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A quantile-regression test of economic models of volunteer labor supply

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Abstract

We estimated quantile regressions on data of volunteers of the German Red Cross (GRC) to test the predictions of three economic models of volunteer labor supply: the public-goods model, the private-consumption model, and the human-capital model for volunteer labor supply. Results of earlier research show that the data are mainly consistent with predictions of the public-goods model. We go beyond earlier research in that we trace out how the explanatory power of the three economic models changes across the quantiles of the conditional distribution of volunteer labor supply.

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1. Introduction

Three classes of economic models of volunteer labor supply have emerged from the literature on the economics of volunteering (Ziemek 1999, Emrich and Pierdzioch 2015, among others): the public-goods model (e.g., Roberts 1984), the private-consumption model (e.g., the "impure altruism" model studied by Andreoni 1990), and the human-capital model (Menchink and Weisbrod 1987). The public-goods model stipulates that volunteers contribute to and derive utility from the total supply of a public good. Altruism is a main motive for volunteer work because not only ones own utility but also the utility of others increases when the contribution of a volunteer increases. Furthermore, because volunteers are interested only in the total supply of a public good, their labor supply is negatively correlated with the labor supply of others. The private-consumption model assumes that volunteers only derive utility (spending leisure time in a worthwhile manner, etc.) from their own labor supply, and not from the contributions of others. There is no cross-sectional correlation between the labor supply of volunteers. The human-capital model stipulates that volunteering is a means of generating future labor income because volunteering helps to acquire job-market skills and to build social networks, which should be easier in larger communities. The contributions of volunteers are complements rather than substitutes.

Being an altruist is easier if a volunteer spends few hours and not much effort on volunteering. Being an altruist is harder if volunteering takes a lot of time and effort. Moreover, a volunteer who supplies much labor most likely supplies more labor than other volunteers because the public-goods model emphasizes the substitutability of volunteer labor supply. In other words, the labor supply of other volunteers should fall as a volunteer increases effort and this inverse link, at some point, is likely to foster disappointment and discontent. Hence, we hypothesize that the public-goods model strongly describes volunteer labor supply of those who volunteer only a few hours per week.

If private-consumption motives are an important determinant of volunteer labor supply, then the marginal utility of volunteering is likely to decline rapidly as a volunteer increases labor supply. For example, the marginal utility a status-seeking volunteer derives from being elected or appointed to a volunteer position should mainly depend on holding a position rather than on spending much time and effort on doing volunteer work. Similarly, if the private benefit from volunteering is mainly to facilitate use of the services of a volunteer organisation by family members the marginal utility of supplying labor should rapidly decrease. While a similar rapid decrease perhaps is not at work as far as other private-consumption motives like meeting other volunteers or spending leisure time in a worthwhile manner are concerned, we hypothesize that the private-consumption model mainly describes the labor supply of volunteers who work only a few hours per week.

A volunteer who seeks to accumulate human capital does not benefit a lot from supplying one or two hours per week. Job-market skills are likely to improve if a volunteer spends much time on volunteering, possibly working on different tasks. Hence, the marginal

utility from volunteer labor supply is likely to decrease relatively slowly for a volunteer who sees volunteer work mainly as a means to accumulate human capital. Similarly, building social networks depends on a volunteer's capability of building trust, signalling competence, and putting reciprocity norms into practice, requiring that a volunteer spends at least a minimum of time and effort on his or her volunteer work. We hypothesize that the human-capital model works best for those volunteers who spend much time on their volunteer work.

Our hypotheses imply that the explanatory power of the three economic models should vary across the conditional distribution of volunteer labor supply. The explanatory power of the public-goods model and the private-consumption model should decline for the upper quantiles of the conditional distribution of volunteer labor supply, while the explanatory power of the human-capital model should strengthen for the upper quantiles.

2. A quantile-regression model of volunteer labor supply

We reanalyzed the data on volunteers of the German Red Cross (GRC) studied by Emrich and Pierdzioch (2015) by means of a quantile-regression model (Koenker and Bassett 1978, Koenker 2015).[1] The dependent variable is volunteer labor supply measured in (log) hours per week (*hpw*). The main explanatory variables are the motives for doing volunteer work: altruistic motives (*pgm*, public-goods model), consumption motives (*pcm*, private-consumption model), and human-capital motives (hcm, human-capital model). We studied both self-attributed motives ("I volunteer because...") and other-attributed motives ("I think that others volunteer because..."). The latter proxy for the perceived motives of other volunteers, interpreted to represent the perceivd labor supply of others. We have the model

$$\mathbf{b}_q^* = \arg\min_{\mathbf{b}_q} \sum_i \rho_q(hpw_i - \mathbf{X_i b}_q), \tag{1}$$

where $\mathbf{X_i b_q} = b_{0,q} + b_{1,q} pgm_i^s + b_{2,q} pgm_i^o + b_{3,q} pcm_i^s + b_{4,q} pcm_i^o + b_{5,q} hcm_i^s + b_{6,q} hcm_i^o + z_i$, z_i = control variables, i = volunteer index, s/o = self-/other-attributed motives, $q \in (0, 1)$ for the quantiles, $\rho_q(u) = u(u - \mathbf{1}(u < 0))$ is the check function, and $\mathbf{1}$ = indicator function.

If the data support the public-goods model, we should observe $b_{1,q} > 0$ and $b_{2,q} < 0$ (substitutability). Moreover, if the data support our hypotheses, such that the model best describes the labor supply at lower quantiles, we should observe $b_{1,q'} > b_{1,q}$ for $q' < q$. If the data are consistent with the private-consumption model, we expect $b_{3,q} > 0$ and

[1] It should be noted that the GRC is an altruistic resource pooling that produces services mainly for nonmembers. Volunteer labor supply in group-egoistic resource poolings like, for example, sports clubs may react in a different way to the various motives for volunteering. Quantile-regression techniques can be a useful tool to analyze volunteer labor supply also in such volunteer organisations.

$b_{4,q} = 0$ (no spillover effect). Given our hypotheses, we further expect $b_{3,q'} > b_{3,q}$ for $q' < q$ if the model mainly describes the labor supply of volunteers who work only a few hours per week. Finally, if the data are consistent with the human-capital model, we expect $b_{5,q} > 0$ and $b_{6,q} > 0$ (complementarity). If the model works best for the upper quantiles of the conditional distribution of volunteer labor supply then we expect, in line with our hypotheses, $b_{5,q'} > b_{5,q}$ for $q' > q$.

3. Empirical analysis

Emrich and Pierdzioch (2015) describe the data in detail. The data were collected in April / May 2013 by means of an online questionnaire study. Data for $N = 1,647$ volunteers (32% females) are available for the analysis. Volunteer labor supply exhibits a wide variation across volunteers (mean = 8.9 hours per week, median = 7 hours, standard deviation = 7.1 hours).[2] Volunteers could rank their motives along several dimensions, in each case on a five-point scale from "unimportant" to "very important". For every volunteer, and for self-attributed motives and other-attributed motives, the various dimensions were then condensed to an index of public-goods motives, an index of private-consumption motives, and an index of human-capital motives. Every index can assume values in the interval from 0.2 to 1, where a larger value implies that a motive is important.[3] We use as control variables the proportion of friends working for the GRC, a volunteer's degree of religiosity, the interest in politics, and hours spent per week on an income-generating job.[4] Musick and Wilson (2008) survey the literature on the correlates of volunteering.

Supporting the public-goods model, the coefficient of the self-attributed public-goods motive is significant, there is a substitutability with other-attributed public-goods motives, and the coefficient of the self-attributed motive is smaller for the upper quantile (Table 1). The data support the private-goods model insofar as the coefficient of the other-attributed private-consumption motives is insignificant. The coefficient of the self-attributed private-consumption motive is significant and positive for the lower quantile. The human-capital

[2]The number of observations differs from the number of observations ($N = 1,678$) studied by Emrich and Pierdzioch (2015) because, as suggested by a reviewer, we deleted data of volunteers who answered that they would work more than 40 hours per week for the GRC from our sample.

[3]Other-attributed motives represent the perceived labor supply of others and also help to control for a social-desirability bias. This bias arises when respondents answer questions in a way that can be viewed favorably by others (that is, overreporting "good" motives and underreporting "bad" motives). It should also be mentioned that slight changes in the allocation of motive items to the economic models (for example, the motive "to improve one's standing within the GRC"' was reallocated from the HCM to the PCM category) leave the results qualitatively unchanged.

[4]Among the participants of the survey (not all of them were included in the analysis because not all participants provided data on motives/control variables), 42% work in the service sector (health sector, banking industry, etc.), 37% in the industrial sector, 11% in the handcraft sector, and 10% in other sectors.

Table 1: Baseline Results

Quantile	0.2	SE	0.5	SE	0.8	SE	OLS	SE
Constant	-0.465*	0.272	0.148	0.290	1.107***	0.294	0.372*	0.198
Friends	0.230***	0.027	0.213***	0.027	0.159***	0.033	0.215***	0.019
Reliogosity	-0.072***	0.025	-0.061**	0.027	-0.043	0.026	-0.058***	0.018
Politics	0.096***	0.032	0.131***	0.033	0.089**	0.039	0.103***	0.024
Job	0.004*	0.002	0.007***	0.002	0.008***	0.002	0.006***	0.002
PGM (s)	1.512***	0.280	1.440***	0.299	0.829***	0.239	1.074***	0.194
PGM (o)	-0.815***	0.233	-0.863***	0.243	-0.558**	0.243	-0.760***	0.178
PCM (s)	0.766***	0.279	0.459	0.285	-0.266	0.343	0.305	0.205
PCM (o)	-0.291	0.360	-0.459	0.416	-0.050	0.453	-0.199	0.274
HCM (s)	0.316	0.196	0.243	0.158	0.336*	0.185	0.186	0.134
HCM (o)	-0.314	0.235	0.048	0.263	0.457*	0.278	0.080	0.164
R^2		0.112		0.106		0.066		0.154

Note: Friends = proportion of friends in the GRC, Reliogisty = degree of religiosity, Politics = interest in politics, Job = time spent on a job. PGM/PCM/HCM = public-goods/private-consumption/human-capital motive. s/o = self-/other-atributed motive, SE = bootstrapped standard error (500 simulations). $R^2 = 1 - L^f/L^b$ (Koenker and Machado 1999), where L^f = loss under the full model, L^b = loss under a model that features only a constant. OLS = ordinary-least squares. For OLS, R^2 is the adjusted coefficient of determination. We used R (R Core Team 2015) and the R package "quantreg" (Koenker 2013).

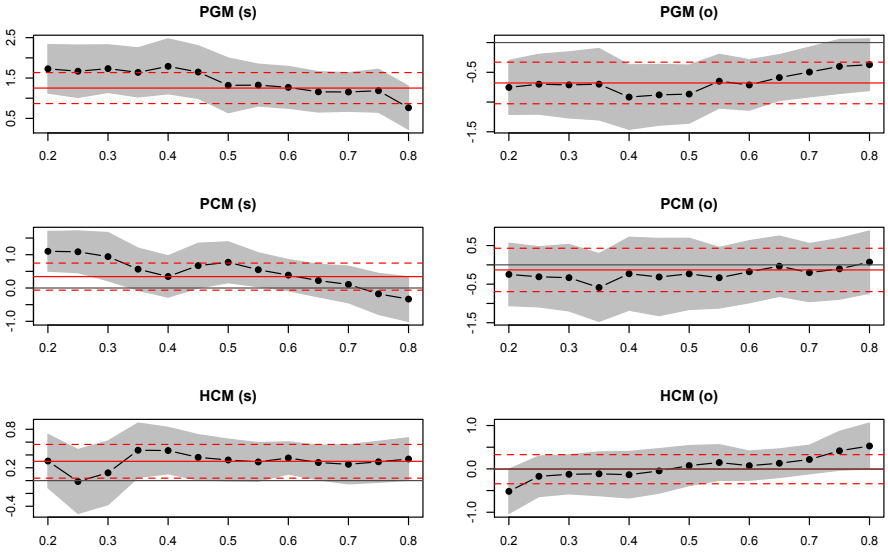
model receives some support for the upper quantile, where a weakly significant positive coefficient and a weak complementarity between self-/other-attributed motives can be observed. The results for an OLS model also summarized in Table 1 show that the coefficients of the public-goods motives are significant and in between the estimates of the quantile-regression coefficients. The coefficients of the private-consumption and the human-capital motives are insignificant. Hence, an analysis of the quantiles of the conditional distribution of volunteer labor supply offers insights that an OLS model does not recover.[5]

A larger proportion of friends in the GRC is positively correlated with volunteer labor supply. The correlation with the "interest in politics" is positive and significant. Reliogosity is negatively correlated with volunteer labor supply. Perhaps religous volunteers prefer to allocate a comparatively larger proportion of their time to doing volunteer work in religious organisations. The correlation with hours worked in the labor market is positive, consistent with the view that having a job fosters social inclusion and increases volunteer labor supply.

For male volunteers (Figure 1), the coefficients of self-/other-attributed public-goods motives are significant. They have opposite signs (substitutability). The coefficient of the self-attributed public-goods motives is smaller for the upper quantiles. The coefficient of the self-attributed private-consumption motives is significant for the lower quantiles. There

[5]The OLS results are qualitatively similar to the results reported by Emrich and Pierdzioch (2015), Table 4. They report results for males and female volunteers separately.

Figure 1: Results for Male Volunteers ($N = 1,117$)



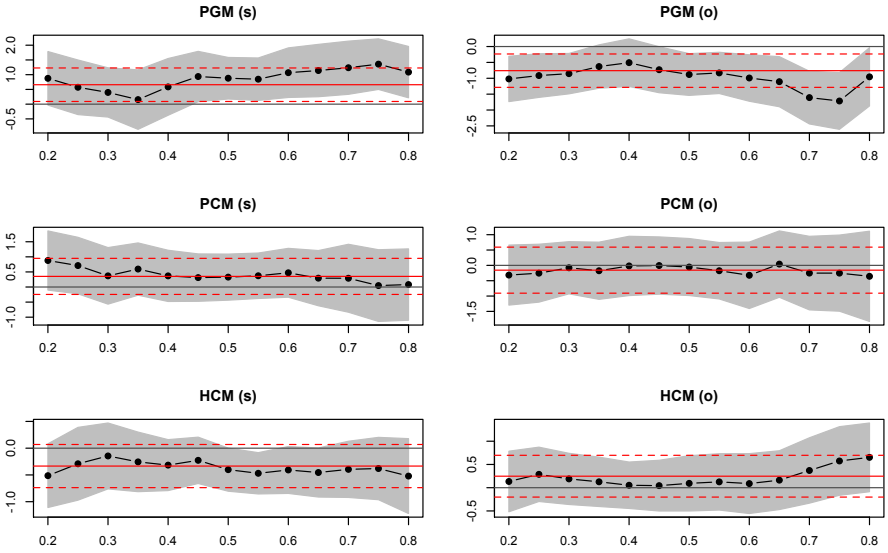
Note: Shaded areas = 90% confidence intervals. Dotted-dashed line = quantile-regression estimates. Straight horizontal lines = least-squares estimates. Control variables not shown.

is no spillover effect. The coefficient of the self-attributed human-capital motives becomes weakly significant at some of the uper quantiles and there is weak evidence of a complementarity for the upper quantiles. For female volunteers (Figure 2), the coefficients of the self-/other-attributed public-goods motives have the expected signs, but the coefficient of the self-attributed motives is insignificant for the lower quantiles and increase for the upper quantiles. The coefficients of the self-/other-attributed private-consumption motives are insignificant. The coefficient of the self-attributed human-capital motives is hardly significant. The coefficient of other-attributed human-capital motives slightly increases for the upper quantiles.

4. Summary and concluding remarks

The correlation of altruistic motives with volunteer labor supply is weaker for the upper quantiles of the conditional distribution of volunteer labor supply. In line with the public-goods model, we observe a substitutability with the labor supply of others. Private-consumption motives mainly affect the labor supply of volunteers in the lower quantiles, and there is no spillover effect from other-attributed motives. The human-capital motive is weakly correlated with volunteer labor supply for the upper quantiles. There is some evidence of a complementarity for the upper quantiles. The results for female volunteers are more mixed than for males, but the number of observations is smaller than for male volunteers.

Figure 2: Results for Female Volunteers ($N = 530$)



Note: Shaded areas = 90% confidence intervals. Dotted-dashed line = quantile-regression estimates. Straight horizontal lines = least-squares estimates. Control variables not shown.

Volunteering can be interpreted as a process of search (Schiff 1980), and our results indicate that different types of volunteers search for volunteer positions with rather different demands of time. Hence, a large volunteer organization like the GRC needs to develop differentiated recruiting and communication strategies to contact volunteers interested in positions characterized by different demands of time. A campaign that stresses that volunteering renders it possible to accumulate specific knowledge and skills is likely to attract different types of volunteers than a campaign that stresses that there is a general crisis of voluntary engagement and that everybody is needed.

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