

# Ethnic Heterogeneity and the Private Provision of Public Goods

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**ABSTRACT** *Theoretically, more ethnic heterogeneity may lead to higher aggregate provision of privately provided public goods if ethnic heterogeneity increases the uncertainty about the aggregate level of public good provision. Empirical results in this article, which are based on household survey data from Kampala, Uganda, show robust evidence that an increase in ethnic heterogeneity is associated with an increase in the willingness to contribute to public goods. The findings suggest that the mechanism, through which public goods are provided, that is whether they are provided publicly or privately, is important in understanding the role of ethnic diversity in public goods provision.*

## I. Introduction

A growing literature suggests that ethnic heterogeneity is associated with economic outcomes at the macro level. Several studies, for example Easterly and Levine (1997), show a negative correlation of ethnic fragmentation and growth. However, the links through which ethnic fragmentation operates are not yet fully understood. Empirical studies at the micro level may help to better understand the specific channels through which they can have an impact on economic decisions and outcomes. One such channel is the provision of public goods. This article provides an investigation of the role of ethnic heterogeneity as determinants of the willingness to contribute privately to public goods. In the empirical work I find that larger ethnic heterogeneity is associated with a higher willingness of individuals to contribute to public goods. This finding is in sharp contrast to existing theoretical models and most empirical findings. I suggest a potential explanation: I argue that more ethnic diversity may be associated with higher uncertainty about the expected contribution of other individuals. This in turn – under certain plausible assumptions about the individuals' preferences – will theoretically lead to higher *private* contributions to public goods under ethnic diversity than under ethnic homogeneity. While there is no direct evidence to provide a link between uncertainty and the private provision of public goods, the article's findings are consistent with the hypothesis that increased heterogeneity implies higher uncertainty about contributions, which in turn increases the willingness to contribute. Thus, the theoretical and empirical findings in this article suggest that the mechanism through which public

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goods are provided, that is whether they are provided publicly or privately, is important in understanding the role of ethnic diversity on public goods provision.

In the empirical part of the article, I look at an urban setting in a developing country and use answers to a hypothetical question about the willingness to contribute to various public goods from a comprehensive data set that was collected in 2000 in Uganda's capital, Kampala. These data are complemented with data from a comprehensive household survey, the Uganda National Household Survey 1999/2000. I find that an increase in ethnic heterogeneity is associated with an increase in the willingness to contribute privately to a public good. The results are robust across various public goods, hold after controlling for the level of satisfaction with existing public goods and a large number of other community level characteristics. Hence, I argue that sorting based on the quality of neighbourhood public goods does not seem to drive the results. These empirical results are in sharp contrast to findings in other studies, but consistent with the theoretical idea laid out in this article, namely that an increase in uncertainty due to ethnic heterogeneity may lead to higher contributions.

Public goods are important for the wellbeing of individuals and a significant body of literature studies the determinants of public goods provision. Most of this literature is concerned with publicly provided goods and there is overwhelming evidence that ethnic heterogeneity is negatively associated with levels of publicly provided public goods (Alesina and La Ferrara, 2005). Developing countries, however, are notoriously lacking resources for public goods, and in this context the role of (local) governments to provide public goods is reduced. As a consequence, local communities and groups of individuals are often left to themselves to provide public goods privately.<sup>1</sup> It is therefore important to understand what determines the ability of communities to organise themselves and to be able to provide public goods privately. In particular, both wealth inequality and ethnic heterogeneity may play a role here. The theory of private provision of public goods provides some strong results concerning the question what the role of absolute levels of wealth is and what the impact of redistributions of wealth would be (for example Bergstrom et al., 1986; Bernheim, 1986; Itaya et al., 1997). However, there are few attempts in the literature to test the implications of those theories. Examples for empirical studies of how wealth inequality affects community-level cooperation are Bardhan (2000) and Dayton-Johnson (2000). They both study cooperative behaviour in the use and maintenance of irrigation systems and find that cooperative behaviour is negatively related to inequality of landholdings. In addition to wealth heterogeneity, heterogeneity in other dimensions has been found to be important, too. In particular, many empirical papers have found heterogeneity of cooperative preferences (see, for example, Fischbacher et al., 2001; Fischbacher and Gächter, 2010; Chaudhuri, 2011) and distinguish especially between the two types of these 'conditional cooperators', who contribute to public goods (or cooperate) if others do so, and 'free riders', who never contribute. The existence of conditional cooperators can explain higher contribution levels than would be predicted by standard theory, as well as decreases in contribution levels over time.

This article is concerned with the role of ethnic heterogeneity. Although ethnicity might be correlated with cooperative preferences, other reasons why ethnic heterogeneity is associated with cooperation levels can be hypothesised, such as a correlation between ethnicity and preferences for various public goods. While most existing studies are concerned with the effect of ethnic heterogeneity on the public provision of public goods, more recently economists have begun to explore the effect of ethnic heterogeneity on the private provision of public goods. In Miguel and Gugerty (2005) the ability to impose social sanctions within ethnic groups is the focus of the theoretical analysis. Their empirical work shows that wells in western Kenya are functioning more poorly in ethnically heterogeneous communities. Miguel (2004) considers the relationship between ethnic heterogeneity and school funding in western Kenya and Tanzania. He finds that higher levels of local ethnic heterogeneity are associated with lower primary school funding and worse school facilities in western Kenya.<sup>2</sup> Using a detailed data set from northern Pakistan, Khawaja (2006) finds that social heterogeneity negatively affects the maintenance of community projects.

In this article, I ask whether more ethnic heterogeneity always makes it more difficult to provide public goods, as is suggested by existing theories. In the first part, I provide a theoretical underpinning for the empirical work. I apply theoretical insights from the public goods literature on the role of uncertainty in the private provision of public goods to argue that more ethnic heterogeneity may under plausible assumptions lead to higher aggregate private provision of public goods. A positive effect of ethnic heterogeneity on the private provision of public goods may occur if ethnic heterogeneity increases the uncertainty about the aggregate level of provision of the public good. Uncertainty about the other ethnic groups' contributions may arise for example because of uncertainty about the other groups' preferences or their wealth levels. One reason why uncertainty is expected to be lower within ethnic groups than across ethnic groups is because of more frequent interactions within ethnic groups. Such an argument about the relationship between information and ethnic group membership is advanced, for example, by Fearon and Laitin (1996). Moving from a group of ethnically homogeneous individuals (or households) to an ethnically diverse group will then increase uncertainty about total contributions. Results from the public goods literature (Sandler et al., 1987; Eichberger and Kelsey, 2002) then imply that this increased uncertainty may induce individuals to increase their contributions and thus may lead to an increase in the number of contributors.<sup>3</sup>

Studying the ex-ante willingness to contribute has the advantage that it constitutes a setup in which learning about others' preferences is limited and therefore the hypothesised mechanism is most likely to be important. Nevertheless, it is important to stress the hypothetical nature of the question that is used for the main empirical work. Further, the underlying theory that I refer to presumes a static game although in many situations the uncertainty may be resolved over time if learning is possible. In response to these potential concerns, it is worth noting a few things. First, whether answers to the hypothetical questions that do not reflect what would occur in actual contribution situations are biasing the results depends on whether these 'incorrect' answers are systematically correlated with control variables, which is not obvious (see also Alesina and La Ferrara, 2002). The potential threat through a hypothetical bias is discussed further in section 3 below. Further, this set up also resembles situations in which potential participants in public goods projects are asked about their willingness to contribute before the start of a potential project and in which the actual implementation of the project is in part based on these hypothetical statements of intent. In addition, because of high initial costs of some projects that require mainly a one-time payment up front, these projects may indeed be approximated theoretically as a one-shot game. Moreover, some researchers have found 'commitment effects', that is that individuals are more likely to perform a task if they have earlier been asked if they would perform this task (results along these lines were found in Cioffi and Garner, 1998; Greenwald et al., 1987), although these results could not be confirmed by Smith et al. (2003) and Kremer and Miguel (2007). The hypothetical question used in this article may thus resemble questions that would be asked in applications that try to exploit this commitment effect. Finally, it is worth noting that the results of this article are in line with some experimental evidence on the role of heterogeneity (Ledyard, 1995; Chan et al., 1999) and stylised facts from public goods games (Eichberger and Kelsey, 2002).

Uncertainty is obviously just one of the many effects that are potentially at work in the presence of ethnic heterogeneity. The final outcomes with respect to public goods provision (and other economic and non-economic outcomes) at all levels, that is from the community level to the macro level, will depend on a large number of factors that this and other related papers are concerned with. In the end, the broader goal of this article is to introduce uncertainty as a novel factor into the important discussion on the role that ethnic diversity plays in determining social and economic outcomes.

The organisation of the article is as follows: in the next section I provide a theoretical basis for the empirical analysis, in particular, I connect the theory that explores the role of uncertainty in public goods games to the area of ethnic heterogeneity. Next, the data and the background for

the data collection are described. Following this, I outline the empirical strategy. Finally, I present and discuss the results.

## **II. Private Provision of Public Goods, Ethnic Heterogeneity, and Uncertainty**

It has recently been recognised that ethnic heterogeneity of an individual's environment is an important determinant of his/her decision-making processes. While the potentially positive effects of ethnic diversity on aggregate economic performance, for example because of complementary skills (Alesina and La Ferrara, 2005), are well understood, the effects of ethnic diversity on public goods provision are generally considered to be negative. Various channels have been proposed. These models assume for example: (a) a taste for ethnic homogeneity (Alesina and La Ferrara, 2002); (b) heterogeneous tastes for the public goods across ethnic groups (Alesina et al., 1999); (c) heterogeneous tastes with respect to how much ethnicities derive utility from altruism (Vigdor, 2004); or (d) the ability to impose sanctions within ethnic groups (Miguel and Gugerty, 2005).

Empirically, these studies have shown a negative correlation of fragmentation and public provision of public goods (Alesina et al., 1999, for the USA; Banerjee and Somanathan, 2007, for India), lower participation rates in heterogeneous communities (Alesina and La Ferrara, 2000, for the USA; La Ferrara, 2002, for Tanzania) and a negative correlation between ethnic fragmentation and trust (Alesina and La Ferrara, 2002; Glaeser, 2000). At the macro level, Dreyer Lassen (2007) shows that more ethnically diverse countries have larger informal sectors, which is hypothesised to work through the effect of ethnic diversity on trust.

### *Public Goods Provision and Uncertainty*

The mechanism that I suggest in this article causes results that contrast with the implications of these existing models and empirical results. Below, I first review some theoretical work on the role of uncertainty in public goods games and then propose to connect that literature with the work on ethnic heterogeneity.

In the non-linear game with identical preferences (and no uncertainty) zero-contributions may arise in equilibrium at the same time that other individuals contribute a positive amount, for example, if wealth  $\omega$  is small relative to others' wealth. A number of theoretical papers have shown that uncertainty may substantially reduce this free-riding problem. In an early paper, Austen-Smith (1980) developed this idea in a partial equilibrium framework. This work was extended to include general equilibrium effects by Sandler et al. (1987). Sandler et al. (1987) model uncertainty as a mean preserving spread of the distribution of the level of public goods contributions of others. They show that an individual's contribution to a public good rises with increased risk if the marginal utility of the public good  $G$  is convex in  $G$ , and the marginal utility of the private good is concave in  $G$  (Sandler et al., 1987).

More recently, Eichberger and Kelsey (2002) have shown that a specific type of uncertainty will increase contributions even if individuals have more general utility functions that do not require assumptions about the third derivative. More specifically, Eichberger and Kelsey (2002) assume that individuals are not able to assign precise probabilities to the possible outcomes, that is that there is ambiguity (Knightian uncertainty) about the contributions of others. They show that if utility is a concave function of contributions to the public good and there is ambiguity about others' contributions, then an increase in ambiguity increases the equilibrium contribution. Therefore, these studies show that uncertainty may in some circumstances reduce the free-riding problem. Note, however, that the equilibrium amount of the public good will typically not be Pareto optimal.<sup>4</sup>

*Uncertainty and Ethnic Heterogeneity*

Applying these theoretical insights from the public goods literature regarding the role of uncertainty in the private provision of public goods to the analysis of ethnic heterogeneity, it follows that a positive (that is free-riding reducing) effect of ethnic heterogeneity on the private provision of public goods may occur if ethnic heterogeneity increases the uncertainty about the aggregate level of provision of the public good.

Why could ethnic heterogeneity increase uncertainty? If one assumes that individuals know preferences (or wealth levels) of members of their own ethnic group (or at least know them sufficiently better) but are uncertain about other groups' preferences (or wealth levels), then switching from an ethnically homogeneous group to an ethnically diverse group of individuals (or households) implies an increase in uncertainty about others' contributions.

The above mentioned results from the public goods literature then imply that this increased uncertainty may lead to an increase of the level of contributions. It will also lead to an increase in the number of contributors, since according to the theoretical results all individuals' contributions are at least as large as under certainty.

In sum, this suggests a channel how ethnic fragmentation will lead to less certainty about others' contributions, which in turn leads to higher contributions and increased numbers of contributors. Note again that this approach does not rely on a taste for ethnic homogeneity or on actual heterogeneous tastes to explain an association of changes in contributions to public goods with changes in ethnic heterogeneity. Instead, this approach relies just on the uncertainty about total contributions, which may arise for a number of reasons, including the possibility that tastes are heterogeneous, that is on uncertainty about tastes of other ethnic groups, or an uncertainty about wealth levels of individuals of other groups.

*Interaction of Ethnic Heterogeneity and Wealth Levels*

Introducing uncertainty into models of ethnic heterogeneity has an interesting implication regarding the combined effect of ethnic heterogeneity and differences in mean wealth levels across neighbourhoods. Start from the standard model, where agents have preference functions, described by  $U_i(x_i, G)$ , which are assumed to be differentiable, quasi-concave and increasing in both arguments (Bergstrom et al., 1986). Let  $g_i$  be the contribution of individual  $i$  towards the public good and let the public good be produced by a convex technology:  $G = G(\sum_{j=1}^n g_j)$ . Each agent chooses  $g_i \in [0, \omega_i]$ , where  $\omega_i$  is the agent's wealth level. In the absence of uncertainty, higher mean wealth in a community means, other things being equal, higher total contributions to the public good  $G$ . If we assume that the marginal utility of the public good  $\frac{dU}{dG}(\cdot, G)$  is decreasing in the amount of the public good then the marginal utility of the public good is lower in richer neighbourhoods than in poorer neighbourhoods. If we further assume that good  $\frac{dU}{dG}(\cdot, G)$  is a convex function, then, by Jensen's inequality, it follows that  $\frac{dU(\omega, E(G_{-i}))}{dG} < E \frac{dU(\omega, G_{-i})}{dG}$ , that is if uncertainty about the aggregate contributions is modelled as a mean-preserving spread, it increases the expected marginal utility of the public good. Because the curvature of  $\frac{dU}{dG}(\cdot, G)$  is larger in poorer communities (which have lower levels of public goods provision in the baseline case without uncertainty), the difference  $E \frac{dU(\omega, G_{-i})}{dG} - \frac{dU(\omega, E(G_{-i}))}{dG}$  is larger in poorer communities than in richer communities, holding the level of uncertainty fixed. Thus, to set the expected marginal utility of the private good, which is now smaller than the expected marginal utility of the public good, equal to the expected marginal utility of the public good, which is required for the first order condition of the individual's optimisation problem to hold, individuals who contributed in the absence of uncertainty have to increase their contributions to the public good by more in poorer communities than in richer communities in the presence of a given amount of uncertainty. Similarly, a non-contributing individual in the absence of uncertainty is more likely to switch from non-contributor to contributor in a poor community than in a rich community in the presence of a given uncertainty.

Therefore, the models imply differences in the willingness to contribute between rich and poor neighbourhoods. Everything else being equal, and under the conditions stated above, which are required to guarantee a theoretical increase in contributions with an increase in uncertainty, an increase in ethnic heterogeneity is more likely to make an individual switch from zero contribution to a positive contribution in a poor neighbourhood than in a rich neighbourhood. I will test this implication below.

### **III. The Data and the Background**

#### *3.1 Background*

The data come from a household survey conducted by the Economic Policy Research Centre (EPRC) for the Kampala City Council with assistance from the World Bank from January to May 2000 (see EPRC, 2000). The purpose of this survey was to provide information for the development of a City Development Strategy.

The survey is a representative survey that covered all of the five divisions of Kampala. Some 16 enumeration areas were randomly chosen from each division for a total of 80 enumeration areas; from each enumeration area a random sample of 25 households was drawn and interviewed. Units of local government in Uganda exist at five different levels, with Local Council 1 (LC1) units being the lowest level units. The enumeration areas consist of one or more LC1 units such that each enumeration area consists of about 250 households (Economic Policy Research Centre, 2000). This ensures that enumeration areas can be thought of as neighbourhoods and not artificial collections of otherwise unrelated households. From now on, I will use the terms 'enumeration area' and 'neighbourhood' interchangeably.

The questionnaire section that I mainly exploit for the present analysis is a section covering household priorities. I keep only households for which either the household head or the spouse of the head answered the questionnaire. After dropping households with missing data, 1,721 households remain in the sample with the main ethnicity measure used in this article (using an alternative measure, as explained below, implies a sample size of 1,673 households). The Online Appendix provides some summary statistics for these households.

#### *3.2 Measuring the Endowment*

The EPRC-survey does not contain a direct measure of financial wealth. Nor is there information on income or expenditure. However, there is a large set of information on households' assets, characteristics of the dwelling and other indicators of welfare. To use this, I complement the EPRC-survey with data from the Uganda National Household Survey (UNHS) 1999/2000 to create a measure that is capturing the household's endowment. This nationally representative survey has comprehensive sections on income, household assets, and welfare indicators. Since the asset categories are very broad, it is difficult to construct a meaningful wealth index with enough variation using only assets. Instead, I use the UNHS to construct an income aggregate, and estimate a model to predict (log-)income using household characteristics, dwelling characteristics, assets, and other welfare indicators as independent variables.<sup>5</sup> Using the estimates of this model, I impute income for the households in the EPRC-survey. Since the income is imputed, one can expect a high correlation between income and wealth, because one does not have to worry about temporary shocks to income. This procedure is greatly helped by the fact that both the EPRC-survey and the UNHS have identical sections for dwelling characteristics and largely identical sections on welfare indicators, with questions being virtually identically worded. The explanatory power of the income model is large, with an adjusted R-squared of 0.37.<sup>6</sup> The mean predicted income is 2,820,000 Ugandan Shillings, with a standard deviation of 1,590,000.<sup>7</sup> I use this imputed income also to estimate inequality at the

neighbourhood-level. The estimated Gini-coefficients range between 0.15 and 0.40, with an average of 0.26 and standard deviation 0.05.

As an alternative, I also perform a principal component analysis with the same set of household and dwelling characteristics, and available assets, to calculate a dwelling characteristics- and asset-based wealth proxy.

### 3.3 *Measuring Ethnic Heterogeneity*

I use the standard fragmentation (or fractionalisation) index used in the recent literature (for example Alesina et al., 2002; La Ferrara, 2002; Easterly and Levine, 1997). This index is calculated as one minus the Herfindahl index of ethnic group shares, that is

$$FRAG_j = 1 - \sum_{k=1}^{K_j} s_{kj}^2$$

where  $s_{kj}$  is the share of households in neighbourhood  $j$  belonging to ethnic group  $k$ , and  $K_j$  is the number of ethnic groups represented in neighbourhood  $j$ . This index represents the probability that two randomly drawn households belong to different ethnic groups.

A number of authors have proposed polarisation measure as alternative measures of heterogeneity. However, fractionalisation and polarisation indices have very different properties. While (ethnic) fractionalisation is largest in the extreme case where every individual is member of a different ethnic group, polarisation measures capture the degree to which the underlying distribution of the relevant characteristic is bimodal and thus is largest with two (ethnic) groups of equal size. Therefore, as Garcia Montalvo and Reynal-Querol (2002) write, ‘the adequacy of a synthetic index of heterogeneity depends on the intrinsic characteristics of the heterogeneous dimension to be measured’ (Garcia Montalvo and Reynal-Querol, 2002: 1). These authors argue in favour of a polarisation index in cases where the conflictive dimension matters.

However, in the context of the present article, the conflictive dimension of heterogeneity is not at the heart of the argument, instead uncertainty, as a result of heterogeneity, is underlying the hypotheses laid out in this article. The hypothesis here is that uncertainty about the willingness to contribute of others is lowest, if there is just one ethnic group in a neighbourhood, while it is highest if everyone is from a different group. In particular, a neighbourhood of two equally sized groups should, according to the hypothesis, have some level of uncertainty that is in between the above extreme cases. Uncertainty, therefore, seems to be better proxied by the fractionalisation index, rather than by polarisation indices.

The information about ethnicity has been inferred from the data using the names of the respondents and I have obtained two independent classifications.<sup>8</sup> A similar classification-approach is for example followed by Miguel and Gugerty (2005) and it appears to work reasonably well. For their region of study in western Kenya, Miguel and Gugerty (2005) report a correlation coefficient of 0.7 between two different measures of local ethnic diversity, where one measure was based on self-reported ethnic group, while the other was inferred from names.

In the presence of classical measurement error for the ethnic diversity indices in this classification exercise estimates of the effect of ethnic heterogeneity will be biased downward. I am not aware of reasons that might explain a systematic correlation of the classification measurement error with the willingness to contribute, which might bias the results in a different direction than under classical measurement error. So any parameter estimate is likely an underestimate of the true effect.

In the first classification, households have been split into nine different language groups, namely: speakers of Gisu, Kinyarwanda, Luganda/Lusoga, Lugbra, Lugwe, Luo, Runyakitara, Teso, and Arabic.<sup>9</sup> The mean of the ethnic fragmentation index calculated from this data is 0.411, with a standard deviation of 0.211. The minimum is 0.00 and the maximum is 0.80. In the

second classification, which was obtained independently, the households have been split conservatively in only four different ethnic groups, which constitute ethnic groups with similar cultures and languages (and hence also similar names). These were categorised as: (1) those originally from the northern and eastern parts of Uganda; (2) those from the Central/Lake region; (3) ethnic groups from the Western/South-Western region, and (4) households with an Arab ethnic origin.<sup>10</sup> The mean of the second ethnic fragmentation index calculated from this data is 0.343, with a standard deviation of 0.187. The minimum is 0.00 and the maximum is 0.67. Both fractionalisation indices are highly correlated, with a correlation coefficient of 0.926.

In the analysis below, I use the first classification, because there is more variation in this measure. However, given the strong correlation, results do not change substantially if the second classification is used; I demonstrate this in the Online Appendix for the baseline regression. There, I also use the second fractionalisation measure to instrument for the first fractionalisation measure. Under the assumption that the measurement errors across both measures are independent, this deals with the potential concern that measurement error might bias the coefficient on the fractionalisation index towards zero. Using this approach to deal with measurement error does not change the results in any important way.

### *3.4 Measuring Willingness to Contribute versus Actual Contributions*

As indicated in the introduction, a concern is the hypothetical nature of the dependent variable. While a number of potential advantages of the hypothetical question were discussed above, some further discussion seems warranted.

Contingent valuation questions are regularly used in economics, in particular, they are frequently used to value environmental characteristics (Hanemann, 1994, and Diamond and Hausman, 1994, provide a good summary of the debate). Obviously, hypothetical and actual valuations of goods, as well as hypothetical and actual contributions to public goods, may not coincide, thus leading to what is called in this literature ‘hypothetical bias’.

Harrison and Rutström (2008) review a large number of studies and find that hypothetical questions systematically overestimate the willingness to contribute to public goods (as well as their valuation of private goods), thus exhibiting a positive hypothetical bias. On the other hand, they also review some papers that make them somewhat optimistic about possibilities to calibrate the hypothetical responses to elicit true valuations. In addition, some of the reviewed studies seem to indicate that more concrete questions and concepts in the hypothetical question reduce the bias. Arguably, the questions addressed in the survey that is used in the present article are relatively concrete, asking for known concepts such as projects in education, street lightning, garbage collection and road building, rather than, for example, global warming.

Murphy et al. (2005) conduct a meta-analysis, based on 28 stated preference valuation studies, in which the median ratio of hypothetical to actual value is significantly smaller than in Harrison and Rutström’s (2008) review, namely 1.35.

Another question is how the hypothetical bias that is typically found in laboratory settings transfers to field settings. Among other findings, Murphy et al. (2005) report some evidence that studies that use student subjects have significantly larger hypothetical biases than other studies. Note that in the survey that is used in the present article, subjects are not students recruited for a laboratory experiment, but chosen from a representative sample of household heads from neighbourhoods in Kampala. Some further indication for the role that laboratory setting as opposed to a field setting plays is given in Alpizar et al. (2008a, b), who study voluntary contributions to a public good and compare their findings from a natural field experiment (a national park in Costa Rica) to laboratory findings. The effects in the field experiment have the signs that were expected based on laboratory experiments, but the magnitudes are smaller. On the other hand, they find both types of studies are similar in that framing effects are similar for both hypothetical and actual contributions.

Most of the existing studies that investigate the hypothetical bias are based on developed countries. Only a small number of studies exist that shed light on this in particular for Africa: Ehmke et al. (2008) investigate whether there are cross-country differences, based on a contingent valuation study run in China, France, the USA and Niger. In Niger they actually find a negative hypothetical bias, that is the hypothetical willingness to pay was *lower* than the actual willingness. On the other hand, Caplan et al. (2010) find evidence for a positive hypothetical bias in a public goods experiment conducted in Botswana, although only in a second round of a two-round experiment, after additional information was provided to subjects.

Finally, note again that although the majority of research discussed above points to the existence of a hypothetical bias in valuation studies, a hypothetical bias would lead to an econometric bias in the present analysis only if the ‘incorrect’ answers in response to the hypothetical questions are systematically correlated with control variables, which is not obvious (see also Alesina and La Ferrara, 2002).

#### IV. Empirical Set Up

The available data allow me to determine the hypothetical willingness to contribute to various public goods. The respondent is asked ‘In which of these areas would you be willing to pay a small contribution for a community initiative to help solve problems?’, followed by 12 categories, each of which could be answered with ‘yes’ or ‘no’. The areas listed are: education, health, roads, public transportation, water, garbage collection, drainage, street lighting, attention to orphans and disabled people (which I abbreviate with ‘charity’ below), green areas and parks, crime prevention and security, and income-generating projects. Categorising some of these areas as public goods may be questionable, and in particular would depend on the specifics of how a possible community initiative would be implemented. But for completeness and to avoid any possibility for data mining based on a selection of categories, I will report results from all 12 categories (in the order in which they appear in the questionnaire). In addition, some of this lack of knowledge about how an initiative would be implemented is part of the uncertainty that the surveyed households face, too.<sup>11</sup> The share of affirmative answers to the various public goods is shown in Table 1 below.

One potential objection to using this question, in addition to those already discussed above, is that different households will interpret the amount that constitutes ‘a small contribution’ differently. But this question is sufficient for the purpose of this article since I am chiefly interested in the principal willingness to contribute towards a public good and not the total amount.

**Table 1.** Summary of willingness to contribute

Public good/community project	Per cent being willing to contribute
Education	0.71
Health	0.70
Roads	0.59
Public transportation	0.39
Water	0.62
Garbage collection	0.63
Drainage	0.61
Street lighting	0.45
Attention to orphans and disabled (‘charity’)	0.68
Green areas and parks	0.29
Crime prevention and security	0.74
Income-generating projects	0.73

The willingness of the household to contribute is modelled as follows: Let  $y_{PG}^*$  be the unobserved propensity to be willing to contribute to a public good where  $PG$  indexes one of the public goods that are considered here, that is  $PG \in \{\text{Education, Health, Transportation, Drainage, Garbage collection...}\}$ . It is assumed that this latent variable of the willingness to contribute is a linear function of observed variables  $x$  and an error term  $\varepsilon$ , which is assumed to be normally distributed:  $y_{PG}^* = \beta x + \varepsilon$ . The household is willing to contribute if  $y_{PG}^* > 0$ . The parameters can therefore be estimated using the probit estimator.

In addition to the community characteristics of interest, controls for individual characteristics of the respondent are included in all regressions. All regressions include indicator variables for the different ethnic groups used in the analysis and interaction terms of ethnic group indicators with the share of individuals in a neighbourhood who belong to the respondent's ethnic group, thus allowing this 'own group share' effect to be different across ethnic groups. Inclusion of these variables implies that the effects that we may find for ethnic diversity do not just proxy for the effect of belonging to one particular ethnic group that may have preferences for specific public goods. To partly address possible endogeneity concerns, I also include a large number of neighbourhood means in the analysis to capture directly as many observables as possible and to proxy for as many unobservables as possible. The idea is that if there is a sorting process based on unobservables this may be proxied by some of these additional controls.<sup>12</sup> More on endogeneity issues follows below. Standard errors are corrected for clustering at the neighbourhood level in this analysis.

In addition to estimating the effect of ethnic diversity and other variables of interest for each public good separately, I also follow an approach suggested by Kling et al. (2007). The idea is to aggregate the available information about the willingness to contribute to the different categories of public goods. Following Kling et al. (2007), I first calculate normalised outcomes and sum the normalised outcomes up to create a summary index of the willingness to contribute. More formally, let  $Y_k$  be the  $k$ th outcome and denote with  $\mu_k$  and  $\sigma_k$  the mean and the standard deviation of this outcome in the sample. Then the normalised outcome  $Y_k^*$  is  $(Y_k - \mu_k)/\sigma_k$  and the summary index of willingness to contribute to public goods is  $1/K \cdot \sum_k Y_k^*$ . The advantage of this approach is that it increases power and reduces the number of statistical tests to be performed. Because in the end, I am not so much interested in the willingness of individuals to contribute to any specific public good but rather in the broader association between heterogeneity and the willingness to contribute in general. The tests based on the summary index will be the most relevant ones and will be used as the baseline specifications below.

## V. Results

### 5.1 Determinants of the Willingness to Contribute

Table 2 shows the results from various specifications that use the summary index of willingness to contribute to public goods. Results show that fractionalisation has a strong positive association with the willingness to contribute to public goods. Specification (1) includes only baseline individual controls in addition to the fractionalisation variable. In specifications (2) and (3) ethnicity-related and neighbourhood averages are added. The coefficient increases in size and becomes significant after these controls are added. In column (4) the results from a regression that uses the dwelling characteristics- and asset-based wealth proxy, which is based on a principal component analysis, instead of the imputed income measure, are shown. The main results are robust to the use of this alternative measure. Other consistently significant findings from these regressions are that age has a negative effect on the stated willingness to contribute, while married respondents are more likely to express willingness to contribute to public goods.

To demonstrate that the results are similar across different goods and do not depend on one or a handful of the categories, Table 3 shows results for all public goods for the preferred

**Table 2.** Baseline results of the determinants to contribute privately to public goods

	(1)	(2)	(3)	(4)
dependent variable = summary index of willingness to contribute to public goods; OLS regression.				
ethnic fractionalisation	0.227 (0.153)	0.449 (0.266)*	0.623 (0.244)**	0.520 (0.257)**
respondent's age	-0.003 (0.002)*	-0.004 (0.002)**	-0.004 (0.002)**	-0.003 (0.002)**
respondent's sex (male = 1)	-0.091 (0.050)*	-0.098 (0.052)*	-0.067 (0.050)	-0.071 (0.051)
respondent's education	-0.009 (0.004)*	-0.008 (0.004)*	-0.007 (0.004)	-0.003 (0.005)
head married	0.188 (0.059)***	0.187 (0.060)***	0.201 (0.058)***	0.217 (0.055)***
household income (in 10 <sup>6</sup> )	0.064 (0.050)	0.064 (0.052)	0.055 (0.049)	
household income squared	-0.007 (0.005)	-0.006 (0.005)	-0.006 (0.005)	
ethnic group dummy variables	no	yes	yes	yes
ethnic group dummies × share of own ethnic group	no	yes	yes	yes
Gini coefficient		-0.472 (0.677)	-0.531 (0.643)	
mean of household income			0.135 (0.098)	
mean of households that own a house			-0.532 (0.331)	-0.422 (0.330)
mean of households that live in an 'individual house'			1.099 (0.413)***	1.035 (0.418)**
mean of households that live in a 'tenement'			0.306 (0.261)	0.461 (0.264)*
mean of households that live in a 'flat'			-0.775 (0.600)	-0.890 (0.614)
mean age of the head of households			-0.025 (0.012)**	-0.025 (0.012)**
percentage of heads of households who are male			-1.003 (0.317)***	-0.904 (0.313)***
mean education of the heads of households			0.053 (0.042)	0.069 (0.042)
percentage of heads of households who are married			0.032 (0.344)	0.006 (0.355)
percentage of heads of households who are single			-0.616 (0.398)	-0.799 (0.392)**
mean distance of household to next road			-0.002 (0.008)	-0.002 (0.008)
mean education of all individuals			-0.082 (0.045)*	-0.111 (0.049)**
asset index (from principal component analysis)				0.013 (0.036)
asset index squared				-0.005 (0.005)
Gini coefficient (based on asset index)				0.165 (0.712)
Mean asset index				0.149 (0.081)*
Observations	1,721	1,721	1,721	1,721
R-squared	0.03	0.04	0.08	0.08

Notes: (1) Standard errors are in parentheses; \*\*\*, \*\*, \* indicates significance at 1 per cent, 5 per cent and 10 per cent respectively.

(2) Standard errors are corrected for pooling at the neighbourhood level.

**Table 3.** Baseline results by public goods category

Dependent variable = 1 if willing to contribute to public good Probit results (marginal effects)						
	education	health	road	transport	water	garbage
fractionalisation	0.289 (0.115)**	0.297 (0.136)**	0.408 (0.157)***	0.284 (0.149)*	0.257 (0.138)*	0.250 (0.170)
	drainage	streetlight	charity	parks	security	income
fractionalisation	0.329 (0.180)*	0.183 (0.148)	0.224 (0.156)	0.118 (0.143)	0.317 (0.129)**	0.228 (0.129)*

*Notes:* (1) Standard errors are in parentheses; \*\*\*, \*\*, \* indicates significance at 1 per cent, 5 per cent and 10 per cent respectively.

(2) Standard errors are corrected for pooling at the neighbourhood level.

(3) Other controls included in all regressions: age, sex, education, marital status, household income; mean neighbourhood income, ethnic group indicator variables, ethnic group indicator variables interacted with share of own ethnic group; 11 neighbourhood level control variables (same as above in baseline regressions).

specification, namely the specification shown in column (3) of Table 2 above. The results from these 12 regressions can be summarised as follows: The parameter on the fractionalisation measure is positive in all 12 categories considered here, and statistically significant at the 10 per cent level in 8 out of 12 of the results.<sup>13</sup>

In sum, I find that there is a statistically significantly higher willingness to contribute to community projects in neighbourhoods with higher ethnic fragmentation. The results are individually statistically significant for several of the categories, and significant when the summary index is used. Before moving to robustness checks and possible interpretations of the findings, it is worth considering a few potential explanations that might come to mind but can be ruled out because of the empirical specification. First, recall that all regressions include a full set of ethnic group indicator variables and the interactions of ethnic group with share of individuals in a neighbourhood who belong to the respondent's ethnic group. Therefore, ethnic diversity does not pick up the effect of belonging to one particular ethnic group that may have particular preferences for public goods. Similarly, because the share of the own ethnic group is controlled for, variations in the size of private networks within ethnic groups, which might serve as substitutes for a global public good, are controlled for, assuming that size of network can effectively be proxied for by the size of the own ethnic group.

## 5.2 Further Robustness Checks

A potential concern in the above analysis could be that I do not directly control for the existing neighbourhood public goods or their quality (note that this refers not only to existing community projects, that is privately funded or maintained projects, but all public goods, including publicly provided ones). A sorting process could lead households to choose the neighbourhood in which they live based on existing public goods, which influences the ethnic composition of a neighbourhood, and the household's willingness to contribute might be affected by the same existing public goods as well, which then might explain the observed correlations.

First, note again that a large number of neighbourhood means are included in the analysis to capture directly as many observables as possible and to proxy for as many unobservables as possible. However, the data also allow me to include controls that are assumed to proxy, although not perfectly, for the quality of some existing public goods. To the extent that these controls indeed proxy for quality, they can reduce the bias that would result from the above sorting process. In particular, I add a measure of satisfaction with two public goods to control for the quality of existing neighbourhood public goods, namely garbage collection and drainage.

Respondents are asked whether they are satisfied with the method of garbage collection and the community drainage system, respectively. From this question, I calculate the percentage of households in a neighbourhood which are satisfied with the method of garbage collection and the community drainage system. The means of those variables are 0.67 and 0.4. Note, however, that the direction of the bias that is introduced through an omission of existing public goods is unclear. For example, if a sufficient drainage system is in place, this might attract an ethnically diverse group of individuals at the same time as it decreases the willingness to contribute, since there is already sufficient drainage. On the other hand, if a sufficient drainage system is in place, individuals might be convinced that any contribution they make is used in an appropriate way and they are more inclined to contribute.

I first confirm the earlier findings for the summary index of willingness to contribute. Including the two measures of satisfaction with existing public goods into the baseline specification that is shown in column (3) of Table 2 above, I find that the parameter estimate for the fractionalisation measure is almost unchanged compared to the baseline regressions, namely 0.64, with a p-value of  $<0.01$ . Looking across individual public goods confirms the finding that including the mean satisfaction with public goods variables does not change results in important ways. The coefficients on the fragmentation index are almost unchanged. The mean satisfaction with public goods variables enter negatively throughout (except in two of the 24 parameter estimates), and 11 of 24 are significant (results are in Table 4): the larger the community satisfaction with the two public goods drainage system and garbage collection, the lower the willingness to contribute. This effect is not just confined to the two public goods in question; therefore it appears that these two variables also proxy for other unobserved factors, especially the satisfaction with other public goods and/or the availability of other public goods in the neighbourhood.<sup>14</sup>

These results give some evidence that a sorting process is not driving the results. A sorting process that is based on other unobserved characteristics (other than existing public goods) which are also correlated with the willingness to contribute to public goods (for example preferences for public goods) cannot be ruled out, but there is evidence against this from mobility

**Table 4.** Controlling for satisfaction with existing public goods

Dependent variable = 1 if willing to contribute to public good						
Probit results (marginal effects)						
	education	health	road	transport	water	garbage
fractionalisation	0.300 (0.114)***	0.308 (0.134)**	0.427 (0.151)***	0.305 (0.143)**	0.274 (0.137)**	0.271 (0.157)*
satisfaction with garbage collection	-0.126 (0.091)	-0.137 (0.099)	-0.170 (0.138)	-0.167 (0.103)	-0.160 (0.108)	-0.307 (0.112)***
satisfaction with drainage system	-0.083 (0.059)	-0.074 (0.070)	-0.294 (0.095)***	-0.157 (0.072)**	-0.132 (0.068)*	-0.323 (0.082)***
	drainage	streetlight	charity	parks	security	income
fractionalisation	0.345 (0.168)**	0.200 (0.142)	0.226 (0.146)	0.134 (0.145)	0.316 (0.122)***	0.226 (0.127)*
satisfaction with garbage collection	-0.050 (0.148)	-0.171 (0.110)	0.111 (0.121)	-0.041 (0.098)	-0.052 (0.097)	0.014 (0.097)
satisfaction with drainage system	-0.607 (0.098)***	-0.242 (0.082)***	-0.328 (0.087)***	-0.346 (0.076)***	-0.231 (0.070)***	-0.177 (0.069)**

Notes: (1) Standard errors are in parentheses; \*\*\*, \*\*, \* indicates significance at 1 per cent, 5 per cent and 10 per cent respectively.

(2) Standard errors are corrected for pooling at the neighbourhood level.

(3) Other controls included in all regressions: age, sex, education, marital status, household income; mean neighbourhood income, ethnic group indicator variables, ethnic group indicator variables interacted with share of own ethnic group; 11 neighbourhood level control variables (same as above in baseline regressions).

**Table 5.** The effect of heterogeneity in poor vs. rich neighbourhoods: using the summary index of willingness to contribute

	dependent variable = summary index of willingness to contribute to public goods; OLS regression				
	(1)	(2)	(3)	(4)	(5)
				poorest half of neighbourhoods	richest half of neighbourhoods
fractionalisation	0.603 (0.279)**	0.791 (0.229)***	0.933 (1.099)	0.627 (0.309)**	0.371 (0.447)
mean neighbourhood income	0.243 (0.115)**	0.143 (0.125)	0.177 (0.169)	0.460 (0.147)***	0.164 (0.168)
neighbourhood is in top half of mean income distribution	-0.155 (0.192)				
fractionalisation × neighbourhood is in top half of mean income distribution	-0.025 (0.342)				
neighbourhood is in top quarter of mean income distribution		0.159 (0.211)			
fractionalisation × neighbourhood is in top quarter of mean income distribution		-0.563 (0.437)			
fractionalisation × mean neighbourhood income			-0.105 (0.382)		
Observations	1,721	1,721	1,721	881	840
R-squared	0.08	0.08	0.08	0.11	0.11

*Notes:* (1) Standard errors are in parentheses; \*\*\*, \*\*, \* indicates significance at 1 per cent, 5 per cent and 10 per cent respectively.

(2) Standard errors are corrected for pooling at the neighbourhood level.

(3) Other controls included in all regressions: age, sex, education, marital status, household income; ethnic group indicator variables, ethnic group indicator variables interacted with share of own ethnic group; 11 neighbourhood level control variables (same as in baseline regressions).

information. Residential mobility is low: 96.5 per cent of households lived in their present neighbourhood for more than one year.<sup>15</sup> On the other hand, the quality of public goods is not as stable over the same time horizon: For example, when asked whether the quality of the neighbourhood drainage system has changed in the last year, 16.5 per cent of households respond that the quality in their neighbourhood is better or much better, while 38.3 per cent respond that quality is worse or much worse than a year before. The available results for other public goods considered here also show considerable variation in the quality of public goods over time.<sup>16</sup> Thus, important changes in the quality of public goods appear to be happening over a short time horizon, while the mobility of residents is small over the same time horizon. Hence, even if the initial neighbourhood choice of households reflected to some extent preferences over public goods, there is no large migration in response to considerable subsequent changes in the quality of neighbourhood public goods.

In addition, levels of ethnic heterogeneity and average residential mobility (or rather lack thereof) across neighbourhoods over the last year are not significantly correlated with each other: the correlation coefficient at the neighbourhood level is  $-0.04$ , with a p-value of 0.73. Therefore more diverse neighbourhoods are on average not neighbourhoods with households that moved there significantly more recently, so that ethnic diversity does not seem to be a result of very recent migration into a neighbourhood.

### *5.3 Interaction of Ethnic Heterogeneity and Neighbourhood Wealth*

The model outlined in Section 2 predicts that an increase in ethnic heterogeneity is more likely to increase the number of contributors in a poor neighbourhood than in a rich neighbourhood. To test whether differences in the effect of ethnic heterogeneity depend on neighbourhood wealth characteristics, I run a variety of regressions based on the summary measure of willingness to contribute. For column (1) I add to the baseline controls an interaction of the ethnic fragmentation index and an indicator variable that is one if the mean income of the neighbourhood is above the 50th percentile of the average-income levels of all neighbourhoods (I also add this indicator variable itself). For column (2) I use instead the 75th percentile. Column (3) uses the continuous mean neighbourhood income measure, while in columns (4) and (5) I run the regressions separately for ‘rich’ (above the 50th percentile) and ‘poor’ (below the 50th percentile) communities.

The results, reported in Table 5, are in line with the predictions based on the theoretical considerations above. They show that in columns (1) and (2) the ethnic fragmentation index is still entering positively. This confirms that on average in the poorer neighbourhoods ethnic heterogeneity is associated with an increase in the probability that an individual indicates willingness to contribute to a public good. However, the parameter estimate on the interaction between fragmentation and the indicator for the richest half (quartile) of the neighbourhoods is negative. This indicates that for households in the relatively richer neighbourhoods the effect of ethnic fragmentation appears to be smaller than in poorer neighbourhoods. This result is confirmed using the continuous measure and the separate regression for poor and rich neighbourhoods.

### *5.4 Interaction of Ethnic Heterogeneity and Size of Own Ethnic Group*

In the theoretical considerations above it was hypothesised that individuals know the preferences of members of their own ethnic group but are uncertain about the preferences of individuals belonging to other groups. This in turn implies an increase in uncertainty about others’ contributions if ethnic heterogeneity increases. However, this argument also suggests that the uncertainty-inducing effect of fractionalisation should be smaller for members of groups that have a relatively larger share in the total population: Being member of a large group and living in a fractionalised community implies relatively less uncertainty than being member of a small

**Table 6.** The interaction between ethnic heterogeneity and own group size

Dependent variable = 1 if willing to contribute to public good Probit results (marginal effects)						
	education	health	road	transport	water	garbage
fractionalisation	0.407 (0.143)***	0.431 (0.153)***	0.451 (0.183)**	0.372 (0.166)**	0.455 (0.164)***	0.483 (0.198)**
fractionalisation × share belonging to own ethnic group	-0.347 (0.259)	-0.387 (0.265)	-0.128 (0.340)	-0.253 (0.312)	-0.594 (0.308)*	-0.716 (0.354)**
	drainage	streetlight	charity	parks	security	income
fractionalisation	0.409 (0.210)*	0.231 (0.182)	0.382 (0.182)**	0.327 (0.174)*	0.439 (0.168)***	0.360 (0.149)**
fractionalisation × share belonging to own ethnic group	-0.245 (0.440)	-0.140 (0.309)	-0.493 (0.367)	-0.616 (0.289)**	-0.354 (0.302)	-0.401 (0.291)

Notes: (1) Standard errors are in parentheses; \*\*\*, \*\*, \* indicates significance at 1 per cent, 5 per cent and 10 per cent respectively.

(2) Standard errors are corrected for pooling at the neighbourhood level.

(3) Other controls included in all regressions: age, sex, education, marital status, household income; mean neighbourhood income, ethnic group indicator variables, ethnic group indicator variables interacted with share of own ethnic group; 11 neighbourhood level control variables (same as above in baseline regressions).

group in a community with the same level of fractionalisation. This would imply that in a regression of willingness to contribute on an interaction between fractionalisation and the share of individuals belonging to one's own group (plus the usual other controls) the coefficient on the interaction should have a negative sign.

Indeed, this is what I find: a negative coefficient on the interaction term between the fractionalisation measure and the share of individuals belonging to one's own group, and a positive coefficient on the fractionalisation variable. Table 6 shows the results for the 12 public goods categories. For the summary index of the willingness to contribute the parameter estimate for the fractionalisation variable is 0.92 (p-value < 0.01) and the estimate of the interaction term is 0.90 (p-value of 0.13) So, the effect of large fractionalisation is most severe if the own group is small and is alleviated if the own group share is large.

## VI. Conclusion

In this article, I investigate the role of ethnic diversity as a determinant of the stated willingness to contribute to public goods. This is done in the context of a study of the determinants of the willingness to privately contribute to public goods for urban households in a developing country. The empirical evidence presented suggests that higher levels of ethnic fragmentation are associated with an increased willingness to provide public goods privately in neighbourhoods of Kampala. The results hold across a number of public goods and are robust to different specifications.

The empirical results presented in this article are in contrast to most of the other existing empirical studies that investigate the effect of ethnic heterogeneity. The mechanisms that are proposed in the theoretical and empirical literature to relate ethnic diversity to public goods imply a negative correlation. To explain the empirical findings, I introduce uncertainty as a novel factor into the discussion regarding the role that ethnic diversity plays in determining social and economic outcomes. An application of insights from the literature on the private provision of public goods under uncertainty shows that an increase in ethnic heterogeneity may have a positive effect on the total number of households who are willing to contribute privately to a public good. This is true under certain plausible assumptions about the individuals' preferences and if there is more

uncertainty about others' contributions in ethnically diverse communities than in ethnically homogeneous communities. Recent work in Kampala by Habyarimana et al. (2007) supports this assumption for the very same setting that is used in the present study. These authors find that individuals appear to be closer connected through social networks to members of their own ethnic group than to members of other ethnic groups. To the extent that uncertainty about other individuals' preferences is reduced through repeated interaction within social networks, this supports the assertion that there is lower uncertainty within ethnic groups in Kampala.

The evidence of experimental studies on private provision of public goods in the presence of heterogeneity and uncertainty provides further support for the hypotheses regarding ethnic fractionalisation, uncertainty and willingness to contribute to public goods that are presented in this article.<sup>17</sup> In particular, Ledyard (1995) conjectures, after surveying several experiments, that heterogeneity has a negative effect on contributions, but that incomplete information about others' payoffs has a positive effect. Later experiments by Chan et al. (1999) confirm parts of Ledyard's conjecture and find that heterogeneity increases contributions in games with incomplete information. Finally, stylised facts on free-riding that emerge from the large experimental literature on public goods are consistent with an important role of uncertainty as well (Eichberger and Kelsey, 2002).<sup>18</sup>

The present results are consistent with the hypothesis that increases in ethnic diversity lead to increased uncertainty about who else values any given public good, which in turn leads to larger individual propensity to be willing to contribute. Although there is no direct evidence linking the findings to uncertainty and alternative mechanisms cannot be ruled out, additional tests provide further support for the uncertainty hypothesis. In particular, the heterogeneous effects of fractionalisation in poor versus rich communities and for individuals belonging to small versus large ethnic groups within a community are further suggestive evidence that is consistent with the uncertainty hypothesis.

A number of existing empirical results point to a decrease of the ability of communities to cooperate with increases in ethnical diversity, in particular in Africa. This article suggests a channel that implies a counteracting effect. I hypothesise that uncertainty is the underlying reason for the difference in results that I find in this article but ultimately I cannot rule out alternative explanations. If uncertainty indeed is part of the explanation for the findings, it should be noted that it affects the private provision of public goods, but it is less clear that it affects the channels through which public provision of public goods occurs. It therefore seems to be important to distinguish carefully between private and public provision of public goods, if the interest is in studying the effect of such community characteristics as ethnic diversity on public goods provision. What could the potential role of uncertainty imply for policy? One can think of implications for the way in which public goods projects should be set up if the goal is to maximise private contributions. For example, it could be that projects that require larger initial investments and smaller subsequent maintenance costs are easier to finance with voluntary contributions than projects that require a continuous flow of contributions, if in the latter type of project there is scope for learning over time which in turn reduces uncertainty and according to the theoretical considerations above increases the incentives to free ride. It is also worth noting that uncertainty may not just be caused by ethnic heterogeneity. Large wealth inequality may lead to limited interaction between individuals of different wealth levels and thus may lead to uncertainty about preferences or about the ability to take advantage of public goods. Given that private provision of public goods might be able to alleviate some of the most pressing problems in countries which usually do not provide public goods in a sufficient amount, these results call for more future research in these directions to get a better understanding of what determines collective action at the community level.

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## Notes

1. For the specific environment that I study, namely the city of Kampala, Uganda, Habyarimana et al. (2007) illustrate the importance that communities attach to these public goods and give evidence for the fact that community action in the above mentioned areas of security measures, drainage, and garbage collection is indeed an important empirical phenomenon.
2. On the other hand, for a neighbouring region in Tanzania he finds that there is a significantly positive correlation between ethnic heterogeneity and one school level outcome (latrines per pupil), and heterogeneity is positively, though not statistically significantly, associated with three of the other four local public goods outcomes that he looks at (Miguel 2004: Table 2). Miguel (2004) focuses on differences in nation-building policies to explain differences between Kenya and Tanzania with respect to public goods.
3. While this effect reduces the free-riding problem, the equilibrium amount of the public good will typically not be Pareto optimal (Eichberger and Kelsey, 2002).
4. If the production technology for the public good is exponential, it is possible to construct examples in which the equilibrium public goods provision is larger with specific types of uncertainty than at the Pareto optimum (Eichberger and Kelsey, 2002).
5. See for example Elbers et al. (2003) for a discussion of the potential for poverty and inequality imputations of this type.
6. The full set of parameter estimates is available upon request from the author.
7. At an USD to Ugandan Shilling exchange rate of 1,510 (January 2000) imputed mean household income is approximately equal to USD 1,800. This translates into an imputed income per household member of USD 360.
8. The classifications were kindly done by the native Ugandans Miriam Babita (classification 1) and Ruth Kamukama in collaboration with Maurice Ekomoloh and William Nangoshya (classification 2). The correspondences between names and ethnic groups are available upon request.
9. The categorisation and labelling of language groups was decided upon by the individuals who carried out the categorisation.
10. In addition, one household was classified as being of Asian origin.
11. According to Habyarimana et al. (2007) communities in Kampala's neighbourhoods rely on community collaboration in several of these areas, for example drainage, garbage, and security.
12. The additional controls that I use are: mean of households that own a house, mean of households that live in an 'individual house', mean of households that live in a 'tenement', mean of households that live in a 'flat', mean age of the head of households, mean education of the head of households, mean years of education (all individuals older than 16), percentage of heads of households who are male, percentage of heads of households who are married, percentage of heads of households who are single, and mean distance of household to next road.
13. I noted above that the services in some categories may be considered more public than others. However, the coefficients on the ethnic fractionalisation in the regressions with the 12 different 'public goods' are in most cases of fairly similar magnitude. Also, in all but one category the coefficient is statistically significantly different from zero at the 10 per cent level. This suggests that the difference in how much these goods can be considered public, as opposed to private, does not influence results. In particular, categories that have, arguably, a somewhat more private component, such as education, health and income generating projects, do not show systematically different results from the other categories.
14. There is also a question in the survey that asks whether respondents know about existing community efforts in the 12 public goods categories covered. Including six indicator variables on the knowledge about existing community projects (for the six categories for which the variation in the responses is the largest) in addition to the satisfaction variables does not alter the results significantly. Including all 12 indicators does not change the point estimates in important ways, but slightly reduces a few of the significance levels, which should not be surprising given that it reduces the degrees of freedom substantially.
15. Unfortunately, the survey does only ask for migration over a one year horizon. Using the Uganda National Household Survey I find that within the group of households who have not always lived in their current place of residence, the median arrival time is 13 years prior to the survey. This is additional evidence that individuals are not migrating very frequently.
16. Only 34 per cent of respondents say that school quality has *not* changed. Only 40 per cent think that the quality of the health provider they have visited did not change, and only about a quarter of households (28%) think that quality of roads has not changed.
17. Note that these studies do not specifically define heterogeneity as ethnic heterogeneity, though.
18. More specifically, Eichberger and Kelsey (2002) cite the following stylised facts that are consistent with an important role of uncertainty/ambiguity: (1) no significant evidence of free-riding in single shot games; (2) decaying of public

goods provision towards free-riding level in repeated games; (3) more free-riding by experienced than by inexperienced subjects; (4) decrease in free-riding when rules of a game are changed unexpectedly.

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