Altruism and crowding out in the provision of public goods: Cross-country evidence from blood donations

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Individual preferences for the provision of public goods range from purely altruistic to purely egoistic. In the context of blood, Titmuss (1971) famously argued that commercial blood would crowd out voluntary donations, implying that individual preferences were, at least, impurely altruistic. However, to date, the extent of crowding out in blood donations has been documented only by one Swedish experiment. Here, using WHO data on blood collections in 109 countries, I found that a 1% increase in incentivized blood collection was associated with reduction in voluntary donation of between 0.55%-0.71%. Also, the extent of crowding out was higher in countries with higher rates of HIV infection. The findings of crowding out were robust to differences in economic, institutional, cultural, and health conditions, as well as specification and data sources. They suggest that, from a cross-country perspective, individual preferences for the provision of blood are impurely altruistic.

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1. Introduction

Economists have long been interested in the private provision of public goods (Bergstrom et al. 1985). Individual preferences range from purely altruistic to purely egoistic (Andreoni, 1989 and 1990). Pure altruists care only about the total quantity of the public good, and individual contributions to increase the quantity of the public good would "crowd out" each other. By contrast, pure egoists care only about their personal contribution to the quantity of the public good, and there would be no crowding out. The intermediate case of "impure altruism" is associated with partial crowding out, i.e., between zero and 100%.

Generally, the empirical evidence points to some degree of crowding out. Past studies have considered the impact of government funding on private contributions to U.S. public radio (Kingma 1989), a survey of whether residents in a Swiss canton would accept storage of radioactive waste in their community (Frey and Oberholzer-Gee 1997), the impact of government funding on private contributions to non-profit social service providers (Payne 1998), and an experiment with monetary incentives in a Swedish blood collection centre (Mellstrom and Johannesson 2008).

The previous studies of crowding out in the provision of public goods were based on the experience and experiments in the U.S., Switzerland, and Sweden. Little is known about the issue under other economic, institutional, cultural, and health conditions.[1]

[1] In the context of a private good – family support in the South African homeland of Venta, Jensen (2004) found that government old-age pensions did crowd out contributions from children to their parents.

Here, using new data from the World Health Organization (WHO) and elsewhere, I report a cross-country study of the relation between incentivized (family/replacement or paid) blood collection and voluntary non-remunerated donation. I found that a 1% increase in incentivized blood collection was associated with reduction in voluntary donation of between 0.55%-0.71%. These findings were robust to differences in economic, institutional, cultural, and health conditions, as well as specification and data sources. In addition, I found evidence that the extent of crowding out was higher in countries with higher rates of HIV infection.

My results suggest that, across a range of economic, institutional, cultural, and health conditions, individual preferences for blood donations are impurely altruistic, resulting in partial crowding out. These results buttress inferences from studies of the provision of public radio, location of nuclear waste disposal, and blood donation in developed countries.

Besides contributing to the economics of the private provision of public goods, these results are of independent importance for public health policy. In developing countries, incentivized blood collection provides more than 50% of the blood supply (WHO 2007). To the extent of crowding out, laws and policies that allow or encourage incentivized collection would simply displace voluntary donation.

2. Background

Social psychology provides a fundamental explanation for crowding out: monetary payments reduce individual's intrinsic motivation to behave altruistically (Frey and Oberholzer-Gee 1997). Among people interviewed as to whether they would accept

storage of radioactive waste in their community, 50.8% agreed with no mention of compensation, but only 24.6% agreed when the same question was posed with mention of monetary compensation.[2] Consistent with this psychological theory, in a field experiment in Israeli day-care centers, the introduction of a fine for late attendance increased the number of parents arriving late (Gneezy and Rustichini 2000).

The empirical evidence on crowding out in the provision of public goods is relatively sparse. Contributions to U.S. public radio stations exhibited partial crowding out (Kingma 1989). In 1986, for every $10,000 increase in government funding, individual contributions were $1,350 lower, hence the net increase was $8,650. On a related but slightly different issue, in large U.S. radio markets, public broadcasting tends to crowd out commercial stations in the supply of classical music (Berry and Waldfogel 1999).

With regard to blood donations, various informal U.S. studies of the effect of rewards and incentives have been inconclusive (Piliavin and Callero (1991), pp. 12-15).[3] By contrast, a field experiment in Gothenburg, Sweden, revealed some crowding out (Mellstrom and Johannesson 2008). A total of 262 subjects were randomly assigned to three treatments: (i) donation without any compensation, (ii) payment of SEK 50 (Swedish kroner), and (iii) choice between SEK 50 payment and donation of SEK 50 to charity. Among men, there was no significant difference across the treatments, but,

[2] Responses to the interviews may have been biased by the sequence of the questions. Apparently, all respondents were posed the two questions in the same sequence. The repetition of the question with the addition of monetary compensation might have signaled to respondents that agreeing to the facility in response to the first question was the wrong answer.

[3] Most studies of blood collection, e.g., Piliavin and Callero (1991), focused on microscopic aspects such as personal characteristics and institutional procedures that influence collection. Healy's (2000 and 2006) studies are exceptions.

among women, there was significant crowding out: the monetary payment reduced the number of blood donors by almost half.

The previous studies of crowding out in the provision of public goods were based on the experience and experiments in the U.S., Switzerland, and Sweden. Little is known about the issue under different economic, institutional, cultural, and health conditions.

3. Data and Analysis

In 1998, the World Health Organization (WHO) initiated the Global Database on Blood Safety (GDBS). The GDBS is based on questionnaires to the WHO member states that are completed by the Ministry of Health or the organization with statutory responsibility for blood transfusion services.

The WHO published a summary of responses to the GDBS questionnaire for the year 2004 (WHO 2007). The questionnaire posed various questions regarding blood collection including the quantity of blood collected from voluntary non-remunerated, family/replacement, paid, and autologous sources in number of units and as a percentage of total collections.[4]

The WHO received responses to the questions on blood collection from 157 of 194 member countries. For each respondent, the WHO reported (i) total number of units collected per thousand population from voluntary non-remunerated, family/replacement,

[4] The questionnaire covered the period January to December 2004, or if 2004 information was not available, the period January to December 2003. Typically, one unit of blood ranges from 450 to 500 millilitres.

and paid sources,[5] and (ii) the percentage of total collection from voluntary non-remunerated sources. The average total collection was 16.81 units per thousand population, of which an average of 59.50% comprised voluntary non-remunerated donation.[6]

My second source was FIODS (International Federation of Blood Donor Organizations), which published total collections and the voluntary non-remunerated percentages for North and South American countries for an unspecified year, which I guessed to be 2001.

The WHO and FIODS reports did not separately identify the percentages of collections from family/replacement vis-a-vis paid sources. For brevity, I give the name "incentivized" collections to blood from family/replacement and paid sources. Accordingly, I constructed voluntary donations as total collections multiplied by the percentage of total collection from voluntary non-remunerated sources, and incentivized collections as total collections less voluntary donations. Some error in measurement was unavoidable as even European countries differed in their definition of "voluntary non-remunerated" (European Commission 2006).

I matched the WHO and FIODS data on blood collection with measures of income, institutions, culture, religion, and health from various sources including the World Bank, Hofstede (2001, 2007), the World Christian Database, and WHO. Table 1

[5] According to Dr Noryati Abu Amin of WHO, the total collection rate excluded autologous donations. However, the rate of autologous donations was generally very low.

[6] Typically, one unit of blood ranges from 450 to 500 millilitres.

reports summary statistics of the data, and Table 2 reports bivariate correlations. (I introduce the covariates in the following section.)

4. Analysis

Figure 1 plots the voluntary donation rate against the incentivized collection rate in the various countries. Evidently, in countries where incentivized collections were higher, voluntary donations were lower. This suggests that incentivized collections did "crowd out" voluntary donations. Figure 1 included many observations of economically advanced countries along the vertical (voluntary donor rate) axis, with zero incentivized collections. Among advanced countries, incentivized collections were positive only in the Czech Republic, Greece, and Poland.

Figure 2 depicts the relationship between voluntary and incentivized collections, excluding any country with zero incentivized collection, which reduced the coverage to 109 countries. Among these countries, the average voluntary donation was 5.08 units per thousand population, while the average incentivized collection was 5.32 units per thousand population. Crowding out – the negative relationship between incentivized collection and voluntary donation – was still evident.

It was important to confirm whether the evidence of crowding out was robust to national economic, institutional, cultural, and health differences. Accordingly, I applied least squares regression analysis with voluntary donations as the dependent variable. To avoid the results being confounded by possible laws and policies against incentivized collection, I limited the analysis to those countries with incentivized collection greater

than zero. As the empirical distribution of voluntary donations was left-skewed towards zero, I specified all variables except the constant in logarithms.

Previous microscopic studies systematically showed that individual blood donations increased with income (Healy 2000). Accordingly, in the first specification, I regressed voluntary donations on a constant, incentivized collections, and GDP per capita. Table 3, column (i), reports the results. Indeed, the coefficient of log(GDP per capita) was positive and significant, consistent with previous findings that, among individuals, donations increased with income. Further, the estimated coefficient of log(incentivized collection + 1) was -0.574 (±0.0948, $p = 0.0000$), which implied that a 1% increase in incentivized collections was associated with a 0.578% reduction in voluntary donations.[7] The explanatory variables collectively were highly significant ($F = 43.59$, $p = 0.0000$). The estimate provided strong evidence of crowding out.

Besides income, another economic factor that might possibly influence blood donations is the state of institutions. With regard to institutions, I considered the World Bank's indexes of "Rule of Law" and "Voice and Accountability" (Kauffman et al. 2007). These indexes are perceptual measures based on multiple sources and cover 191 countries.

Table 3, column (ii), report an estimate including the "Rule of Law" and "Voice and Accountability". With the additional variables, the coefficients of incentivized collections and GDP per capita were slightly smaller in absolute value, but still highly

[7] Using the formula derived in Table 3, note (b), and the average voluntary donation being 5.08 units per thousand population and the average incentivized collection being 5.32 units per thousand population.

significant. However, neither measure of institutions was significant, suggesting that institutions did not significantly influence blood donations.

Next, I investigated whether the evidence of crowding out was sensitive to national differences in culture and religion. Geert Hofstede (2001) famously developed four indexes of national culture from surveys of over 72,000 IBM employees in 40 countries between 1967–1973. The indexes were later extended to cover 66 countries and three regions (Hofstede 2007). The indexes measured individualism (and its complement, collectivism), power distance, masculinity, and uncertainty avoidance. Hofstede's indexes have been used in numerous academic studies of individual behaviour and business strategy.

The two dimensions of culture which seemed most relevant to blood donation were individualism and uncertainty avoidance.[8] "On the individualist side we find societies in which the ties between individuals are loose: everyone is expected to look after him/herself and his/her immediate family" (Hofstede 2007). "[U]ncertainty accepting cultures, are more tolerant of opinions different from what they are used to; they try to have as few rules as possible, and on the philosophical and religious level they are relativist and allow many currents to flow side by side" (Hofstede 2007).

Buddhism, Christianity, Islam, and other major religions encourage contributions to charity. Accordingly, blood donations ought to be higher among more religious populations. For a parsimonious specification, I used the percentage of atheists in the

[8] In a separate (unreported) regression, I confirmed that masculinity and power distance were not statistically significant in explaining voluntary blood donations.

national population rather than the percentages of the various religions. The data on religion were procured from the World Christian Database (2008).

Table 3, column (iii), reports an estimate including Hofstede's indexes of individualism and uncertainty avoidance. The sample was much reduced owing to the limited geographical coverage of Hofstede's indexes. Consistent with prediction, the coefficient of individualism was negative, but marginally significant. Blood donations tended to be lower in more individualistic countries. There was some evidence that donations were higher in countries that were more averse to uncertainty, but the result was not significant, perhaps because of the small sample. Importantly, regarding our key issue, the coefficient of incentivized collections was -0.711 (±0.157, $p = 0.0000$), suggesting that the crowding out effect was even larger than implied by the base estimate in Table 3, column (i).

Table 3, column (iv), reports an estimate including Hofstede's indexes of individualism and uncertainty avoidance as well as the percentage of atheists in the population. The sample was further reduced owing to the limited coverage of the data on religion. As predicted, donations decreased with the atheist percentage of the population. However, the result was not significant, probably because of the small sample. The coefficients of incentivized collection, GDP per capita, and individualism were similar to those in Table 3, column (iii).

Finally, I considered whether the evidence of crowding out was sensitive to national differences in health conditions. The risk of infection through blood transfusion is a serious issue. WHO (2008) highlighted various transfusion-transmissible infections,

the first of which was HIV. If the risk of infection is high, there would be more demand to procure blood from known sources such as family and friends and less demand for blood from unknown persons. More generally, the overall state of health might possibly affect blood donations. People in poorer health would be less able or willing to donate blood.

Table 3, column (v), reports an estimate including HIV prevalence and female life expectancy. I used female life expectancy as a proxy for the overall state of health in the country. Donations appeared to decrease with HIV prevalence (as expected) and female life expectancy (somewhat unexpected), but, neither coefficient was statistically significant. As for the main issue, the inclusion of the health co-variates tended to strengthen the crowding out effect relative to the base estimate in Table 3, column (i).

Overall, reviewing the various estimates in Table 3, the coefficient of log(incentivized collection + 1) ranged between -0.550 and -0.711, and was statistically significant in all specifications, implying that a 1% increase in incentivized collections was associated with a reduction in voluntary donations of between 0.554%-0.716%.[9]

Among the various specifications, I preferred the base specification (i). It was simple, included the largest number of countries, and provided coefficients for incentivized collection and GDP per capita towards the middle of their respective ranges among the various specifications.

5. Robustness

[9] Using the formula derived in Table 3, note (b), and the average voluntary donation being 5.08 units per thousand population and the average incentivized collection being 5.32 units per thousand population.

Mellstrom and Johannesson's (2008) field experiment revealed crowding out of blood donations among women but not men. With data from multiple countries, I could readily account for the impact of national differences in economic, institutional, cultural, and health conditions on crowding out.

For each of the specifications in Table 3, I also regressed a variation adding log(Incentivized collection +1) interacted with the focal covariate as an additional explanatory variable. The coefficient of this interaction term would capture any impact of the focal covariate on the extent of crowding out.

The interaction was significant in only one specification. Table 4, column (a), reports the results. The coefficient of the interaction between incentivized collections and the HIV infection rate was negative and significant. However, the coefficient of the HIV rate by itself was not significant.

The WHO (2008) has highlighted the risk of HIV transmission through blood transfusion. My results indicate that this risk affects blood donations mainly by increasing the extent to which incentivized collections crowd out voluntary donations. In countries with higher HIV infection, the pool of safe blood donors would be smaller, and apparently, the tightness in potential supply results in more crowding out. Further research would be necessary to identify the cause of this effect: whether it is because the people in relatively good health substitute more easily between voluntary donation and incentivized contribution, or because people in marginal health are accepted for voluntary donation but are not targeted for incentivized collection.

Given the policy importance of the extent of crowding out, it is important to verify the robustness of the estimates. Table 4, columns (b)-(e), reports various robustness tests using the base specification, with voluntary donations regressed on a constant, incentivized collection, and GDP per capita.

I first included Brazil and Uruguay, which were excluded from the Table 3 estimates, owing to apparent inconsistencies in the data. As reported in Table 4, column (b), inclusion of these two countries had little effect on the coefficients.

Next, I included all countries in the WHO data-set, including those with zero incentivized collections. As reported in Table 4, column (c), with the larger sample, the crowding out effect was slightly stronger.

One concern is that incentivized collections might possibly be endogenous, despite controls for economic, institutional, cultural and health factors.[10] There might still be another factor which had opposite effects on voluntary donations and incentivized collections, and so, would give rise to a negative relationship between voluntary donations and incentivized collections. Accordingly, I checked whether incentivized collections were endogenous.

Some possible instruments for incentivized collections might be the legality of commercial sale of blood, individualism, and the overall state of health. Referring to Table 2, legality was *negatively* correlated with incentivized collections and positively correlated with voluntary donations. The negative correlation between legality and

[10] The WHO published the data on blood collections for only one year – 2004, hence it was not possible to apply country fixed effects.

incentivized collections was surprising. Incentivized collections might be dominated by blood from family/replacement sources, but this would imply a weak correlation between legality and incentivized collections, not a negative correlation.

Referring to Table 2, individualism and female life expectancy (as a proxy for the overall state of health) looked promising as possible instruments – each was more strongly correlated with incentivized collections than voluntary donations. However, the relevant Hausman tests suggested that incentivized collections were not endogenous: in the second-stage regressions, the first-stage residuals with individualism as an instrument were only marginally significant ($p = 0.0932$), while those with female life expectancy as an instrument were not significant ($p = 0.3012$).[11]

Nevertheless, Table 4, column (d), reports a two-stage least squares (2SLS) estimate using individualism as an instrument. The coefficient of log(incentivized collection + 1) was -1.393 (±0.480, $p = 0.0064$), implying that a 1% increase in incentivized collections was associated with a 1.403% reduction in voluntary donations. This result seemed unreasonably large, which cast more doubt on the 2SLS specification. Overall, I preferred the base OLS specification.

Finally, Table 4, column (e), reports an estimate using the FIODS data for American countries. The results were remarkably similar to those from the base specification using the WHO data.

[11] Specifically, in the first-stage, I regressed incentivized collections on a constant, GDP per capita, and the possible instrument. In the second stage, I regressed voluntary donations on a constant, incentivized collection, GDP per capita, and the first-stage residuals.

5. Conclusions

Based on statistical analysis of blood collections in 109 countries, I found that a 1% increase in incentivized blood collection was associated with reduction in voluntary donation of between 0.55%-0.71%. Also, the extent of crowding out was higher in countries with higher rates of HIV infection. These findings were robust to national differences in economic, institutional, cultural, and health conditions.

The findings suggest that, individual preferences for blood donations are impurely altruistic, resulting in partial crowding out. Further, they suggest that the extent of crowding out varies with health conditions. They buttress conclusions from previous studies of the provision of public radio, location of nuclear waste disposal, and blood donation in developed countries.

In the specific context of blood supply, the findings provide a further justification, in addition to medical safety, for international and national efforts in favour of voluntary blood donations over incentivized collection. They are especially pertinent for developing countries, which rely on incentivized collection for more than 50% of the blood supply (WHO 2007). To the extent of crowding out, laws and policies that allow or encourage incentivized collection would simply displace voluntary donation.

The major limitation of my study was that the WHO did not separately report collections from family/replacement vis-à-vis paid sources. Family/replacement sources might exhibit substantially different motivations and behaviour from paid sources. However, the distinction between family/replacement and paid sources should not be over-stated. In South Asia, for instance, relatives and employees may be paid to donate

“replacement” blood (IFRCS 2000), which suggests that it might well be more accurate to aggregate collections from family/replacement and paid sources in any empirical analysis.

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Table 1: Summary statistics

		Source	Units	Count-ries	Min	Mean	Max	Std dev
1	Voluntary non-remunerated collection, 2004[(a)]	WHO	Units per '000 popn[(b)]	157	0.00	13.01	69.54	17.12
2	Incentivized collection, 2004	WHO	Units per '000 popn[(b)]	157	0.00	3.74	25.50	4.99
3	Voluntary non-remunerated collection	FIODS	Units per '000 popn[(b)]	29	0.00	1.53	7.87	2.03
4	Incentivized collection	FIODS	Units per '000 popn[(b)]	29	0.64	7.60	15.40	3.56
5	Legality of commercial sale	Seah (2008)		36	0.00	0.42	1.00	0.50
6	GDP per capita	World Bank	US$'000 at PPP (2005 prices)	176	259	10.906	69.452	12.917
7	Law and order	World Bank		192	-2.29	-0.08	2.03	0.99
8	Voice and accountability	World Bank		191	-2.19	-0.05	1.60	1.02
9	Individualism	Hofstede		77	6.00	42.32	91.00	22.88
10	Uncertainty avoidance	Hofstede		77	8.00	66.05	112.00	22.13
11	Atheist	World Christian Database	%	73	0.00	0.08	0.43	0.10
12	HIV prevalence	WHO	%	126	0.10	2.79	33.40	5.51
13	Female life expectancy	WHO	years	192	34.0	68.25	86.00	12.46

Notes:

(a) There were large discrepancies in the percentage of voluntary non-remunerated donations between the FIODS and WHO reports for Brazil (FIODS: 0% and WHO: 52%), and Uruguay (FIODS: 8% and WHO: 100%). I omitted these two countries from all analysis, except for one robustness check. For Trinidad and Tobago, the voluntary non-remunerated percentage was missing from the WHO report, so I imputed it from the FIODS report.

(b) Typically, one unit of blood ranges from 450 to 500 millilitres.

Table 2: Correlations

	1	2	5	6	7	8	9	10	11	12
1	1.00	0.30	0.14	0.84	0.55	0.31	0.35	0.20	-0.16	-0.27
2	0.30	1.00	-0.44	0.64	0.10	0.52	0.61	0.81	0.32	-0.14
5	0.14	-0.44	1.00	-0.26	0.08	-0.60	-0.10	-0.69	-0.48	-0.31
6	0.84	0.64	-0.26	1.00	0.64	0.71	0.57	0.53	0.24	-0.23
7	0.55	0.10	0.08	0.64	1.00	0.67	0.37	0.10	0.56	-0.38
8	0.31	0.52	-0.60	0.71	0.67	1.00	0.61	0.57	0.72	-0.09
9	0.35	0.61	-0.10	0.57	0.37	0.61	1.00	0.32	0.26	-0.03
10	0.20	0.81	-0.69	0.53	0.10	0.57	0.32	1.00	0.38	-0.16
11	-0.16	0.32	-0.48	0.24	0.56	0.72	0.26	0.38	1.00	-0.04
12	-0.27	-0.14	-0.31	-0.23	-0.38	-0.09	-0.03	-0.16	-0.04	1.00
13	0.33	0.46	-0.72	0.68	0.46	0.83	0.42	0.47	0.62	0.27

Notes:

(a) Variables as numbered in Table 1.

Table 3: Dependent variable: Log(Voluntary donation + 1)

Explanatory variable	(i)	(ii) institutions	(iii) culture	(iv) culture & religion	(v) health
Constant	1.133*** (0.132)	0.900*** (0.316)	-6.662*** (1.446)	-10.75** (4.224)	2.312 (3.668)
Log(Incentivized collection + 1)	-0.574*** (0.0948)	-0.550*** (0.0968)	-0.711*** (0.157)	-0.705*** (0.204)	-0.621*** (0.104)
Log(GDP per capita)	0.721*** (0.0606)	0.649*** (0.0925)	0.698*** (0.132)	0.796*** (0.266)	0.760*** (0.129)
Log(Law and order + 3)		0.0670 (0.453)			
Log(Voice and accountability + 3)		-0.350 (0.255)			
Log(Individualism)			-0.466* (0.238)	0.536* (0.314)	
Log(Uncertainty avoidance)			0.427 (0.299)	0.963 (0.732)	
Log(Atheists)				-0.134 (0.149)	
Log(HIV)					-0.0789 (0.0821)
Log(Female life expectancy)					-0.271 (0.919)
No. of observations	107	107	38	25	73
Adjusted R^2	0.446	0.451	0.613	0.589	0.471
F-statistic	43.59	22.74	15.65	7.87	17.01

***, **, * denote statistical significance at 1%, 5% and 10% respectively.

Notes:

(a) Voluntary donation and incentivized collection ranged as low as 0.00 and 0.05 units per thousand, hence were specified as the logarithm of the variable plus one. The Rule of Law and Voice and Accountability indexes ranged as low as -1.76 and -2.19 respectively, hence they were specified as the logarithm of the variable plus three.

(b) Generally, let V = voluntary donations and X = incentivized collections, and suppose that $\lg(V+1) = a + b\lg(X+1)$. Then

$$\frac{X+1}{V+1}\frac{d(V+1)}{d(X+1)} = \frac{d\ln(V+1)}{d\ln(X+1)} = b.$$

Now,

$$\frac{d(V+1)}{d(X+1)} = \lim\frac{[V+1+\delta V]-[V+1]}{[X+1+\delta X]-[X+1]} = \lim\frac{\delta V}{\delta X} = \frac{dV}{dX}.$$

Thus, the elasticity of V with respect to X is

$$\frac{X}{V}\frac{dV}{dX} = \frac{bX}{V}\frac{V+1}{X+1}$$

Table 4: Robustness Checks

Explanatory variable	(a) interaction	(b) including BR, UY	(c) all countries	(d) 2SLS	(e) FIODS data
Constant	1.271*** (0.166)	1.128*** (0.131)	1.183*** (0.0989)	1.883*** (0.536)	-3.742** (1.698)
Log(Incentivized collection + 1)	-0.751*** (0.126)	-0.568*** (0.0943)	-0.597*** (0.0659)	-1.393*** (0.480)	-0.590*** (0.148)
Log(GDP per capita)	0.810*** (0.107)	0.724*** (0.0606)	0.725*** (0.0351)	1.057*** (0.219)	0.653*** (0.187)
Log(HIV)	0.146 (0.113)				
Log(Incentivized collection + 1) * Log(HIV)	-0.169** (0.075)				
No. of observations	73	108	150	38	32
Adjusted R^2	0.507	0.444	0.725		0.474
F-statistic	19.50	43.73	197.6	12.84	14.96

***, **, * denote statistical significance at 1%, 5% and 10% respectively.

Figure 1. Voluntary donation vis-à-vis incentivized collection

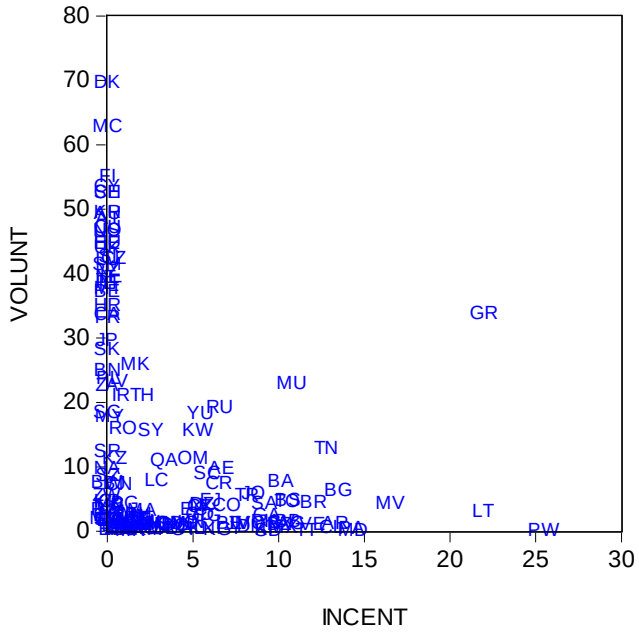

Figure 2. Voluntary donation vis-à-vis incentivized collection, countries with incentivized collection > 0