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**Ethnic Divisions and the Size of the
Informal Sector**

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Abstract

This paper investigates the relationship between ethnic fragmentation and the size of the informal economy. Recent experimental and empirical research links, in turn, ethnicity and trust, and trust and tax compliance. In addition, recent empirical studies have identified an unwillingness to contribute to public goods benefiting other ethnic groups. Combining these insights, we argue that increasing ethnic fractionalization decreases voluntary tax compliance, and present empirical evidence at the macro level in a cross-section of more than fifty countries, that more ethnically fragmented societies have significantly larger informal sectors.

1   Introduction

Tax compliance and administration are central issues in public finance. For developing economies, difficulties in tax collection remain a major obstacle for economic development. Tax evasion and large informal sectors can force governments and tax agencies to increase tax rates on activities less prone to evasion, resulting in increased distortions that can have adverse effects on investment and growth and, additionally, non-compliance can result in effective tax systems being less equitable than those legislated. These problems of noncompliance are present also in the developed world; for example, European countries are currently considering how to finance extensive welfare state programs in the face of adverse demographic changes, and the presence of large scale tax evasion will make this even harder.[1]

This paper provides the first cross-country empirical investigation of two explanations for the size of the informal sector that have received much attention in the literature on tax compliance and administration, particularly regarding developing countries:[2] (i) The degree of voluntary tax compliance and (ii) the size of the rural, or agricultural, economy. While the latter is straightforwardly tested using available data, I draw on recent experimental and empirical research in economics, political science and social psychology to formulate the hypothesis that the degree of voluntary tax compliance – and the size of the informal sector – depends on the degree of ethnic fragmentation in society: Ethnic fragmentation (i) decreases the level of trust, which decreases tax compliance and (ii) increases the unwillingness to contribute to financing public goods, to the extent that these (primarily) benefit other ethnic groups.

This approach might give some insight into why developing nations, some of which – especially in Africa – are characterized by a high degree of ethnic heterogeneity, have larger informal sectors. While ethnic heterogeneity could be one of many reasons many

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[1]See Slemrod and Yitzhaki (2002) for a thorough discussion of the importance of tax administration issues for tax policy.

[2]See, e.g., Goode (1952) and Kaldor (1963), and Burgess and Stern (1993) for a recent overview.

developing countries have problems securing (voluntary) support for taxation, it is also very relevant for the discussion concerning the financing of Europe's extensive welfare state programs, given that – the historically very homogenous – European countries are currently experiencing increasing ethnic heterogeneity due to immigration and, further, that an integrated European Union itself will be an area with a high degree of ethnic, linguistic and religious fragmentation.

While there is by now a substantial theoretical literature on tax compliance and the size of the informal sector, comparative empirical evidence – for obvious reasons – is more scarce. In the first cross-country study of the informal sector, Friedman, Johnson, Kaufman and Zoido-Lobatòn (2000) find that the size of the informal sector increases in the level of corruption, measured in a variety of ways. They do not, however, consider the effect of societal heterogeneity on the informal sector, and generally control only for two explanatory variables at a time.

A small, recent group of papers address issues related to the analysis presented here. Slemrod (1998, 2001) suggests, without testing it empirically, that voluntary tax compliance is linked to social capital and trust.[3] Scholz and Lubell (1998b) find, linking survey data on attitudes with micro data on tax compliance for the U.S., that trust in others increases tax compliance. La Porta, Lopez-de-Silanes, Shleifer and Vishny (1997) consider trust in large organizations. In their analysis, they instrument a survey measure of tax compliance as a proxy for trust by the degree of ethnolinguistic fractionalization, without discussing their finding.[4]

This paper provides a framework for why ethnic fractionalization, through trust, matters for tax compliance. The resulting hypothesis is tested using as the dependent variable actual estimates of the size of the informal sector, rather than the qualitative survey measure employed by La Porta et al. Finally, the empirical analysis employs a

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[3]Social capital, like trust, is influenced by ethnic heterogeneity; see Knack and Keefer (1997) and Alesina and La Ferrara (2000). Cross-country measures of trust has been carried out in the *World Value Surveys*, but these so far cover only a limited number of countries.

[4]The survey measure is from the World Competetiveness Yearbook, and asks a group of respondents to rate qualitatively the severity of tax evasion in their country.

wider set of control variables in a larger sample.

The next section presents the theory and derives the testable hypothesis, and section three describes the empirical model and the data. Section four presents econometric evidence that confirms the main hypothesis at the macro level, and section five concludes.

2   Voluntary tax compliance and ethnic divisions: A hypothesis

The economic literature on tax evasion has largely been built on Becker's (1968) economics-of-crime approach. Pioneered by Allingham and Sandmo (1972), the possibility of tax evasion is modelled as essentially adding to the tax payer optimization problem a risky asset, the return of which is determined by tax rates, fines and the risks of detection. In accordance with the theory, it has been established empirically that tax payers respond to incentives such as changes in the audit probabilities. However, two (related) puzzles for the theory remain. First, tax collection based strictly on enforcement in environments where the return on taxes is very low is remarkably ineffective.[5] Second, given the existing degree of enforcement in industrial countries, characterized by low audit probabilities, tax compliance is remarkably high.[6]

A possible solution to the puzzles is the existence of *voluntary tax compliance.* Observed already by Machiavelli, "no prince can govern long unless most citizens willingly obey the laws of the land."[7] Tax payers who voluntarily comply *choose* to pay taxes – that is, they do not (actively) engage in non-compliance. Goode (1952), summarizing his experience as advisor to the IMF, made the case for voluntary tax compliance half a century ago, arguing that "a large degree of voluntary compliance on the part of tax payers [is a] requirement for satisfactory income taxation." Though empirical evidence on the prevalence of voluntary tax compliance is non-existent, and experimental evidence

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[5]Collins (1988) on tax evasion in absolutist France, Cheibub (1998) on taxation in dictatorships and democracies and Fjeldstad and Semboja (2001) on the use of violence in tax collection in comtemporary Tanzania.

[6]Andreoni, Erard and Feinstein (1998, p. 819).

[7]Cited in Roth et al. (1989, p. 118).

is scarce, many, such as Slemrod (1998, 2001), remain convinced of its importance.

It is important, therefore, to identify the causes of voluntary tax compliance or the lack thereof. Based on her historical and comparative work on tax evasion, Levi (1988, p. 53) argues that voluntary compliance will occur "only when taxpayers have confidence that (1) rulers will keep their bargain and (2) the other constituents will keep theirs. Taxpayers are strategic actors who will cooperate only when they can expect others to cooperate as well. The compliance of each depends on the compliance of the others. No one prefers to be a "sucker." "

Following Levi's classification, voluntary tax compliance is influenced by two (implicit) social contracts. The *horizontal* contract concerns the perceived fairness of the tax payment: If people expect others to evade or avoid taxes, they will try to do so themselves, whereas people expecting others to comply will comply themselves. The *vertical* contract concerns what has been called the *quid pro quo* of taxation: Do tax payers get "sufficient" public goods in exchange for taxes paid?[8] And do they get the public goods mix they prefer? In the Allingham-Sandmo model, taxes finance an exogenous revenue requirement, and tax payers are not concerned with what they get in exchange for taxes paid; hence, there is no quid pro quo. In the following, I argue that ethnic fractionalization can affect the size of the informal sector through both the horizontal and the vertical contracts.

2.1   The horizontal contract

Experimental evidence from social and political psychology has established that (a) the level of trust and the degree of trustworthiness decreases with ethnic diversity (Zucker, 1986; Tyler, 1998; Glaeser et al., 2000; Alesina and La Ferrara, 2001), and that (b) tax compliance increases with trust (Scholz and Pinney, 1995; Scholz and Lubell, 1998a,b; Scholz, 1998). The argument given is that people are willing to comply if they know that everyone else complies. If people do not trust others to comply, they choose to

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[8]This is sometimes referred to as exchange equity (Spicer and Lundstedt (1976)).

evade taxes themselves. Tax payer surveys and experimental evidence support this. For example, Laurin (1986, p. 185-7) reports survey evidence from Sweden that people who think that other tax payers underreport are more likely to do so themselves.[9]

What is the theoretical basis for such a behavior? Tax compliance is typically modelled as a prisoner's dilemma (PD) game. In PDs, non-compliance is a strictly dominant strategy; the role of tax enforcement, then, is to promote compliance by decreasing the gains from non-compliance. However, as noted by Andreoni et al. (1998), the expected penalties found in actual tax enforcement systems are not large enough to make compliance a dominant strategy. Therefore, accounting for tax enforcement still leaves players in a PD. But people pay taxes anyway.

The fact that people pay taxes, even though the analysis framed as a PD says they should not, fits a general conclusion of experimental game theory: that people cooperate more than predicted by the theory (Ledyard, 1995). Two recent papers, Fehr and Schmidt (1999) and Bolton and Ockenfels (2000), attempt to solve this inconsistency by modeling individuals as having preferences not only over absolute monetary outcomes, but also over equity in outcomes, and they show that such preferences can support observed behavior in a wide range of games, including public goods games. When people have equity concerns, they compare their resulting payoff with that of others in a similar situation, and incur disutility from over- or undercontributing, a feature confirmed experimentally (Loewenstein, Thompson and Bazerman (1989)). Bolton and Ockenfels (2000) consider a game of incomplete information about the types of other players, and find that the probability that a player contributes is increasing in the probability he ascribes to other players contributing, which is exactly the behavior postulated by Levi (1988), as noted above.[10]

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[9]Further, Spicer and Becker (1980) report experimental evidence suggesting that tax evasion increases for victims of (perceived) fiscal inequity. See Roth et al. (1989) for a survey of the behavioral approach to tax evasion.

[10]Such behavior in PD games was documented experimentally already by Deutsch (1958). A different literature has argued that people in fact do not play a PD but rather a coordination game of (mutual) assurance (a term coined by Sen, 1967). The two approaches are essentially equivalent. In assurance games, it is *assumed* that the decision to contribute is conditional to the expected contribution of others

Another avenue through which tax compliance could be affected by ethnic fragmentation is social sanctions or norms. Olson (1965) argues that social sanctions can provide 'selective incentives,' facilitating public goods provision and, therefore, as noted by Roth, Scholz and Witte (1989), social stigma associated with non-compliance could improve compliance. For social sanctions to be effective, however, it is important that individuals are affected by such sanctions. To the extent that individuals are affected mainly by social sanctions exercised by their own ethnic group, such sanctions will not be as effective in ethnically fragmented communities as in more homogenous communities.

2.2 The vertical contract

According to the quid pro quo argument, tax compliance depends in part on tax payers receiving "sufficient" public goods in return for taxes paid. Thus, if the (perceived) rate of transformation from revenue to (favored) public goods is low, tax payers will feel that the state has not kept its bargain, with voluntary tax compliance deteriorating as a result. There can be two reasons for this: (a) preference divergence/favoritism; and (b) corruption.[11]

It has been established empirically that public goods provision and participation is lower in ethnically fragmented societies; see Alesina, Baqir and Easterly (1999) and Alesina and La Ferrara (2000) for US municipal level evidence, and Miguel (2001) for micro evidence from school financing in Kenya. The possible reasons suggested are that different ethnic groups may prefer different public goods mixes and, further, that people may not want to contribute to public goods benefiting other ethnic groups.[12] Alesina et

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(see Runge, 1984). In Bolton and Ockenfels (2000), this behavior arises endogenously, as a result of people having preferences over both absolute and relative outcomes, but is not related to the assurance game literature.

[11] This argument provides another, complementary, explanation of why corruption matters for tax compliance, in addition to that identified by Friedman et al. (2000). They argue that firms carrying out transactions in the formal sector make themselves subject to extortion by public officials, and that this risk outweighs the costs incurred by the lack of contract enforcement experienced in the informal sector.

[12] See Luttmer (2001) for evidence of this type of behavior regarding support for welfare spending in the US.

al. (1999) argue that the lower provision is determined through the political process, by tax payers exercising their voice option. However, another way of expressing discontent is the exit option: If taxpayers feel that the public goods mix provided is very different from what they would have preferred themselves, or that it benefits people with whom the taxpayer does not identify, or that the rate of transformation is low due to pervasive corruption with much rents being appropriated by public officials and politicians, they will feel the attractiveness of the quid pro quo contract diminished, which could lead to lower voluntary compliance.

This argument is closely related to political legitimacy. As noted by Alt (1983, p. 185) "the legitimacy of a tax is that of the state that levies and collects it." Therefore, if the state is perceived to have low legitimacy, for example due to non-representativeness, this can lead into a downward spiral of non-compliance. Rabushka and Shepsle (1972), in their analysis of multi-ethnic societies, argue that ethnic salience can result in "ethnicization of collectively provided goods" (p. 84) in the sense that the political process allocates excludable public goods and transfers based on ethnic characteristics (favoritism). The failure of the state to insure nonexcludeability make individuals turn to their ethnic communities, as a sort of alternative statehoods, for the provision of public goods and this process can initiate a vicious cycle in which ethnic communalism "breeds attitudes of illegitimacy, which in turn reduce the effectiveness of the state, and further intensify attitudes of illegitimacy." (p. 85).

2.3 The hypothesis

Together, the two arguments suggest that people sometimes choose to exit when the horizontal or vertical contracts break down. To sum up, in both the vertical and horizontal contracts, ethnic fragmentation decreases the degree of tax compliance and, thus, the size of the informal sector:

Hypothesis: The size of the informal sector increases in the degree of ethnic fragmentation.

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3 Empirical model and data

This section sets up an empirical model for testing the hypothesis that greater ethnic fragmentation increases the size of the informal sector. In doing so, it is necessary to control for the level of corruption, as documented by Friedman et al. (2000). Corruption is measured with error and likely to be endogenous to the size of the informal sector; these problems are addressed using instrumental variables methods.

3.1 Empirical model

I estimate the following simultaneous equations model:

$$INFMSEC = \beta_0 + \beta_1 CORR + \beta_2 ETHNIC + \beta^* X^C + \varepsilon \tag{1}$$

and

$$CORR = \delta_0 + \delta_1 INFMSEC + \delta^* INSTR + \nu \tag{2}$$

where $INFMSEC$ is the size of the informal sector relative to (official) GDP; $ETHNIC$ is ethnic fragmentation, a measure of ethnic divisions presented below, and $CORR$ is a measure of corruption. X^C in equation (1) includes additional controls likely to influence the size of the informal sector, and $INSTR$ includes additional determinants of corruption, which will serve as instrumental variables. The degree of corruption is likely to be endogenous with respect to the size of the informal sector: Where tax revenue generation is difficult – and public employment wages therefore small – public officials and the judiciary are more likely to accept bribes and perform extortion (Burgess and Stern, 1993). This feedback effect from the size of the informal sector to corruption is the reason for the presence of equation (2), which transforms the econometric model into a simultaneous equations system.

The focus in this paper will be on equation (1), which will be estimated using OLS and 2SLS. Under the hypothesis of no overidentification, which will be tested, the exogenous variables in the second equation are valid instruments for the level of corruption in the first. The instrumental variables approach accounts for the possible endogeneity of

corruption as well as the fact that corruption is measured with error (see below). While I will not consider in detail the determinants of corruption (see Treisman (2000) for such an analysis), it will also be of interest to estimate the full simultaneous system set up above, as this allows for evaluating the possible feedback effect from the size of the informal sector on the level of corruption.

3.2 Data

Defining the informal – or shadow, or underground – economy is difficult. A commonly used working definition is that the informal economy consists of "all currently unregistered economic activities which [should] contribute to the officially calculated GDP" (Schneider (2000, p. 4)). This includes the production of ordinary goods and services, both from monetary and barter transactions, as well as income generated by illegal activities. The production of ordinary goods and services in the informal economy is the amount that should be included in the tax base.

Data for the size of the informal economy is limited, for obvious reasons. Using various different sources, Friedman et al. (2000) are able to obtain estimates of the size of the informal sector in percent of GDP for 69 countries. The estimates are indirect, based on observed electricity consumption (most non-OECD countries) or currency demand (most OECD countries).[13] In the regressions carried out below, the sample typically comprises around fifty countries due to missing data for a number of additional variables; a complete list of countries included in the sample, and summary statistics for the data is provided in appendix A. These methods result in estimates of the size of the informal sector

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[13]The income (GDP) elasticity of short-run electricity consumption is typically estimated to be close to one around the world. Thus, observed electricity consumption provides an estimate of "true" GDP and, thus, by subtracting official GDP, an estimate of the informal sector. For OECD countries, a similar approach based on the demand for cash is used. The estimates for Latin American countries is based on Loayza's (1996) multiple-indicator multiple-cause approach, in which the size of the informal economy is inferred from observations of the likely causes and effects of the underground economy. Other estimates for Latin America based on electricity consumption differ to some extent from Loayza's, but this does not affect results (see the discussion of robustness below).

I will not enter the controversy on measurement of the informal sector, but merely take as given the estimates used by Friedman et al. (2000). See, e.g., Tanzi (1999) for a discussion of such estimates.

measured with error. However, it is important to stress that the presence of (random) measurement errors in the dependent variable does not bias the estimates, it only inflates the standard error of the regression. The estimates relate to different years, typically around 1990-1997, and the explanatory variables have been matched whenever possible.

Ethnic divisions are measured by the degree of ethnic fractionalization in a country. A country's degree of ethnic fractionalization ($ETHNIC$) is the probability that two randomly drawn individuals are from different ethnic groups. Formally, it is defined as

$$ETHNIC = 1 - \sum_{i \in I} k_i^2$$

where k^i is the share of ethnic group i in the population and I is a partitioned set of ethnic groups in the population. The larger the number of ethnic groups and the more equal in size, the larger is $ETHNIC$. Data on $ETHNIC$ is taken from Alesina, Devleeschauwer, Easterly, Kurlat and Wacziarg (2002). They provide separate fractionalization indices based on religion, language and ethnicity. This constitutes an important improvement over the most commonly used measure of fractionalization, the ethno-linguistic fractionalization index, ELF, as linguistic variation can be an imprecise measure of ethnicity, which is the main variable of interest here.

To measure corruption, Transparency International's *Corruption Perceptions Index* (CPI) is used: This is a subjective measure, constructed each year sine 1995 by aggregating evaluations by experts for an expanding number of countries. It assigns to a country a value between 1 (most corrupt) to 10 (least corrupt); to facilitate interpretation, in the results reported below the corruption scale has been inverted such that a higher value corresponds to a higher level of corruption. A consequence of the aggregation procedure is that the index is subject to measurement error. Such survey indices are measured with error; however, this is corrected for by the instrumental variables approach, as are the problems arising from possible endogeneity. As instruments we use latitude (Hall and Jones, 1999), an indicator variable for presidential vs. parliamentary regimes (Lederman, Loayaza and Soares (2002)), an indicator variable for transition countries, and indicator

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variables for the legal system (La Porta et al. 1999).

Finally, additional controls are included. Country studies suggest that the informal economy labor force is often twice as high in rural areas as in urban areas owing in part to difficulties in tax collection; therefore, we expect that a higher degree of urbanization will be associated with smaller informal sectors.[14] Finally, a measure of inflation is included to capture that citizens in countries with a history of high inflation often will be less inclined to carry out monetary transactions, which will tend to reduce taxable income. Typically, GDP per capita is included to control for economic development. However, since the estimates of the informal sector are based on income elasticities with respect to GDP, it is not surprising that this turns out significant; therefore, the estimations are done without controlling for the level of income, but robustness analysis (not reported) shows that including the level of income as an additional endogenous variable does not affect the results regarding ethnic fractionalization.[15] Additional controls are included and discussed in the robustness analysis below.

4   Results

Table one presents the main results.

< Table 1 around here >

The first two columns report the simplest cases, including only ethnolinguistic fractionalization and corruption. Column (1) contains the results from an OLS regression of the size of the informal sector on $ETHNIC$ and corruption. The $ETHNIC$ coefficient is significant at the 95 percent level. The interpretation of the coefficient is that as the degree of ethnolinguistic fractionalization increases by 10 percentage points, the informal sector increases by 2.2 per cent of GDP. Further, the results of Friedman et al. (2000)

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[14]See Burgess and Stern (1993, section 4.3).

[15]Furthermore, the level of income is strongly correlated with the level of corruption ($r = -.82$), and including both implies strong multicollinarity. A factor analysis shows that corruption and income can be explained by the variation in one common factor, and including an estimate of this (latent) factor in the analysis leaves the results regarding ethnic fractionalization unchanged.

are strongly confirmed: A higher level of corruption leads to a larger informal sector. Taken together, the two explanatory variables explain over half of the variation in the data.

Column (2) reports results when the relationship is estimated using 2SLS to correct for the possible endogeneity of corruption. The three bottom rows of the table reports information on instrument validity. F (1st) reports the F-test statistic from the first stage regression, capturing the ability of the instruments to explain the variation in corruption. The F-test statistics together with the high partial R^2's observed throughout the empirical analysis indicate that the instruments are not "weak" in the sense discussed in the recent econometrics literature on instrumental variables methods (e.g. Staiger and Stock (1997)). An additional check on instrument validity is whether the instruments really belong in the main estimating equation. This is possible to test as the equation is overidentified, and the final row reports Hansen's J-statistic and the corresponding probability associated with the null hypothesis of no overidentification. Throughout, the null cannot be rejected. The results of the 2SLS regression are largely similar to the OLS results, although the coefficient estimate of corruption is somewhat smaller.[16]

Columns (3) and (4) report results when additional explanatory variables are included. The results regarding ethnic fractionalization and corruption are not affected, and urban population is strongly significant in the expected – negative – direction, while inflation is only borderline significant. Regression (4) provides the base case regression for the robustness analysis below, and the significant and negative sign on the share of the population living in urban areas does not reject the hypothesis that more agricultural economies have larger informal sectors.

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[16]In fact, a Durbin-Wu-Hausman specification test rejects that OLS results in biased estimates, but due to the obvious endogeneity of corruption, I have chosen to use IV estimation regardless. It makes no difference to the results. All estimations are done with robust standard errors; a Pagan-Hall test rejects homoscedastic errors in the IV-regressions.

Finally, columns (5) and (6) report results after the inclusion of ETHNIC *squared* is included, as suggested by a number of recent studies (using the ELF index).[17] I find the squared term to be significant (while the linear term ceases to be), but as the explanatory power of the model is increased only slightly from the inclusion of the squared term, in the following I keep the linear version of the model to facilitate interpretation of the results.

4.1 Robustness

Table two reports selected robustness results. In particular, additional explanatory variables are included: Columns (7) - (9) report results of including, respectively, religious fractionalization, marginal tax rates and economic inequality, measured by Gini-coefficients. Though religion is seldom controlled for when measuring trust at the micro-level, religious fractionalization could potentially have effects similar to those of ethnicity, but the results do not indicate that this is the case (nor so when excluding ETHNIC). Marginal tax rates are included to control for possible incentive effects, but, as is often the case, micro level effects of tax wedges do not show up in the aggregate since measure of taxation are often correlated with both income and corruption. Finally, another measure of societal cohesion, income inequality, is included. Howver, due to multicollinearity between the Gini-coefficient and corruption, the Gini-coefficient has an unexpected minus sign; if corruption is excluded, the Gini-coefficient has the expected positive sign and is strongly significant, without affecting ETHNIC. Thus, in all three cases nothing happens to the variables of interest and the additional variables are never significant, nor when including them together. In addition to these reported results, measures of total public expenditure, openness and dependecy ratio were included, but again had no effect on the results regarding ethnic fractionalization. As noted above, including the level of income as an endogenous variable also did not affect ETHNIC.

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[17]A number of studies find a quadratic effect of ethnolinguistic fractionaliztion on outcomes. See Collier and Hoeffler (1998) for an example, and Collier (2001) for a survey.

< table 2 around here >

The two last columns of table two reports the results when different measures of corruption and the informal sector are used. Column (10) employs a measure of "Government Corruption", averaged over 1990-1995, from the *International Country Risk Guide.* ETHNIC remains unchanged. For some countries Friedman et al. (2000) report two estimates of the size of the informal sector, and while they use a primary sample, their results continue to hold if they use their secondary sample. Column (11) reports results when their secondary sample is employed; the results are generally unchanged, though the effect of ETHNIC is slightly less precisely estimated.

Finally, I do a fully joint system estimation of the size of the informal sector and corruption. I estimate the simultaneous equations system (1) and (2) by three-stage least squares, using both measures of corruption employed above. The two first columns of table three report the results for the CPI: Ethnic fractionalization is significant at the 99 percent level, and so is corruption (endogenously determined in the second column); furthermore, note from the second column that the size of the informal sector significantly increases corruption. The two columns on the right uses instead Government Corruption as an endogenous variable, which leaves the results are unchanged.

< Table 3 around here >

Taken together, the results suggest that the hypothesis presented above can be supported by the data. Throughout, while confirming the findings of Friedman et al. (2000) concerning corruption, I find that the size of the informal sector is increasing in the degree of ethnic fractionalization and in the share of the population living rural areas. Further, these results are robust to various measures of corruption, additional control variables, and controlling for endogeneity.

5   Concluding remarks

The analysis of this paper should be seen as a preliminary empirical inquiry into the effect of social structures on the size of the informal sector and the degree of tax compliance. In particular, an extension of the sample of countries is warranted. For example, we conjecture that including estimates from more African countries would support the hypothesis put forward here: African countries are ethnically very heterogenous and, at the anecdotal level, characterized by large informal sectors. A crucial problem that more data will not solve, however, follows from the nature of the informal sector data; this data is (perhaps very) imprecisely estimated, and, therefore, one should be very cautious in making results such as these the basis for policy intervention or policy recommendation. Rather, the goal of the present analysis is to emphasize, once again, the importance of social and ethnic heterogeneity on public sector outcomes.

An interesting empirical extension would be to test the hypothesis on U.S. micro data. Such data, collected thought the IRS' Taxpayer Compliance Measurement Program, are much more precise than aggregate country estimates and at the same time could help mitigate many problems associated with cross-country studies. Unfortunately, the use of this data is severely restricted.

As for economic development, the results of this paper contribute to the bad news associated with ethnic fractionalization. While Collier (2001), in a careful review of the evidence, concludes that the difficulties facing ethnically diverse societies have been greatly exaggerated, he concedes that regarding "the public sector there is evidence that ethnically differentiated organizations encounter problems." (Collier, 2001, p. 154). In particular, the results of Easterly and Levine (1997) and Alesina, Baqir and Easterly (1999) suggest that public expenditures are lower, and less efficiently allocated, in fragmented communities.

The results of this paper confirm the problems of the public sector in ethnically fragmented societies, but suggest that such problems exist also on the revenue side of the public budget. This suggests that trying to improve the public sector in fragmented

societies by improving allocative efficiency on the expenditure side, for example – as suggested by Collier – by reducing ethnic employment patronage, while securing a better vertical contract could be insufficient to secure a better public sector if problems of the horizontal contract persist.

In a broader context, Collier (2001) suggests that one should simply accept the fact that the public sector is relatively less effective in diverse societies than in more homogenous societies, so that the role of the public sector relative to the private sector should be redefined in such societies. This does not necessarily mean that public goods will not be provided, as it could to some extent be provided through ethnic groups, but perhaps that public goods will be provided less effectively, and in smaller scale.

Table 1. Empirical results

	(1) OLS	(2) IV	(3) OLS	(4) IV	(5) OLS	(6) IV
ETHNIC	22.433** (2.26)	27.421** (2.32)	20.553** (2.14)	22.575** (2.27)	−31.620 (−1.21)	−30.576 (−1.19)
ETHNIC^2					68.614** (2.09)	67.838** (2.13)
CORRUPTION	4.359*** (5.91)	3.294*** (3.42)	3.791*** (4.80)	3.207*** (3.41)	3.977*** (5.01)	3.844*** (4.20)
URBAN			−.279*** (−2.75)	−.304*** (−2.95)	−.255** (−2.54)	−.261*** (−2.64)
INFL9095			0.008 (1.43)	0.009* (1.70)	0.008* (1.73)	0.008* (1.89)
N	52	51	45	45	45	45
R^2	.57	.54	.68	.67	.70	.70
Partial R^2 (1st)		.60		.65		.67
F (1st) (p-value)		10.72 (0.000)		10.95 (0.000)		11.54 (0.000)
Hansen's J (p-value)		9.263 (0.100)		6.37 (0.266)		7.313 (0.198)

Dependent variable is size of informal sector to GDP. Estimated using ivreg2 in STATA 7.0. A constant was included in all regressions, but is not reported. Robust t-values (z-values) are reported in parenthesis for OLS (IV). ***, ** and * denote significance at 99, 95 and 90 per cent levels, respectively.

Table 2. Robustness

	(7) IV	(8) IV	(9) IV	(10) IV[a]	(11) IV[b]
ETHNIC	21.667** (2.19)	21.224** (2.14)	23.583** (2.44)	20.550** (2.13)	18.961* (1.92)
CORRUPTION	3.369*** (3.49)	3.019*** (3.05)	3.099*** (2.57)	7.300*** (3.57)	2.942*** (2.95)
URBAN	−.312*** (−3.02)	−.306*** (−2.96)	−.391*** (−3.51)	−.343*** (−3.36)	−.283** (−2.54)
INFL9095	0.009 (1.60)	0.008* (1.70)	0.010** (1.97)	0.009** (2.39)	−.001 (−0.26)
RELIGIOUS	4.427 (0.59)				
MARG. TAX		−0.082 (−0.63)			
GINI			−0.041 (−0.19)		
LOG(INCOME)					
N	45	45	41	43	45
R^2 (centered)	.68	.67	.71	.70	.58
Partial R^2 (1st)	.62	.62	.59	.52	.65
F (1st) (p-value)	9.21 (0.000)	9.41 (0.000)	7.13 (0.000)	6.04 (0.000)	10.95 (0.000)
Hansen's J (p-value)	7.068 (0.216)	4.845 (0.435)	5.210 (0.391)	3.467 (0.628)	5.608 (0.346)

Dependent variable is size of informal sector to GDP. Estimated using ivreg2 in STATA 7.0. A constant was included in all regressions, but is not reported. Robust z-values are reported in parenthesis. ***, ** and * denote significance at 99, 95 and 90 per cent levels, respectively.

a) In regression (10), corruption is measured by "Government Corruption" rather than TI's CPI.

b) In regression (11), the dependent variable is from secondary sample, cf. the text.

Table 3. Systems estimation (3SLS)

Dep. variable	System 1 (CPI)		System 2 (GCORR)	
	INFMSEC	CORRUPTION	INFMSEC	CORR
ETHNIC	22.190*** (3.07)		19.801*** (2.56)	
CORRUPTION	3.448*** (3.68)		7.598*** (3.78)	
INFMSEC		0.079*** (3.90)		0.027** (2.27)
URBAN	−0.310*** (−3.39)		−0.350*** (−3.75)	
INFL9095	0.003 (0.63)		0.006 (1.15)	
LATITUDE		−1.591 (−1.21)		−1.337 (−1.56)
TRANSITION		0.721 (1.16)		−0.236 (−0.59)
BRITISH LAW		−1.529*** (−3.55)		−0.382 (−1.36)
SCAND LAW		−2.266*** (−3.43)		−1.154*** (−2.70)
GERMAN LAW		−0.098 (−0.18)		−0.225 (0.57)
PRESIDENTIAL		0.966** (2.29)		0.634** (2.34)
N	45	45	43	43
R^2	.67	.78	.70	.71
χ^2	81.6	152.5	88.0	94.5

Estimated in STATA 7.0. A constant was included in all regressions, but is not reported. z-values are reported in parenthesis. ***, ** and * denote significance at 99, 95 and 90 per cent levels, respectively. R^2 does not have the usual interpretation in instrumental variables models.

A   Data

Countries included in the 52 country sample: Argentina, Australia, Austria, Belgium, Bulgaria, Bolivia, Brazil, Botswana, Canada, Chile, Columbia, Costa Rica, Denmark, Germany, Ecuador, Egypt, Spain, Estonia, Finland, France, United Kingdom, Greece, Guatemala, Hong Kong, Honduras, Hungary, Ireland, Israel, Italy, Japan, Republic of Korea, Lithuania, Latvia, Morocco, Mexico, Mauritius, Malaysia, Nigeria, Netherlands, Norway, Peru, Philippines, Poland, Portugal, Paraguay, Romania, Russia, Singapore, Thailand, Uruguay, USA and Venezuela.

Table A: Summary statistics

Variable	No. of obs.	Mean	Std. Dev.	min	max
Informal sector	52	24.7	17.9	5.9	76
Corruption Perceptions Index	52	5.2	2.4	1.5	10
Ethnic fractionalization	52	0.33	.22	.002	.85
Urban population (percent)	51	67.6	18.4	20.17	100
Inflation, 1990-95	46	85.7	284.6	1.65	1400.3
Government corruption	47	4.0	1.2	2	6
Gini coefficient	47	38.6	10.7	23.1	60
Religious fractionalization	52	0.39	0.22	.004	.82
Marginal tax rates	52	40.9	13.4	0	67
Latitude (0-1 scale)	52	0.36	0.20	.02	.67
Presidential system dummy	51	0.47	.50	0	1
Transition country	52	0.15	.36	0	1
British law	52	.23	.43	0	1
Scandinavian law	52	.06	.24	0	1
German law	52	.08	.27	0	1

Table B: Data sources

Variable	Source
Informal sector	Friedman et al. (2000); Schneider and Enste (2000)
Corruption Perceptions Index	http://www.transparency.org
Ethnic, religious	Alesina et al. (2002)
Urban, infl9095	World Development Indicators (1999)
Legal variables	World Bank CAIRO dataset.
Government corruption, gini	Available through http://www.worldbank.org/research/
Marginal tax rates	Gwartney and Lawson (2000)
Latitude	Hall and Jones (1999)
Presidential system dummy	Beck et al. (2000)
Transition countries	Available through http://www.worldbank.org/research/

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