams) where 6 answered yes, tell much about the general structure of social capital building activities. Variable L8c, Participated in bridge project over the last 12 months, is different. There are 74 persons who say they have participated in such activity and only 5 are missing. This variable would be interesting to keep for further study.

Comparing factors from binary variables and ordinary scale variables

The two factor studies, one on 30 variables (both scale and binary variables, table 3) and one on 26 variables (only binary variables, table 7), have only 13 variables in common. This makes a direct comparison of variable factor loadings somewhat pointless. If we correlate the resulting factor scores, we find that only one factor is similar in the two studies. Factor 2, "Helping family and other people" from the 30 variable analysis, and factor 3, "Trusting people with money" from the 26 variable analysis, correlate with a coefficient of 0.6. This suggests that the common variance of the two factors is in the order of 35%. This common core of the two factors is largely defined by the variables K1a-e.

Table 9
Correlations among factors derived from two different variable sets: 4 factors based on 26 variables and 257 cases (table 7) correlated with 5 factors based on 30 variables and 235 cases (table 3)

	F1_30	F2_30	F3_30	F4_30	F5_30
F1_26	.104	.355**	.039	.005	.157*
F2_26	-.012	-.319**	.010	-.174**	.050
F3_26	-.066	.608**	.013	.035	-.192**
F4_26	-.058	.045	-.037	-.125	-.052

**Correlation is significant at the 0.01 level (2-tailed).
*Correlation is significant at the 0.05 level (2-tailed).
Listwise deletion of missing: N=223

Factors 1 and 2 from the 26-variable study are weakly related to Factor 2 from the 30-variable study. These 2 factors in the 26-variable study are defined by 16 L-variables (including L2, L3, L7, L8). Only 8 of them are included in the 30-variable study, and none from the L8 group that define factor 2 in the 26-variable study. Since also the variables left out in the 30-variable study mainly relate to the factor defined by the included variables (defining factor 2 in the 30-variable study), it seems reasonable to conclude that the group of L-variables left out in the 30-variable study are adequately represented by those included.

This leaves us with the variables K2c, K2d, and K2e that are unique in the 26-variable study. They are the most important variables in the definition of factor 4 (Trusting people with tools) in the 26-variable study. The two other variables important for this factor are K2a and K2b. In the 30-variable study, they do not load strongly on any factor but contribute weakly to factor 2. It seems reasonable to conclude that factor 4 in the 26-variable study represent a dimension not adequately represented by the 5 factors of the 30-variable study, suggesting that maybe we should end up with 6 factors.

Trust demonstrated in actions[17]

Questions K1 and K2 concerns what kind of trusting actions household members have performed during the last year. The final categories of these questions ("Other") produced so few "yes", only 1 for K1 and 8 for K2, that it is impossible to include them in the analysis. Besides, there were also very many that did not answer at all. This would damage the analysis. However, the many missing answers and the very few "yes" may also be seen as evidence that the included categories do comprise the vast majority of the actual targets for trusting actions. In a standard factoring of these 10 variables by SPSS we find 3 factors with eigenvalues above 1 accounting for 66.3% of the variation in the 10 variables. In table 8 these factors show up as

Factor 1: Trusting people with money
Factor 2: Trusting people outside the family with tools
Factor 3: Trusting family with tools

In the introduction, we noted that factor analysis of dichotomous variables (or rather estimating correlations among them) represents a methodological problem. The advice is to use tetrachoric correlations (Christoffersson 1975, Schumacker and Lomax 2010). This approach is provided by the program LISREL 8.72/ PRELIS 2.72 and later versions[18]. To test

[17] More detailed information than what is presented below can be found in Supplementary tables 6 Tables for Factors of trust and trustworthiness and social capital based on 10 K1 and K2 variables (Berge 2020).
[18] Access to the PRELIS program has been limited to the fall of 2010. Later it has been too expensive for the rather limited purpose of this article. Some details will be found in Supplementary tables 6 (Berge 2020).

if the use of tetrachoric correlations made any substantive difference, the 10 K1 and K2 variables were used in a principal component analysis in the PRELIS 2.72 program. . In table 8 the SPSS and PRELIS solutions are compared. The substances of the 3 dimensions are the same, except that factor 2 and 3 switch rank in the PRELIS compared to SPSS. It is noteworthy that lending money is just one factor while lending tools differentiate between family and others.

Table 10
Comparison of principal components of the K1 and K2 variables found by SPSS 26 and PRELIS 2.72 Factor Loadings Varimax-Rotated.

	SPSS(a)			PRELIS/LISREL(b)		
	1	2	3	1	2	3
K1a Lending money to family members	.746	-.072	.452	.755	.615	.037
K1b Lending money to kin	.836	.016	.248	.889	.254	.121
K1c Lending money to people in your own village	.848	.070	.139	.903	.210	.113
K1d Lending money to people outside the village	.582	.346	-.047	.781	.053	.345
K1e Lending money to people from the same mosque/ church	.572	.438	-.072	.738	.060	.360
K2a Lending tools like axes, hoes etc. to family members	.153	.054	.868	.215	.925	.314
K2b Lending tools like axes, hoes etc. to kin outside the household	.116	.278	.747	.286	.503	.636
K2c Lending tools like axes, hoes etc. to people in your own village	.151	.528	.499	.290	.227	.801
K2d Lending tools like axes, hoes etc. to people outside the village	.111	.821	.094	.163	-.029	.986
K2e Lending tools like axes, hoes etc. to people from the same mosque/ church	.051	.801	.237	.117	.264	.781

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization in SPSS; varimax rotation in PRELIS 2.72
Sample size 283, analysis is based on 279 cases; 4 cases with missing data excluded listwise.
(a) Rotation converged in 6 iterations in SPSS
(b) Two Heywood cases reported by PRELIS

The PRELIS program offers several ways of estimating factor loadings. In the next table, two different ways of estimating them are compared. There is no difference in the substance of their interpretation.

Table 10 (continued)

	PRELIS					
	Factor Loadings ML estimates			Factor Loadings TSLS estimates		
	1	2	3	1	2	3
K1a Lending money to family members	.755	.615	.037	.707	.487	-.204
K1b Lending money to kin	.889	.254	.121	.908	.053	-.005
K1c Lending money to people in your own village	.903	.210	.113	.934	.000	.000
K1d Lending money to people outside the village	.781	.053	.345	.786	-.125	.293
K1e Lending money to people from the same mosque/ church	.738	.060	.360	.735	-.105	.309
K2a Lending tools like axes, hoes etc. to family members	.215	.925	.314	.000	1.000	.000
K2b Lending tools like axes, hoes etc. to kin outside the household	.286	.503	.636	.099	.534	.463
K2c Lending tools like axes, hoes etc. to people in your own village	.290	.227	.801	.126	.238	.722
K2d Lending tools like axes, hoes etc. to people outside the village	.163	-.029	.986	.000	.000	1.000
K2e Lending tools like axes, hoes etc. to people from the same mosque/ church	.117	.264	.781	-.068	.324	.697

The 3 factors extracted from 279 observations explain 88.6% of the variance. They can be interpreted in terms of underlying attitudes or propensities to:

- Lending money to people
- Lending tools to people outside the village (not kin and family)
- Lending tools to kin and family

Extracting components from questions based on lending money alone produced the same factors as here. Analysing the questions about lending tools alone produced only one factor. Pooling the two types of questions in the same analysis produces 3 factors as presented above. Lending money to people outside the village correlates weakly with lending tools to people outside the village, but sufficiently to differentiate between propensity to lend tools to family and kin and lending tools to people outside the village.

The conclusion here is that the methodological problems related to factor analysis of dichotomous variables probably do not affect the substance of our interpretations.

Factors from 55 binary variables - 39 dichotomous variables and 16 created from measurement variables[19]

The SPSS factor analysis program is based on product-moment correlations that assume interval scale measurement. The variables we use here are dichotomous and ordinal scale. The theoretical dimensions we look for are, however, continuous, and an interval scale would be preferable. Correlations among ordinal scale and nominal scale variables should ideally be computed as rank bi-serial. There is no procedure available for doing this in the SPSS factor analysis module.

However, we can explore the differences between the measurement variables and the binary variables in another way. Of the 22 ordinal scale variables (M2 and M3) 6 were excluded. The rest can be made binary by coding values 4-5 as 1 and values 1-3 as 0. Thus 16 variables can be added to the 39 true binary variables in the same analysis providing a basis for binary factor analysis of all 55 variables. With 55 binary variables constructed this way, we end up with 209 cases. There clearly are more variables than the number of cases would support in a factor analysis. If one takes as a rule of thumb that the absolute minimum is 5 cases per variable as suggested by Bentler and Chou (1987) (read in Schumacker and Lomax (2010, 42)), we should limit ourselves to about 40 variables Nevertheless we will start with the 55 variables since we expect that many variables will drop out, increasing the number of cases.

Starting with 55 variables we find 15 components with eigenvalues of 1 or more. One component is defined by one variable. Two components are weakly defined by two variables, one loading above 0.5 and the other below. One component is weakly defined by 3 variables, all of which loads with between 0.467 and 0.493. Ten variables (L1a-f, L3c, L8f, L8j, and L8l) do not contribute meaningfully to any component.

Removing the 10 variables that do not contribute meaningfully and rerunning the analysis we see 219 valid cases and find 12 components with eigenvalues above 1. Two variables (L1h and M2k) who contributed weakly (loadings 0.492 and 0.486) to components in the 55 variable analysis do not contribute to any component in this 45 variable analysis. Removing these two variables and rerunning the analysis, we find 222 valid cases, thus taking us just above the bare minimum. We find 11 components with eigenvalues above 1. In this analysis, all variables contribute to the definition of a component.

[19] More detailed information than what is presented below can be found in Supplementary tables 8 Tables for Factors of trust and trustworthiness and social capital based on 55 binary variables (Berge 2020).

Table 11
Factor analysis of 43 binary variables for 222 cases, extracting 11 principal factors varimax rotated

Factor no	1	2	3	4	5	6	7	8	9	10	11
K1a Lending money to family members	-.088	.032	-.044	.744	.070	-.029	-.104	.407	.142	-.068	-.030
K1b Lending money to kin	-.066	.130	-.106	.793	.076	.013	-.107	.220	.166	-.074	.082
K1c Lending money to people in your own village	-.010	.292	-.067	.794	.042	.040	.075	.100	.061	-.039	.046
K1d Lending money to people outside the village	.070	.296	-.015	.553	-.150	.269	.137	-.091	-.048	.122	-.039
K1e Lending money to people from the same mosque/ church	-.103	.228	-.038	.466	.091	.393	-.040	-.139	.108	.195	-.025
K2a Lending tools like axes, hoes etc. to family members	-.055	.044	-.096	.243	-.129	.154	.001	.782	-.024	.004	-.044
K2b Lending tools like axes, hoes etc. to kin outside the household	-.039	.063	-.097	.124	-.115	.309	.067	.628	-.008	.002	.308
K2c Lending tools like axes, hoes etc. to people in your own village	-.084	.092	.069	.204	-.078	.544	.027	.409	-.085	-.057	.306
K2d Lending tools like axes, hoes etc. to people outside the village	.009	.054	.042	.075	.057	.809	.075	.097	-.113	.020	-.020
K2e Lending tools like axes, hoes etc. to people from the same mosque/ church	-.020	-.007	.141	.015	.030	.845	-.063	.139	.043	.034	-.052
L1g Member of religious groups	.017	.149	-.043	.030	-.078	-.007	-.059	.124	-.023	.167	.844
L2 Participated in cooperative agricultural work	.013	.882	.006	.085	.074	.021	-.034	.137	.034	-.083	.012
L3.a. Participated last 12 months in cooperative work of preparing a garden	.064	.695	-.062	.168	.092	.054	.031	-.083	-.064	.053	-.003
L3.b. Participated last12 months in cooperative work of planting	.110	.426	.180	.073	-.149	.087	-.015	-.077	.109	-.017	.055
L3.d. Participated last 12 months in cooperative work of weeding	-.020	.639	.055	.177	.039	.169	.183	.067	-.081	.028	-.171
L3.e. Participated last 12 months in cooperative work of harvesting	.078	.709	.029	.080	-.097	-.092	.050	.054	.031	-.138	.210
L3.f. Participated last 12 months in cooperative work of other agriculture work	.128	.494	-.242	.075	.022	-.113	-.078	.230	.326	-.056	.129
L6 Participation in other exchange work than agriculture	-.106	.416	-.040	.172	.145	.042	-.299	.427	.299	.317	-.073
L7 Participated in public works without payment during the last year	-.198	-.357	.598	-.174	.038	.128	.106	-.196	-.243	.244	-.086
L8.a. Participated in school project over the last 12 months	-.057	-.005	.775	.085	.124	-.022	.035	.011	-.186	-.016	-.026
L8.b. Participated in road project over the last 12 months	.023	-.209	.544	-.027	-.215	.182	.086	.038	-.062	.531	.047
L8.c. Participated in bridge project over the last 12 months	-.056	.110	.518	-.193	-.102	.022	.119	.244	-.133	.190	-.300
L8.d. Participated in church project over the last 12 months	.084	.064	.670	-.104	-.083	.153	-.050	-.149	.117	-.081	.097
L8.g. Participated in health centre project over the last 12 months	.022	.074	.400	-.170	-.106	.196	-.239	.059	-.058	.160	.010
L8.h. Participated in irrigation project over the last 12 months	.027	.093	.459	.163	-.104	-.085	-.051	-.017	.029	.037	-.194
L8.i. Participated in borehole project over the last 12 months	.072	-.045	.638	-.222	-.061	.005	-.101	-.138	.267	-.057	.206
L8.k. Participated in graveyard clearing project over the last 12 months	-.114	-.285	.276	-.059	-.111	.037	-.036	-.032	-.035	.724	.259
M1 Most people can be trusted (1) or you cannot be too careful (0)	.494	.260	-.261	.087	-.032	-.053	.024	.054	.139	.524	-.034
M2.d. Trust in Traditional Authorities	.217	-.003	-.011	-.012	.805	.057	.167	-.056	.093	-.052	.002
M2.e. Trust in group village headmen	.267	.001	-.086	.049	.830	.047	.153	-.111	.062	-.079	-.089
M2.f. Trust in village headmen	.263	-.025	-.166	.114	.725	-.010	.221	-.091	.195	-.044	-.008
M2.j. Trust in police	.431	.176	.014	-.029	.428	-.171	.387	.184	-.204	.041	-.060
M2.l. Trust in teachers	.185	.009	.006	.019	.281	.009	.748	-.044	.129	.003	-.011
M2.m.Trust in school administrators	.226	.133	-.037	-.082	.181	.044	.765	.029	.242	-.054	-.044
M2.n. Trust in religious leaders	.283	-.026	-.254	.004	.302	.050	.459	.062	.160	.270	-.046
M3.a. Trust in family members	.174	-.001	-.014	.122	.082	-.026	.214	-.038	.631	.004	-.017
M3.b. Trust in kin	.278	.106	-.009	.196	.171	-.061	.150	.022	.718	.018	-.045
M3.c. Trust in people in own village	.615	.036	-.031	.023	.213	-.051	.177	.023	.418	.016	.104
M3.d. Trust in people outside the village	.691	.089	-.126	-.113	.091	-.083	.090	.041	.209	-.067	.089
M3.e. Trust in people of same ethnic group	.805	.034	.035	-.065	.224	.016	.017	-.035	.064	-.033	-.056
M3.f. Trust in people outside ethnic group	.792	.002	-.034	-.097	.141	-.099	-.006	-.006	.065	.028	.104
M3.g. Trust in people from same church/ mosque	.687	.080	.082	.194	.115	.081	.224	-.167	.094	.006	-.153
M3.h. Trust in people not from same church/ mosque	.804	.036	.137	-.034	.061	.080	.151	-.069	-.025	.009	-.038

Extraction Method: Principal Component Analysis of covariances. Rotation Method: Varimax with Kaiser Normalization.

The 11 factors can tentatively be labelled:

Factor 1: Trust in people outside the closest family
Factor 2: Participation in cooperative work
Factor 3: Participation in modern public work
Factor 4: Trusting family and kin with money
Factor 5: Trust in traditional authorities
Factor 6: Trusting people with tools
Factor 7: Trust in modern authorities
Factor 8: Trusting family with tools
Factor 9: Trust in family members
Factor 10: Participation in traditional public works
Factor 11: Member of religious group

We see that the last factor is defined by one variable, L1g. Redoing the analysis, extracting 10 components (explaining 64.5% of the variation) shows that variable L1g, "Member of religious groups" is related to Factor 8, Trusting family with tools. The other factors are unchanged except that factors 3 and 4 change place in the rotated solution. They are ordered in rank in terms of amount of variance explained in the initial unrotated solution. It can also be argued that factors like no. 10 and 3 in the 11 factor solution are similar. Redoing the analysis with 9 factors extracted we again find that variable L1g alone defines the last factor, nr 9.

Dropping variable L1g and redoing the analysis with 42 variables we find 224 valid cases and 11 factors with eigenvalues above 1 explaining 68% of the variance. The factors remain similar. Variable L8g, Participated in health centre project over the last 12 months, does not contribute to any factor. All factors have at least 2 loadings above 0.5 and one in the interval 0.4-0.5.

We take note that variables L3b and M2n load weakly on one factor each, and variables K1e, L6, M1, and M2j loads weakly on two factors. To see if the number of factors will change this we extract 10 and 9 factors. In the 10 factor solution 65.5% of the variance is explained. The factors remain unchanged. In the 9 factor solution 62.8% of the variance is explained. Two factors in the 10 factor solution (factors 6 and 8 both concern lending tools to kin and other people) join into factor 6 here: "Trusting people with tools". Otherwise we see the same factors.

Table 12 Factor analysis of 42 binary variables for 224 cases, extracting 9 principal factors varimax rotated[20]

Factor	1	2	3	4	5	6	7	8	9
K1a Lending money to family members	-.120	.062	-.117	.789	.033	.132	-.079	.187	.004
K1b Lending money to kin	-.072	.124	-.140	.807	.052	.096	-.101	.197	-.042
K1c Lending money to people in your own village	-.008	.259	-.059	.787	.038	.064	.067	.070	-.049
K1d Lending money to people outside the village	.120	.222	.064	.529	-.133	.173	.140	-.123	.009
K1e Lending money to people from the same mosque/ church	-.028	.135	.063	.479	.125	.230	-.015	-.039	.066
K2a Lending tools like axes, hoes etc. to family members	-.113	.137	-.215	.317	-.202	.510	.036	.062	.121
K2b Lending tools like axes, hoes etc. to kin outside the household	-.083	.129	-.192	.135	-.165	.640	.033	.144	.126
K2c Lending tools like axes, hoes etc. to people in your own village	-.089	.101	.038	.199	-.103	.729	-.017	.012	-.006
K2d Lending tools like axes, hoes etc. to people outside the village	.057	-.001	.113	.092	.120	.721	.065	-.213	-.032
K2e Lending tools like axes, hoes etc. to people from the same mosque/ church	.027	-.055	.217	.046	.098	.767	-.070	-.078	-.018
L2 Participated in cooperative agricultural work	.007	.890	-.008	.122	.070	.082	-.018	.030	-.036
L3.a. Participated last 12 months in cooperative work of preparing a garden	.093	.650	-.012	.185	.084	-.004	.061	-.126	-.013
L3.b. Participated last12 months in cooperative work of planting	.132	.401	.208	.070	-.134	.044	-.021	.087	-.039
L3.d. Participated last 12 months in cooperative work of weeding	-.002	.611	.093	.215	.038	.143	.223	-.160	-.022
L3.e. Participated last 12 months in cooperative work of harvesting	.063	.719	.009	.068	-.107	-.008	.017	.103	-.087
L3.f. Participated last 12 months in cooperative work of other agriculture work	.103	.540	-.299	.104	.017	.028	-.079	.365	.056
L6 Participation in other exchange work than agriculture	-.114	.438	-.079	.310	.133	.165	-.224	.202	.401
L7 Participated in public works without payment during the last year	-.179	-.393	.638	-.198	.045	.012	.102	-.254	.178
L8.a. Participated in school project over the last 12 months	-.078	-.007	.755	.092	.100	-.020	.025	-.132	-.016
L8.b. Participated in road project over the last 12 months	.034	-.233	.558	-.032	-.211	.179	.084	-.055	.516
L8.c. Participated in bridge project over the last 12 months	-.068	.139	.481	-.110	-.136	.079	.190	-.178	.190
L8.d. Participated in church project over the last 12 months	.092	.051	.688	-.142	-.054	.096	-.102	.151	-.089
L8.g. Participated in health centre project over the last 12 months	.001	.073	.400	-.148	-.035	.175	-.272	-.066	.239
L8.h. Participated in irrigation project over the last 12 months	.024	.085	.474	.174	-.104	-.106	-.041	-.012	-.012
L8.i. Participated in borehole project over the last 12 months	.059	-.022	.615	-.285	-.025	.006	-.182	.371	.019
L8.k. Participated in graveyard clearing project over the last 12 months	-.090	-.315	.273	-.069	-.127	.039	-.032	.000	.737
M1 Most people can be trusted (1) or you cannot be too careful (0)	.510	.237	-.240	.146	-.017	-.078	.083	.028	.512
M2.d. Trust in Traditional Authorities	.202	-.008	-.004	-.008	.802	.014	.179	.092	-.052
M2.e. Trust in group village headmen	.262	-.012	-.076	.061	.836	-.050	.184	.028	-.094
M2.f. Trust in village headmen	.256	-.033	-.165	.114	.731	-.074	.237	.181	-.040
M2.j. Trust in police	.374	.214	-.044	-.004	.392	-.074	.409	-.143	.096
M2.l. Trust in teachers	.167	-.008	.040	-.005	.294	-.002	.721	.129	-.039
M2.m.Trust in school administrators	.217	.139	-.032	-.098	.179	.070	.758	.247	-.081
M2.n. Trust in religious leaders	.297	-.049	-.238	.054	.276	.030	.522	.079	.219
M3.a. Trust in family members	.198	-.008	-.020	.153	.091	-.078	.246	.561	.007
M3.b. Trust in kin	.307	.106	-.020	.244	.151	-.079	.207	.633	-.008
M3.c. Trust in people in own village	.608	.058	-.062	.017	.206	-.020	.184	.442	.043
M3.d. Trust in people outside the village	.665	.130	-.167	-.136	.100	-.025	.073	.268	-.004
M3.e. Trust in people of same ethnic group	.794	.051	.022	-.074	.236	-.012	.031	.066	-.034
M3.f. Trust in people outside ethnic group	.772	.030	-.071	-.119	.130	-.065	-.006	.125	.061
M3.g. Trust in people from same church/ mosque	.722	.035	.135	.200	.114	-.053	.269	-.005	-.130
M3.h. Trust in people not from same church/ mosque	.806	.032	.146	-.050	.070	.030	.157	-.034	-.032

Extraction Method: Principal Component Analysis of covariances. Rotation Method: Varimax with Kaiser Normalization.

[20] This table as well as all other tables in the paper is produced using SPSS 26. Using JMP 12 this table can be reproduced by choosing Multivariate Methods/Principal components with row-wise estimation method. In the resulting analysis tables, the output is changed by going from estimates based on correlations to estimates based on covariances. Then one chooses factor analysis by principal components as factoring method and principal components (diagonals=1) for prior. The number of factors is set to 9 and varimax is kept on as method for rotation. In the results tables one may choose to add factor scores of rotated components for the 224 observations (due to the row-wise estimation method) used in the factor analysis, and also adding estimated factor scores for the excluded observations.

The factors can be labelled as follows:
Factor 1: Trust in people outside the family
Factor 2: Participation in cooperative work
Factor 3: Participation in public works
Factor 4: Trusting people with money
Factor 5: Trust in traditional authorities
Factor 6: Trusting people with tools
Factor 7: Trust in modern authorities
Factor 8: Trust in family members and kin
Factor 9: Participation in traditional public work

We note that all variables contribute meaningfully to at least one factor. Variable M1 loads equally strongly on factor 1 and factor 9. The same holds for variable L8b loading on both factor 9 and factor 2. To explore if factor 9 can be represented by factors 1 and 2 we redo the analysis with 8 factors, now explaining 59.9% of the variance.

We see significant changes reducing the number of factors from 9 to 8. The factor "Trust in family" disappears. Variable M3a do not load on any factor and M3b loads weakly on two factors. In addition, variables K1d, L3b, and L8g show no loadings above 0.4. And 8 variables (K1e, K2a, L3f, L6, L8c, L8h, M2j, and M2n) have only one weak loading on one factor (weak = between 0.4 and 0.5). Factor 9 (see table 12) defined by variables related to participation in traditional public work, remains. The variables defining factor 8 in the 9-factor solution are now split between factor 1, Trust in people outside the closest family, and factor 7, Trust in modern authorities, with only weak contributions to their definition. The 8-factor solution does not work.

It seems reasonable to conclude that in the set of 55 binary variables, 13 do not correlated meaningfully with the factor structure defined by the 42 retained in the last factor extraction. To represent adequately the correlations among these 42 variables we need 9 factors as shown in table 12. These 9 factors explain 62.8% of the variation in the 42 variables.

In addition, we may note that participation in activities related to social capital seems to be different from trust and trustworthiness. Thus, the 9 factors identified in table 12 can be seen to be of three kinds. There are 4 factors where people express their trust-beliefs in other kinds of people, there are 2 factors where people express willingness to entrust others with valuable objects (trust activity factors), and there are 3 factors showing which types of activities related to the building of social capital that people take part in (social capital factors). The 5 different approaches to the original 55 variables can be compared (see table 13).

In the analysis of 55 binary variables compared to the analysis of 55 mixed variables there are important differences. In the 5 factor solution based on mixed variables the variables indicating trusting people with tools do not load on any factor. The variables defining trust in modern authorities and trust in family members and kin in the 55 binary variables analysis does not define exactly the same factors in the mixed variable analysis. The variables defining these 2 trust factors in the 55 variable mixed analyses are split differently between the two somewhat similar factors. One conclusion is that the mixture of scale and binary variables may not provide the best solution to the problem of identifying the unobserved dimensions of the data. The analysis of the 55 binary variables resulting in 9 factors will be preferred.

Table 13
Factors identified in 5 different ways

	# variables / solution # variables / # factors				
Factors from the 55/42/9	Binary 55/42/9	Mixed 55/30/5	Scale 16/16/4	Binary 14/14/2	Binary 39/26/4
Trust belief factors					
Factor 1: Trust in people outside the family	X	X	X		
Factor 5: Trust in traditional authorities	X	X	X		
Factor 7: Trust in modern authorities	X	X	X		
Factor 8: Trust in family members and kin	X	X	X		
Trust activity factors					
Factor 4: Trusting people with money	X	X		X	X
Factor 6: Trusting people with tools	X				X
Social capital factors					
Factor 2: Participation in cooperative work	X			X	X
Factor 3: Participation in modern public works	X				X
Factor 9: Participation in traditional public work	X				

Regional differentiation[21]

From table 13 it is concluded that we probably need 9 factors to account for the variation in the data. Starting with 55 binary and scale variables we find that with the 16 scale variables recoded to binary variables, 42 of them contribute to the definition of 9 factors.

Our starting assumption is that the answers to such questions as those analysed here primarily will express how socialization into a culture has shaped the propensity to trust and collaborate with other people and authorities. As far as the answers are context sensitive, it is assumed that the default context consists of the village with ordinary activity and functionality. However, since the local culture in this sense varies considerably from the densely populated matrilineal villages in the south of Malawi to the sparsely populated patrilineal villages of the north, it will tentatively be performed separate analysis for the 3 regions South, Central and North. These will be compared to the national factor structure.

The national analysis of 42 variables utilized 224 cases. The regional distribution of these is as follows:

North Region	62 cases
Central Region	79 cases
South Region	83 cases

With 42 variables and 62 cases (or even 224) we are way below the recommended minimum number of 20 cases per variable (Schumacker and Lomax 2010, 42). The extraction of principal components, varimax rotated, will at best be exploratory and indicative. For the 224 cases of Malawi, the extraction of 9 factors seemed to provide reasonable results. For the 3 regions it will be more difficult. Extraction of 9 factors based on covariances failed in the central region. The varimax rotation failed to converge. Extraction of 8 factors provided a result. For the 3 regions we find the following factors:

[21] More detailed information than what is presented below can be found in Supplementary tables 9 Tables for Factors of trust and trustworthiness and social capital in 3 regions of Malawi (Berge 2020).

Region North:
Factor 1: Trust in family, kin and traditional authorities
Factor 2: Trusting kin and family with money
Factor 3: Participation in traditional public work
Factor 4: Trusting people outside the family with tools
Factor 5: Trust in people outside the family
Factor 6: Participation in modern public works
Factor 7: Trust in traditional authorities
Factor 8: Participation in cooperative work
Factor 9: Trust in police

Region Central:
Factor 1: Participation in cooperative work - Participation in traditional public work
Factor 2: Trust in people outside the family
Factor 3: Participation in modern public work
Factor 4: Trust in traditional authorities
Factor 5: Trusting family and kin with money
Factor 6: Trust in people - Participation in cooperative agricultural work
Factor 7: Trusting people with tools
Factor 8: Trust in modern authorities

Region South:
Factor 1: Trust in people and traditional authorities
Factor 2: Participation in cooperative work
Factor 3: Trusting people with money
Factor 4: Participation in modern public work
Factor 5: Participation in traditional public work
Factor 6: Trusting people with tools
Factor 7: Trusting people with tools and Participation in cooperative work
Factor 8: Trust in family
Factor 9: Trusting family with tools

Although each regional factor analysis is independent, the resulting factors are very similar. However, in neither region do we find the same factor structure as in the whole of Malawi. The differences seem to be caused primarily by variables defining factors of their own or variables shifting from one factor to another. In addition, we see that in the central region factor 1 is bipolar. High score on "Participation in cooperative work" corresponds to low score on "Participation in traditional public work". Factors 1 in the north and in the south seem to be similar to factor 4 and 2 in the central region. If we compute factor scores for various factors from the 3 regions, adding scores from factor 1 from north, factor 4 from central and factor 1 from south into one variable and correlate it with factor 5, "Trust in traditional authorities", from the whole of Malawi, we find a correlation coefficient of 0.619.

The similarity is not very high. Given the insecurity in factor estimates, to be expected due to very few cases in each region, it seems reasonable to conclude that the factors based on the total number of observations should be preferred.

Regional factors based on scale variables from M2 and M3 questions.

Analysing the 16 M2 and M3 variables used in table 4 separately for the 3 regions provides the following factors

Trust in traditional authorities
Trust in outside people/ authorities
Trust in village members
Trust in modern authorities

These can be compared to each other and to the factors for Malawi (see table 14). They are reasonably close in interpretation.

The first factor, Trust in traditional authority, is basically the same in all 3 regions. One difference is that it is the most important component in the north, but only the second most important in central and south region. However, for the other factors the central region gives deviations. In the central region trust in outside people/ authorities seems to be inseparable from trust in modern authorities. The consequence of this is that factors 2 and 3 for the central region are different from factors in the north and south, and also for Malawi. In some sense factors 2 and 3 in the central region seem to be measuring the same phenomenon. In the central region the interpretation of Factor 2, "Modern authorities and people outside the close family" does not appear fundamentally different from Factor 3, "Trust in people outside the close family".

Table 14
Comparison of four rotated factors from regional and national principal factoring of M2 and M3 variables

Trust in traditional authorities

Factor # in the analyses	2 Malawi	1 north	1 central	2 south
M2.d. Trust in Traditional Authorities	.853	.785	.736	.867
M2.e. Trust in group village headmen	.866	.844	.850	.820
M2.f. Trust in village headmen	.764	.842	.841	.807
M2.j. Trust in police	.425	.288	.585	.458
M2.k. Trust in traders	.074	.160	.458	.152
M2.l. Trust in teachers	.437	.526	.655	.287
M2.m.Trust in school administrators	.372	.613	.420	.198
M2.n. Trust in religious leaders	.321	.311	.580	.260
M3.a. Trust in family members	.172	.316	.143	.149
M3.b. Trust in kin	.014	-.064	.350	.128
M3.c. Trust in people in own village	.181	.188	.253	.266
M3.d. Trust in people outside the village	.098	.187	.169	.086
M3.e. Trust in people of same ethnic group	.233	.156	.209	.333
M3.f. Trust in people outside ethnic group	.151	.134	.195	.283
M3.g. Trust in people from same church/mosque	.237	.027	.251	.301
M3.h. Trust in people not from same church/mosque	.154	-.057	.064	.304

Table 14 (continued)

Trust in outside people/ authorities

Factor # in the analysis	1 Malawi	3 north	2 central	3 central	1 south
M2.d. Trust in Traditional Authorities	.185	.135	.135	.219	.187
M2.e. Trust in group village headmen	.248	.156	.092	.297	.394
M2.f. Trust in village headmen	.163	.013	.191	.055	.323
M2.j. Trust in police	.293	.120	.345	.247	.391
M2.k. Trust in traders	.215	.023	.593	.208	.204
M2.l. Trust in teachers	.099	.103	.507	-.141	.185
M2.m.Trust in school administrators	.121	.163	.591	-.178	.263
M2.n. Trust in religious leaders	.109	.094	.180	.331	.127
M3.a. Trust in family members	.205	.054	.207	.287	.619
M3.b. Trust in kin	.222	-.140	.082	.362	.717
M3.c. Trust in people in own village	.496	.311	.329	.544	.683
M3.d. Trust in people outside the village	.690	.554	.070	.691	.479
M3.e. Trust in people of same ethnic group	.808	.861	.614	.529	.788
M3.f. Trust in people outside ethnic group	.814	.760	.284	.799	.715
M3.g. Trust in people from same church/mosque	.408	.386	.723	.291	.686
M3.h. Trust in people not from same church/mosque	.796	.815	.778	.393	.665

Table 14 (continued)				
Trust in kin and village members				
Factor # in the analysis	3 Malawi	2 north	4 central	3 south
M2.d. Trust in Traditional Authorities	.142	.070	.165	.198
M2.e. Trust in group village headmen	.155	.049	.104	.189
M2.f. Trust in village headmen	.333	.297	.281	.249
M2.j. Trust in police	.050	-.088	-.018	.271
M2.k. Trust in traders	.130	.247	-.232	.138
M2.l. Trust in teachers	.408	.528	.217	.613
M2.m.Trust in school administrators	.426	.423	.366	.593
M2.n. Trust in religious leaders	.616	.698	.211	.804
M3.a. Trust in family members	.654	.676	.843	-.161
M3.b. Trust in kin	.803	.801	.767	.122
M3.c. Trust in people in own village	.542	.552	.299	.432
M3.d. Trust in people outside the village	.167	.057	.273	.577
M3.e. Trust in people of same ethnic group	.252	.073	.198	.271
M3.f. Trust in people outside ethnic group	.221	.052	.098	.451
M3.g. Trust in people from same church/mosque	.511	.664	.218	.186
M3.h. Trust in people not from same church/mosque	.146	.141	.123	.334

Table 14 (Continued)				
Trust in modern authorities				
Factor # in the analysis	4 Malawi	4 north	central	4 south
M2.d. Trust in Traditional Authorities	.133	.202		.156
M2.e. Trust in group village headmen	.145	.139		.121
M2.f. Trust in village headmen	.247	.098		.183
M2.j. Trust in police	.597	.767		.479
M2.k. Trust in traders	.868	.791		.896
M2.l. Trust in teachers	.465	.149		.452
M2.m.Trust in school administrators	.546	.367		.493
M2.n. Trust in religious leaders	.222	.136		-.019
M3.a. Trust in family members	.031	-.175		.352
M3.b. Trust in kin	.122	.204		.185
M3.c. Trust in people in own village	.211	.288		.068
M3.d. Trust in people outside the village	.188	.309		.198
M3.e. Trust in people of same ethnic group	.043	-.119		.079
M3.f. Trust in people outside ethnic group	.149	.068		.111
M3.g. Trust in people from same church/mosque	.100	-.127		.133
M3.h. Trust in people not from same church/mosque	.178	.082		.225

It should here be noted that the factors from the central region are computed from the correlation matrix, not the covariance matrix like the factors from the other regions and Malawi. In table 15 factors based on covariances for the central region is used. The covariance matrix for the central region allowed the extraction of 3 factors, not 4. Thus, the comparison of the central region to the whole of Malawi and to the other regions is not straightforward. Analysing only the scale variables M2 and M3 gives much the same picture (Table 13).

Table 15
Central region. 3 varimax rotated principal factors extracted from covariances among scale variables M2 and M3

	3 factors from covariances		
M2.d. Trust in Traditional Authorities	.743	.328	.048
M2.e. Trust in group village headmen	.819	.276	.154
M2.f. Trust in village headmen	.867	.183	.188
M2.j. Trust in police	.528	.193	.457
M2.k. Trust in traders	.299	.066	.868
M2.l. Trust in teachers	.696	.111	.378
M2.m.Trust in school administrators	.515	.137	.448
M2.n. Trust in religious leaders	.543	.384	.217
M3.a. Trust in family members	.323	.677	-.054
M3.b. Trust in relatives	.472	.645	-.049
M3.c. Trust in people in own village	.253	.629	.289
M3.d. Trust in people outside the village	.168	.686	.027
M3.e. Trust in people of same ethnic group	.209	.705	.420
M3.f. Trust in people outside ethnic group	.109	.744	.309
M3.g. Trust in people from same church/mosque	.276	.534	.514
M3.h. Trust in people not from same church/mosque	.044	.610	.585

The factors here can be identified as
Factor 1 = Trust in authorities
Factor 2 = Trust in people
Factor 3 = Trust in modern authorities and people from outside the village

The central region is arguably the most "modern" part of Malawi. It may be reasonable to suspect that trust in strangers (people outside family and village people) and trust in modern authorities should be closer connected her than in the north and south of the country. The conclusion seems to be the same as above: The factor structure for all of Malawi is the best choice to represent the factor structure of the local communities.

Conclusion
The study of answers to questions about trust in people, trustworthy institutions and participation in activities indicating social capital shows that we need 9 factors to account for the observed variation in the 42 variables that are seen to correlate in meaningful ways.

Table 16 (below) lists the factors we believe best describe the pattern of correlations among the observed variables. There are four factors measuring trust beliefs. Two of these relate to trust in family relations or not, and two relate to trust in authorities, traditional and modern. There are two factors measuring trusting behaviour, lending money and lending tools. Then there are three factors related to social capital. They are based on participation in cooperative work, and in public works, modern as well as traditional.

These 9 factors were identified from analysing 42 binary variables. Thus, of the original 55 variables, 13 did not contribute to the identification of the unobserved dimensions. Table 17 lists these variables. Twelve of the variables ask about membership in groups or participation in activities. Only one is about trust, trust in traders.

Above (table 8) we studied the relations among the L-variables and concluded on 3 common factors. But to get to that result we had to leave out of the analysis 13 variables that did not

contribute to any common factor. The groups and activities where we (see L1 variables in table 17) ask about membership are Local farmers group; NASFAM; Any other farmers group such as TAMA; Credit club, revolving fund, SACCOS; Water user associations; Dance, music, and culture groups; Religious groups; Home based care groups; and the activities are L3c Irrigation work.

Already the first test of principal factors in the 55 variables available for the study noted that the L1 variables did not correlate with the other variables in a meaningful way. Extraction of principal components from the 8 L1 variables listed here shows 3 components with eigenvalues above 1 (see table in Supplementary tables 7 Tables for Factors of trust and trustworthiness and social capital based on 28 L-variables of participation, (Berge 2020)). Varimax rotation to simple structure shows that each of the 3 factors is defined by only one variable (L1a, L1f, and L1g). The other 5 variables do not contribute to any factor. It may be relevant that all these variables indicate membership in groups (see table 17) that seem rather "modern" and not obviously part of the local culture as such. It seems reasonable to assume that such memberships and activities may be unevenly distributed across the villages visited. The high number of "No" provides variables with little and, as it turns out, insufficient variation. They may yet be useful for analysis of results from the trust game. The single question about trust that we left out, Do you trust traders, may have a similar outcome when we dichotomize the 5-scale answer. For the variable L3c, participation in irrigation work, we note that the variation is very low. At the outset, we excluded variables where the smallest category had 5 or fewer observations. Here we see 6 observations in the smallest category. The same holds for variable L8j, participation in work on dams. The conclusion for the variables L8f and M2k is that we should retain them as an option in further studies.

Table 16 **Factors based on 42 variables and 224 cases from Malawi**
Trust belief factors
Factor 1: Trust in people outside the family
Factor 5: Trust in traditional authorities
Factor 7: Trust in modern authorities
Factor 8: Trust in family members and kin
Trust activity factors
Factor 4: Trusting people with money
Factor 6: Trusting people with tools
Social capital factors
Factor 2: Participation in cooperative work
Factor 3: Participation in modern public works
Factor 9: Participation in traditional public work

Table 17
Variables not used in the analysis of 42 binary variables

Var	Name	N	Missing	0 = No	1 = yes
L1	**Are you or anybody in your household a member of the following groups and clubs?**				
L1a	Local farmers group	283	4	230	49
L1b	NASFAM	283	4	266	13
L1c	Any other farmers group such as TAMA	283	8	249	26
L1d	Credit club, revolving fund, SACCOS	283	4	266	13
L1e	Water user associations	283	5	261	17
L1f	Dance, music and culture groups	283	7	245	31
L1g	Religious groups	283	4	141	138
L1h	Home based care groups	283	7	249	27
L3	**In the past twelve months, did you participate in the following types of cooperative agricultural work (*chipele ganyu, badili, chikimva, chinzake, dima, etc.)?***				
L3c	Irrigating	283	0	277	6
L8	**Which of the following types of projects have you or anybody in your household participated in over the last 12 months?**				
L8f	Kindergarten	283	0	271	12
L8j	Work on dams	283	0	277	6
L8l	Other	283	3	259	21

Table 17 (continued)

M2	**In general, do you trust the leaders and officials in this country? Would you say you trust all, most, some, just a few or none in the following groups**	N	Missing/ Do not know	1 = None	2 = Only a few	3 = Some	4 = Most	5 = All
M2k	Traders	283	4	75	86	65	9	44

Appendix A

Questions from the MLTSC household head questionnaire[22] used in the present study. Questions K and M are mainly targeting trust, while questions L are mainly targeting social capital involved in cooperation.

Social capital – Trust

K1	**People often lend money to each other. Did you or anybody else in this household lend out money to anybody in these groups during the last 12 months?**			
		Yes	*No*	*Do not know*
	Your own family members	☐	☐	☐
	Your kin	☐	☐	☐
	People in your own village	☐	☐	☐
	People outside your village	☐	☐	☐
	People from same church/mosque	☐	☐	☐
	Other	☐	☐	☐

K2	**People often lend tools like axes, hoes, etc. and other tools to each other. Did you or anybody else in this household lend out tools to anybody in these groups during the last 12 months?**			
		Yes	*No*	*Do not know*
	Your own family members	☐	☐	☐
	Your kin outside the household	☐	☐	☐
	People in your own village	☐	☐	☐
	People outside your village	☐	☐	☐
	People from same church/mosque	☐	☐	☐
	Other	☐	☐	☐

Social capital – Cooperation

L1	**Are you or anybody in your household a member of the following groups and clubs?**			
		Yes	*No*	*Do not know*
	Local farmers group	☐	☐	☐
	NASFAM	☐	☐	☐
	Any other farmers group such as TAMA	☐	☐	☐
	Credit club, revolving fund, SACCOS	☐	☐	☐
	Water user associations	☐	☐	☐
	Dance, music and culture groups	☐	☐	☐
	Religious groups	☐	☐	☐
	Home based care groups	☐	☐	☐
	Other	☐	☐	☐

[22] See Berge et al. (2009) pages 108-121 for the questionnaire; in particular pages 115-118 on trust and social capital.

	L2	**Have you or anybody in your household during the last 12 months participated in cooperative agricultural work (e.g. Chilimila, Chikimva, Chinzake, Dima)**										
		Yes				1	☐					
L4	←	No				2	☐					
L4	←	Have no garden				9	☐					

L3	**In the past twelve months, did you participate in the following types of cooperative agricultural work (*chipele ganyu, badili, chikimva, chinzake, dima, etc.)?***				
					# days/year
	Preparing garden	1	☐		☐☐☐
	Planting	1	☐		☐☐☐
	Irrigating	1	☐		☐☐☐
	Weeding	1	☐		☐☐☐
	Harvesting	1	☐		☐☐☐
	Other agriculture work	1	☐		☐☐☐
	Have no garden	1	☐	Not transferred to SPSS, cpr L2	
	Did not participate in any of the indicated types	1	☐	Not transferred to SPSS	

L4	**What type of people participate in collective agricultural work through work exchange**			
		Yes	*No*	*Do not know*
	Only kin and/or close friends?	☐	☐	☐
	Only people living in the villages?	☐	☐	☐
	Also people living outside the village?	☐	☐	☐

L5	**When people do not comply in the cooperative agricultural work, what types of sanctions are used against them? [Multiple response]**			
	Gossip	1	☐	
	Confiscate tools, products, etc.	1	☐	
	Fine	1	☐	
	Cast a spell	1	☐	
	Punish physically	1	☐	
	Threaten the person with no help in future	1	☐	
	Not threaten openly, but do not give help in the future	1	☐	
	Discriminated when there are handouts in the village	1	☐	
	Eviction from the village	1	☐	
	Do nothing	1	☐	

L6	Besides cooperative agricultural, have you or anybody in your household participated in similar exchange work for other tasks?				
		Yes	1	☐	
		No	2	☐	

L7	**Have you or anybody in your households participated in any type of public works without payment in the last year, e.g. construction or maintenance of roads or buildings?**				
		Yes	1	☐	
M1 ←		No	2	☐	
M1 ←		Do not know	3	☐	

L8	**Which of the following types of projects have you or anybody in your household participated in over the last 12 months?**			
		No	*Yes*	*# days/year*
	School	☐	☐	☐☐☐
	Road	☐	☐	☐☐☐
	Bridge	☐	☐	☐☐☐
	Church	☐	☐	☐☐☐
	Mosque	☐	☐	☐☐☐
	Kindergarten	☐	☐	☐☐☐
	Health centre	☐	☐	☐☐☐
	Irrigation works	☐	☐	☐☐☐
	Borehole	☐	☐	☐☐☐
	Work on dams	☐	☐	☐☐☐
	Clearing graveyard	☐	☐	☐☐☐
	Other	☐	☐	☐☐☐

Social capital – Generalized trust

	M1	**Generally speaking, do you think most people can be trusted or that they cannot be trusted?**							
		Most people can be trusted	1	☐					
		Most people cannot be trusted	2	☐					

	M2	In general, do you trust the leaders and officials in this country? Would you say you trust all, most, some, just a few or none in the following groups						
			All	*Most*	*Some*	*Only a few*	*None*	*Do not know*
		Government officials	☐	☐	☐	☐	☐	☐
		Councillors	☐	☐	☐	☐	☐	☐
		Local assembly staff	☐	☐	☐	☐	☐	☐
		Traditional authorities	☐	☐	☐	☐	☐	☐
		Group village headmen	☐	☐	☐	☐	☐	☐
		Village headmen	☐	☐	☐	☐	☐	☐
		Courts	☐	☐	☐	☐	☐	☐
		Army	☐	☐	☐	☐	☐	☐
		Leaders of NGOs	☐	☐	☐	☐	☐	☐
		Police	☐	☐	☐	☐	☐	☐
		Traders	☐	☐	☐	☐	☐	☐
		Teachers	☐	☐	☐	☐	☐	☐
		School administrators	☐	☐	☐	☐	☐	☐
		Religious leaders	☐	☐	☐	☐	☐	☐

	M3	In general, do you trust people in this area? Would you say you trust all, most, some or just a few people in the following groups?						
			All	*Most*	*Some*	*Only a few*	*None*	*Do not know*
		Your family members	☐	☐	☐	☐	☐	☐
		Your kin	☐	☐	☐	☐	☐	☐
		Your village	☐	☐	☐	☐	☐	☐
		People from outside the village	☐	☐	☐	☐	☐	☐
		People of same ethnic group	☐	☐	☐	☐	☐	☐
		People from outside ethnic group	☐	☐	☐	☐	☐	☐
		People from same church/mosque	☐	☐	☐	☐	☐	☐
		People *not* from same church/mosque	☐	☐	☐	☐	☐	☐

Appendix B

Frequency distributions for 78 variables describing trust, trustworthiness, and social capital. Questions K and M, 35 variables, are mainly targeting trust, while questions L, 43 variables, are mainly targeting social capital. Questions K, L, and M1 are dichotomous while questions M2-M3 are ordinal.

Var	Name	N	Missing	0 = No	1 = yes	Var no
K1	**People often lend money to each other. Did you or anybody else in this household lend out money to anybody in these groups during the last 12 months?**					
K1a	Your own family members	283	1	157	125	1
K1b	Your kin	283	1	144	138	2
K1c	People in your own village	283	2	172	109	3
K1d	People outside your village	283	2	235	46	4
K1e	People from same church/mosque	283	2	233	48	5
K1f	Other	283	107	175	1	6
K2	**People often lend tools like axes, hoes, etc. and other tools to each other. Did you or anybody else in this household lend out tools to anybody in these groups during the last 12 months?**					
K2a	Your own family members	283	1	83	199	7
K2b	Your kin outside the household	283	1	75	207	8
K2c	People in your own village	283	1	96	186	9
K2d	People outside your village	283	1	216	66	10
K2e	People from same church/mosque	283	2	201	80	11
K2f	Other	283	124	151	8	12
L1	**Are you or anybody in your household a member of the following groups and clubs?**					
L1a	Local farmers group	283	4	230	49	13
L1b	NASFAM	283	4	266	13	14
L1c	Any other farmers group such as TAMA	283	8	249	26	15
L1d	Credit club, revolving fund, SACCOS	283	4	266	13	16
L1e	Water user associations	283	5	261	17	17
L1f	Dance, music and culture groups	283	7	245	31	18
L1g	Religious groups	283	4	141	138	19
L1h	Home based care groups	283	7	249	27	20
L1i	Other	283	67	201	15	21
L2	**Have you or anybody in your household during the last 12 months participated in cooperative agricultural work (e.g. Chilimila, Chikimva, Chinzake, Dima)**	283	0	168	115	22

L3	**In the past twelve months, did you participate in the following types of cooperative agricultural work (*chipele ganyu, badili, chikimva, chinzake, dima, etc.)?***					Var no
L3a	Preparing garden	283	2	226	55	23
L3b	Planting	283	1	267	15	24
L3c	Irrigating	283	0	277	6	25
L3d	Weeding	283	2	237	44	26
L3e	Harvesting	283	1	230	52	27
L3f	Other agriculture work	283	5	242	36	28
L4	**What type of people participate in collective agricultural work through work exchange**					
L4a	Only kin and/or close friends?	283	38	73	172	29
L4b	Only people living in the villages?	283	64	104	115	30
L4c	Also people living outside the village?	283	71	162	50	31
L5	**When people do not comply in the cooperative agricultural work, what types of sanctions are used against them?**					
L5a	Gossip	283	56	169	58	32
L5b	Confiscate tools, products, etc.	283	56	225	2	33
L5c	Fine	283	56	170	57	34
L5d	Cast a spell	283	56	227	0	35
L5e	Punish physically	283	56	221	6	36
L5f	Threaten the person with no help in future	283	56	188	39	37
L5g	Not threaten openly, but do not give help in the future	283	56	154	73	38
L5h	Discriminated when there are handouts in the village	283	56	225	2	39
L5i	Eviction from the village	283	56	227	0	40
L5j	Do nothing	283	56	166	61	41
L6	**Besides cooperative agricultural, have you or anybody in your household participated in similar exchange work for other tasks?**	283	2	135	146	42
L7	**Have you or anybody in your households participated in any type of public works without payment in the last year, e.g. construction or maintenance of roads or buildings?**	283	1	49	233	43
L8	**Which of the following types of projects have you or anybody in your household participated in over the last 12 months?**					
L8a	School	283	10	130	143	44
L8b	Road	283	3	119	161	45
L8c	Bridge	283	5	204	74	46
L8d	Church	283	2	207	74	47
L8e	Mosque	283	0	283	0	48
L8f	Kindergarten	283	0	271	12	49
L8g	Health centre	283	0	241	42	50
L8h	Irrigation works	283	2	249	32	51
L8i	Borehole	283	5	203	75	52
L8j	Work on dams	283	0	277	6	53
L8k	Clearing graveyard	283	1	161	121	54
L8l	Other	283	3	259	21	55
M1	**Generally speaking, do you think most people can be trusted (1) or that they cannot be trusted (0)?**	283	2	149	132	56

M2	**In general, do you trust the leaders and officials in this country? Would you say you trust all, most, some, just a few or none in the following groups**	N	Missing/ Do not know	1 = None	2 = Only a few	3 = Some	4 = Most	5 = All	Var no
M2a	Government officials	283	19	16	51	76	41	80	57
M2b	Councillors	283	44	63	53	64	21	38	58
M2c	Local assembly staff	283	51	35	54	68	23	52	59
M2d	Traditional authorities	283	5	6	40	68	58	106	60
M2e	Group village headmen	283	3	6	55	65	55	99	61
M2f	Village headmen	283	3	7	56	59	62	96	62
M2g	Courts	283	19	10	53	72	31	98	63
M2h	Army	283	48	5	15	47	57	111	64
M2i	Leaders of NGOs	283	29	15	38	69	53	79	65
M2j	Police	283	10	11	54	58	50	100	66
M2k	Traders	283	4	75	86	65	9	44	67
M2l	Teachers	283	3	3	35	75	62	105	68
M2m	School administrators	283	11	7	43	63	66	93	69
M2n	Religious leaders	283	3	3	34	51	75	117	70
M3	**In general, do you trust people in this area? Would you say you trust all, most, some or just a few people in the following groups?**								
M3a	Your family members	283	2	2	12	39	45	183	71
M3b	Your kin	283	2	4	35	70	52	120	72
M3c	Your village	283	2	5	67	104	48	57	73
M3d	People from outside the village	283	5	36	90	95	33	24	74
M3e	People of same ethnic group	283	5	14	71	112	42	39	75
M3f	People from outside ethnic group	283	10	29	93	100	22	29	76
M3g	People from same church/mosque	283	2	2	41	94	66	78	77
M3h	People *not* from same church/mosque	283	3	28	80	98	28	46	78

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MALAWIAN LAND TENURE AND SOCIAL CAPITAL
Behaviour in trust games in 18 Malawian villages in 2007.

Linking data from trust games to data from household interviews

Preface

This paper came out of an effort to study behaviour in trust games in 18 Malawian villages in 2007. In 2007-2008 the Malawian land tenure and social capital project[7] interviewed households on many subjects deemed relevant to land tenure and social capital. The data collection is documented in Berge et al. (2009). Interviews were conducted in villages selected with 6 in each of the regions North, Central, and South. They included 13 questions about trust, trustworthiness, and social capital (Berge et al. 2009, 115-118). The goal was to get 15 household interviews in each village. That should add up to 270 interviews. Adding some key informer interviews led to a total of 283 household interviews. The period of interviewing ended with a session of trust games with monetary payoffs as a kind of gratitude for the time and effort given by the participants (Berge et al. 2009, 147-176). In two villages we did not get to play 15 games. In one village we found only 14 households, and in another there was a funeral in a neighbouring village leaving participants for only 13 games. We hence played a total of 267 trust games.

After the return to Norway in 2008, Tomas Moe Skjølsvold and Sverre Bjørnstad started out on an exploration of the results from the trust games. They wanted to report on this in a paper in Norwegian. The bulk of their work was done during the summer of 2008 when they were employed as research assistants by the project. A first draft of the paper appeared in the summer of 2009 and a second one in 2010. By then the idea of using factor analysis to develop indices indicating trust and social capital both at household and village level had taken hold. The main author of the current papers was to assist in the development of indexes by principal factor analysis. However, at the end of 2010, this author moved from NTNU to what now is known as NMBU (The Norwegian University of Life Sciences) and its department of property rights and law where I in 2011 got a position as professor of property rights and institutional theory. Teaching obligations, other research interests, and lack of tools for data analysis kept me away from the Malawi data until retirement in 2016, and only in 2019 were the tools for data analysis ready for the study of the factor structure of trust and social capital in the Malawian villages that is reported on here.

Developing factor indexes for the households interviewed in 2007 was however not sufficient for studying behaviour in the trust games. We had to link as many of the 267 trust games played to a specific interview. There was no easy link between the interview and an outcome in the trust game. Working through the records we ended with 204 games that could be linked to interview data.

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At the early stages of the Malawian Land Tenure and Social Capital project Dr. Stanley Khaila contributed significantly to the collection of data and the development of questions we here try to investigate. We also appreciate the support of the National Statistical Office of Malawi, and Statistics Norway during the data collection process.

Table of content

Introduction

In 2007 Malawi conducted a National Census of Agriculture and Livestock (NACAL). The MLTSC project planned to use data from this census and extend it with some data collection of its own to get a deeper understanding of land tenure issues as a status report in advance of expected reforms in land tenure legislation (Khaila et al. 2006). The data collection is documented in Berge et al. (2009). In the 18 villages selected for in depth study 283 household interviews were done. The plan was for 15 interviews per village, but in 6 villages from 1-4 interviews in excess of this was done. These are interviews of key informers.

Data on trust

The fieldwork in the villages was ended with one day of trust games where one individual from one of the interviewed households played against another village member without information about who they were except that they were members of the village. In each village we planned to interview 15 households. With one player from each of these in addition to 15 other village members each village would provide 30 players. This would give 270 games where one player would provide a link to a household we had interviewed.

As it turned out, one of the selected villages provided only 14 households for the trust game, and in another village, on the day of the trust game, people were occupied with a funeral in a neighbouring village, reducing the number of games performed to 13. The file with trust game data thus contains 267 games.

The day of trust games started with each participant picking at random an envelope with a number on it and MK80 in MK20 notes inside or 0.6 USD at the exchange rate of 140 MK/USD at that time. Then a list of names of players was taken, linking envelope number and players before they were separated into groups, numbers 1-15 were type-1 players (investors) and those numbered 16-30 were type-2 players (responders). More details on the procedures used are available in Berge et al. (2009, 147-176). The original plan was to pair the members from the interviewed households to a randomly chosen villager. But this did not come to pass. The envelope numbering and the process of selection of these prevented this. However, each village list of players should contain 15 people from households we had interviewed.

The field notes with results from 12 villages, including the one with 14 games, and the one with 13 games due to funeral activities, provide complete name lists of players. From the last 6 villages we only find names of the household members participating in the game, not the other villagers, and for two villages we find only 14 and 13 names even though 15 games are reported. This suggests that there will be a maximum number of identifiable households of 264.

The first job, then, is to try to link as many names of players to household interviews as possible. We have 441 names of game players, and we have interviews of 283 households. However, households will usually have many members. There are households with up to 5 members, all grown up, that easily might take part in a trust game as played here.

If the plan for the game had been followed, we would find links to one household for each game played. But assigning players to games in the prescribed way prevented this link. Many games were played by players where both participants came from known households; hence

Malawian Land Tenure and Social Capital Project 2007-8.

other games were played by persons without any identifiable link to any of the interviewed households.

The game sessions started with making a list of names of the players, but without any indication of the household they came from. Finding links to a household was a tedious task and did not always succeed. To find out which household each player belonged to we had to compare names from the list of players to names in the file with household interviews. One problem here was that the spelling of names differed in the two records. If you are aware of the problem, many misspellings are obvious, but there are doubtful cases. For example, it was decided to say that Lehebium in one of the household questionnaires from village 11 is the same name as Rhehabiyamu in the player list. Appendix table 1 below summarizes the findings detailed below.

After linking as many players and household identities as feasible, we found 55 games where neither player had a known link to one of the households interviewed. There also were 69 games with two players linking to household data. Thus we can, at best, find links to household data for 212 of the trust games. But as noted, there are several cases where households have 2 participants in the game. We found 20 households with 2 players participating in the game (1018, 3012, 3015, 4172, 4203, 5004, 5009, 5010, 5013, 6248, 6263, 6272, 6293, 9004, 9006, 9007, 9010, 9015, 9020, 12009), but none with more.

Not all the 20 double entries may lead to loss of games. As detailed below we see that the 20 double entries leads to the loss of 8 games. The result was 204 games with links to household data. But some of these games had two links. Thus the final step was to survey the games with two players with known links to household data, removing the link to household data for one of the two players. The main goal was to keep an even number of the two types of players. In several cases the players came from the same household. They had links to the same household interview. However, there is no indication that they were aware of this link themselves.

Survey of households with two participants in the games

Both household 1018 and 3012 have two members playing against unknown players. Removing one link for each household leads to loss of 2 games.
Household 3015 has two type-1 players, but only one plays against an unknown player. There will be no loss of a game removing the link for the other.
From household 4172 there are two type-2 players; one player is identified as the granddaughter of the headperson, the other is the headperson. They are both playing against unknown type-1 players. Deleting the link of the granddaughter leads to one lost game.

The two players from household 4203 are, according to the household interview, sisters. They are both playing against other known household members. Dropping the link of one, or the other, player will not reduce the number of games.
The two players from household 5004 are married and both are type-2 players playing against unidentified type-1 players. Here another game is lost.

The two players from household 5009 are married and type-1 players. Only one plays against an unknown type-2 player. Deleting the link to 5009 for the player playing against a known type-2 player leads to no loss of games. But this leads to the situation that both 5010 players play against unknown type-1 players, leading to the loss of one more game. However, both players left out come from households included in other games.

Household 5013 has two players playing against other known household members. Deleting one link to 5013 does not reduce the number of games.
The two players from 6248 have only one member playing against an unknown player. Removing the link where the other player is known will not reduce the number of games.
One of the two players from household 6263 plays against an unknown type-1 player. The other player plays against a known household member. Deleting the link for this player leads to no loss of game.

In household 6272 there are two players playing against unknown players. One game is lost.
The 2 players from household 6293 are both type-2 players playing against known type-1 players. Deleting the link to 6293 for one of them leads to no loss of game.
Household 9004 has two members playing. Only one plays against an unknown player. Removing the link to their household from the one playing against a known player does not reduce the number of games.

One of the two players from 9006 plays against an unknown player. Removing the link to the household data for the other member does not lead to any lost game.
Household 9007 has two members playing against other known household members. Removing one link to 9007 does not reduce the number of games.

Only one of the two type-2 players from household 9010 plays against an unknown type-1 player. Deleting the link to 9010 for the other, leads to no loss of game.
Both players from household 9015 play against known players. There will be no loss of a game.

Two members of household 9020 play against unknown players. One more game is lost.
The two players from 12009 both play against unknown players. One more game is lost.

Removing one link from one of the 20 doubly linked households led to the loss of 8 games.

Conclusion
Removing links both of households with two participants, and of known households playing against each other, resulted in 63 games without any known link to a household, 102 type-1 players with links to a household, and 102 type-2 players. In total we find 204 games with household data for further analysis.

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Appendix table 1
Survey of games and interview data collected by the MLTSC study in Malawi in 2007

Village	Number of HHQ in paper file	Number of games played	Number of HH identified in games	HH participating in 2 games	HH where members play against other known HH	Number of games with 2 HH	Games without known HH participant	Number of games that are linked to HH data
01 Kunda	15	15	14	1018	1001-1011 1002-1004 1003-1021 1022-1042	4	5	10
02 Banjo	15	15	15		2002-2010 2008-2006 2013-2011 2015-2004	4	4	11
03 Pida	15	15	16	3012 3015	3011-3017 3013-3002 3015-3008	3	2	13
04 Njinga	15	15	17	4172 4203	4191-4203 4201-4187 4207-4190 4213-4203 4218-4200	5	3	12
05 Mende	15	15	19	5004 5009 5010 5013	5001-5011 5003-5012 5009-5010 5013-5008 5014-5007 5015-5013	6	2	13
06 Thodwe	15	15	19	6248 6263 6272 6293	6267-6248 6270-6275 6280-6293 6306-6263 6308-6293	5	1	14
07 Nsaru	15	14	15		7009-7015 7010-7012 7020-7021	3	2	12
08 Chitenje	16	15	13		8026-8044 8030-8036 8053-8029	3	5	10
09 Kabudula	18	15	20	9004 9006 9007 9010 9015 9020	9002-9007 9004-9001 9007-9010 9014-9006 9015-9011 9015-9013	6	1	14
10 Mtengo	16	15	15		10003-10008 10011-10006 10014-10031 10019-10026 10037-10027	5	5	10
11 Mphasa	18	15	17		11013-11037 11019-11038 11032-11044 11056-11060 11059-11058	5	3	12
12 Dewele	16	13	14	12009	12013-12015 12024-12004 12029-12016	3	2	11

13 Naphini	15	15	15		13011-13064 13078-13072	2	2	13
14 Payere	19	15	15		14013-14007 14071-14036	2	2	13
15 Tsavu	15	15	15		15016-15007 15045-15049 15094-15096	3	3	12
16 Katundu	15	15	13		16040-16006 16041-16065 16071-16075 16112-16043	4	6	9
17 Mpeni	15	15	15		17056-17021 17063-17068 17073-17053	3	3	12
18 Supuni	15	15	14		18098-18121 18100-18150 18137-18112	3	4	11
Sum	283	267	281	20	69	69	55	212