Not all incentives wash out the ‘warm glow’: The case of Blood Donation revisited

Abstract

The issue of the nature of the altruism inherent in blood donation and the perverse effects of financial rewards for blood and/or organ donation has been recently revisited by the economics literature. As Titmuss (1970) famously pointed out, providing incentives to blood donors may crowd out blood supply as purely altruistic donors may feel less inclined to donate if a reward is involved. Most of the recent papers analyse the impact that financial rewards have on blood and organ donation. We take a different perspective and a novel approach to analyse this issue. We aim to answer two questions: First, whether donors and non-donors’ have different preferences towards incentives for blood donation. Second, if different types of incentives have the same effect on willingness to donate. We use data from the 2002 Eurobarometer, representative sample of 15 European countries, to estimate two different simultaneous equations systems and an ordered probability model with binary endogeneous switching. Our results indicate that donors and non-donors’ preferences differ. Also, we find that while monetary rewards may crowd-out blood donation, non monetary rewards may not have the same effect.

1. Introduction

Blood donation is a often envisaged as a clear-cut example of ‘altruism with non-monetary pay-offs’ (Elster 1990). Altruism normally has to do with giving money without a specific self-interested reason (Etzioni 1988). Similarly as money, blood is a scarce good which might be voluntarily given to an anonymous recipient.

Nevertheless, once the initial difficulty in understanding how consent to a wealth transfer could be granted without appearing to receive anything in return was overcome, the impasse in thought was rapidly overcome. The act of gift giving is unique, in that it contains characteristics of both command and market economies. On the one hand, the donor is similar to a central planner in that she alone has the power to determine what resources should be offered, to whom they should be offered, and under what circumstances the transfer is to take place.

Most donors will give some altruistic reason for giving, often citing feelings of community attachment or some commitment to the common good as their motive (Healy, 2000).

The understanding of the act of giving stands among the main motivations behind the organisation of modern societies. Methodologically, stands in the boundaries of the economic discipline as far as the act of exchange is grounded on a variety of motivations that determine human social psychology, which are in turn largely determined by the current formal and informal norms guiding the behaviour of human being as 'social animals'. However, disentangling the embeddings of such norms is largely subject to the scrutiny of empirical analysis.

Gift-giving in theory is envisaged as an act immune to strategic behaviour of giving agents although giver individuals (Kolm, 2000)[1]. Giver individuals must care about the receivers utility rather than pure self-interest benefits. Thus, interaction between giver and receiver are the primary focus of interest and likely to be guided by notions of fairness and social cohesion when the giver sees others as themselves and this has emphatic feelings of social equality – a in the sense of equal treatment of equals in similar situations-. On the other hand, some altruistic behaviour takes place as a result of expected social reciprocity with other individuals resulting from duty and human rights among others, in addition to self-interested motivations (e.g., feeling of being a good person). Indeed, because human being live in an uncertain world, altruism might be envisaged as a form of preventing self-interest behaviour in certain circumstances that could harm individuals in the future if they were in need. Accordingly, time preference is likely to influence altruistic behaviour, in that the view of future needs might be highly weighted by individuals valuing the 'future' as opposed to those valuing immediate self gratification. On the other hand, altruism might result for a feeling of reciprocity resulting from having been previously given to themselves something as a form of social or moral indebtedness. Finally, altruism might result from imitation of others behaviour, especially of those individuals who are signalled in society as 'reference groups'.

From a theoretical standpoint, the influence of altruism inevitably leads to the expansion of the simplistic individual utility function to include process utility benefits and other peoples utility rather than a pure 'consequencislistic' utility function. Social sentiments and emotions towards some societal information on the need of some scarce sources such as blood are likely to

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[1] Kolm, S.C (2000). Introduction: The Economics of Reciprocity, Giving and Altruism. In Gerard-Varet, L.A, Kolm, S.C and Mercier Ythier, J (eds). The Economics of Reciprocity, Giving and Altruism. International Association Series, McMillan, New York, US, pp 1-46.

motivate attitudes towards giving as part of social interactions. Therefore, let i, j denote individuals, and let the non-decreasing utility function such that:

$$u_i = v_i + \sum_{j \neq i} a_{ij} v_j$$

In economic terms , blood donation as any other donation is an economic (and voluntary) transfer as far as implies some sacrifice for the given in exchange of a benefit for the receiver which the receiver is not obliged to comply with. Blood donation is encapsulated in the so-called 'collective give-giving' where the assumption underlying is that the reasons for donation are similar across individuals. In the famous work by Titmuss (1971), he reported evidence that market mechanisms for blood donation are not only ethically superior but more efficient. Indeed, according to Titmuss (1971)[2] hepatitis rates from blood transfusions significantly decreased when the blood was donated rather than purchased, which was explained by the fact that donors who are not paid for blood have not incentive to hide an illness which lead to a higher quality of blood in such systems. Moreover, a financial reimbursement for blood donation could induce those who are more 'in need' for money to oversupply, eliciting a 'new supply from non-altruistic individuals' which are in turn likely to be less healthy . On the other hand, reimbursement for blood would reduce the altruistic motivations behind individuals blood donation behaviour, producing a decline in supply in those individuals. This feature lead to Arrow's (1972)[3] response stating that rather than being this an evidence of an inefficient system in the US as compared to Britain, this results from the asymmetry of information in the blood donation markets and in addition, he questioned the 'substitution' from altruists to non-altruists. Moreover, Kessel (1974)[4] questioned that market mechanisms do not provide guarantees for blood quality , in that market mechanisms could be accompanied by screening techniques to ensure the product liability. Interestingly, in Thorne (2000)[5] it is presented a discussion on the effects of co modification of products that are market-inalienable which is envisaged to affect the efficiency of such market and make inextricably more efficient other alternative mechanisms to that of markets based on exhortation to donors who are averse to co modification.

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[2] Titmuss, R (1971). Th Gift Relationship: From Human Blood to Social Policy. London, Allen and Unwin.

[3] Arrow, K.J (1972). Gift and Exchanges. Philosophy and Public Affairs, vol 1, pp 343-362.

[4] Kessel, R.A (1974). Transferred Blood, Serum Hepatitis and the Coase Theorem . *Journal of Law and Economics*, 17: 265-289.

[5] Thorne, E.D (2000). The Common Property Nature of Market-Inalinability. In Gerard-Varet, L.A, Kolm, S.C and Mercier Ythier, J (eds). The Economics of Reciprocity, Giving and Altruism. International Association Series, McMillan, New York, US, pp 47-77.

2. The methods

Simultaneous Equations Model with Mixed Binary-Ordered Endogenous Variables

We estimate a simultaneous equations model with two endogenous variables: binary donation (y_1) and ordinal money reward (y_2). We also estimate a second model with binary donation and binary 'non monetary reward' as a special case. The model is characterized by the structural equations for the corresponding latent variables (y_1^* and y_2^*):

$$y_1^* = \gamma_1 y_2^* + x'\beta_1 + z'\alpha_1 + u_1 \tag{1}$$

$$y_2^* = \gamma_2 y_1^* + x'\beta_2 + w'\alpha_2 + u_2 \tag{2}$$

where x, z, and w are vectors of exogenous variables, $\alpha_1, \alpha_2, \beta_1$ and β_2 are conformable parameter vectors, and γ_1 and γ_2 are scalar parameters. The reduced-form equations are

$$y_1^* = h'\theta_1 + v_1 \tag{3}$$

$$y_2^* = h'\theta_2 + v_2, \tag{4}$$

where $h = [x', w', z']'$, and θ_1 and θ_2 are vector functions of the structural parameters $(\alpha_1, \alpha_2, \beta_1, \beta_2, \gamma_1, \gamma_2)$ in (1) and (2). Assume the error terms are distributed with zero means and unitary variances, then the composite error vector $v = [v_1, v_2]' = Au$ is distributed as bivariate normal with zero means, variances $[\omega_1^2, \omega_2^2]'$, correlation τ, and covariance matrix[6]

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[6] This error distribution is specified for the donation-other reward system. For the donation-money reward system, error distribution is specified on the error terms of the reduced forms equations instead. That is, the error terms (v_1, v_2) are assumed to be distributed with zero means, unitary variances, and correlation ρ. This corresponds to the error covariance matrix with $A = I_2$ and $\omega_1 = \omega_2 = 1$ in (5). This is the only way to make it work. The other error distribution produced poor results (insignificant error correlation and coefficients for the latent variables (y_1^* and y_2^*) on the RHS).

$$\Omega = \begin{bmatrix} \omega_1^2 & \tau\omega_1\omega_2 \\ \tau\omega_1\omega_2 & \omega_2^2 \end{bmatrix} = A\Sigma A' \tag{5}$$

such that

$$A = \frac{1}{1-\gamma_1\gamma_2}\begin{bmatrix} 1 & \gamma_1 \\ \gamma_2 & 1 \end{bmatrix}$$

Observed binary variable y_1 and ordinal variable y_2 relate to their latent counterparts such that

$$\begin{aligned} y_1 &= 1 \quad \text{if} \quad h'\theta_1 + v_1 > 0 \\ &= 0 \quad \text{if} \quad h'\theta_1 + v_1 \leq 0 \end{aligned} \tag{6}$$

$$y_2 = j \quad \text{if} \quad \mu_{j-1} \leq h'\theta_2 + v_2 < \mu_j, \ \ j = 1,\ldots,J \tag{7}$$

where the threshold parameters are parameterized such that $\mu_0 = -\infty, \mu_1 = 0, \mu_J = \infty$ and $\mu_2,\ldots,\mu_{J-1}$ are estimable. Then, the sample likelihood function for an independence sample is

$$L = \prod_{\text{All}} \prod_{j=1}^{J} \left\{ \Pr[y_1 = 0, y_2 = j]^{1-y_1} \Pr[y_1 = 1, y_2 = j]^{y_1} \right\}^{1(y_2 = j)} \tag{8}$$

where $1(A)$ is a binary indicator function which equals 1 if event A holds and 0 otherwise. The likelihood function for an independent sample is the product of likelihood contributions over the sample. To provide further estimation details on the likelihood contribution (8), define a bivariate CDF $F(w_1, w_2) = \Pr(W_1 \leq w_1, W_2 \leq w_2)$ with margins $F_1(w_1) = \Pr(W_1 \leq w_1)$ and $F_2(w_2) = \Pr(W_2 \leq w_2)$. Then, the likelihood contributions (probabilities) in (8) for the two distinctive sample regimes are

$$\begin{aligned} \Pr(y_1 = 1, y_2 = j) \ &= \ F\left(\frac{\infty - h'\theta_1}{\omega_1}, \frac{\mu_j - h'\theta_2}{\omega_2}; \tau\right) - F\left(\frac{\infty - h'\theta_1}{\omega_1}, \frac{\mu_{j-1} - h'\theta_2}{\omega_2}; \tau\right) \\ &\quad - F\left(\frac{0 - h'\theta_1}{\omega_1}, \frac{\mu_j - h'\theta_2}{\omega_2}; \tau\right) + F\left(\frac{0 - h'\theta_1}{\omega_1}, \frac{\mu_{j-1} - h'\theta_2}{\omega_2}; \tau\right) \\ &= \ F_2\left(\frac{\mu_j - h'\theta_2}{\omega_2}\right) - F_2\left(\frac{\mu_{j-1} - h'\theta_2}{\omega_2}\right) \\ &\quad - F\left(\frac{0 - h'\theta_1}{\omega_1}, \frac{\mu_j - h'\theta_2}{\omega_2}; \tau\right) + F\left(\frac{0 - h'\theta_1}{\omega_1}, \frac{\mu_{j-1} - h'\theta_2}{\omega_2}; \tau\right) \end{aligned} \tag{9}$$

The probability for $\Pr(y_1 = 0, y_2 = j)$ is similar, with integration limits (0,∞) in (9) replaced with (–∞,0).

Because distributional assumptions are known to be important in discrete response modeling (e.g., Horowitz 1993, p. 70), we extend this framework to one with non-Gaussian error distributions. To allow skewness in the distribution of the error vectors $[v_1, v_2]'$, each of the bivariate CDFs (i.e., $G(\cdot,\cdot)$) in (9) is specified as a copula (Nelsen, 2006). For brevity we present only the bivariate Gaussian copula,[7] which is the preferred copula for the current application as a result of model specification tests. The copula representation for the bivariate CDF of (v_1, v_2) is

$$C(F_1, F_2; \tau) = \Phi_2[\Phi^{-1}(F_1), \Phi^{-1}(F_2); \tau] \quad (10)$$

where F_1 and F_2 are the margins and τ is the correlation parameter measuring the association between the two random variables. This is the distribution function used by Lee (1983), not called copula at the time, in developing sample selection models with non-normal error distributions. To demonstrate the copula approach in the current context, the third bivariate probability in (9) is

$$F\left(\frac{0 - h'\theta_1}{\omega_1}, \frac{\mu_j - h'\theta_2}{\omega_2}; \tau\right) = \Phi_2\left\{\Phi^{-1}\left[F_1\left(\frac{0 - h'\theta_1}{\omega_1}\right)\right], \Phi^{-1}\left[F_2\left(\frac{\mu_j - h'\theta_2}{\omega_2}\right)\right]; \tau\right\}. \quad (11)$$

The other bivariate probabilities in (9) are similar, with slightly different integration limits. We consider two forms of marginal distributions for each of F_1 and F_2. The first is the generalized log-Burr CDF for standardized random variable t (Burr, 1942)

$$F_t(t; \kappa_t) = 1 - (1 + \kappa_t e^t)^{-1/\kappa_t}, \; -\infty < t < \infty. \quad (12)$$

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[7] A copula, denoted $C(v_1, v_2) = C[F_1(v_1), F_2(v_2)]$, is a dependence function that can be used to generate joint distributions of random variables V_1 and V_2 with specific margins $F_1(v_1)$ and $F_2(v_2)$. Besides the Clayton copula, we also use the Gaussian, Frank, and Gumbel copulas (Nelsen, 2006) which are all capable of accommodating error skewness beyond that accommodated by the margins.

The generalized log-Burr distribution includes the logistic ($\kappa_t = 1$) and extreme value ($\kappa_t \to 0$) distributions as special cases. We also consider the better known Gaussian (standard normal), in which case the bivariate probability in (11) reduces to the standard bivariate normal probability

$$F\left(\frac{0-h'\theta_1}{\omega_1},\frac{\mu_j-h'\theta_2}{\omega_2};\tau\right)=\Phi_2\left(\frac{0-h'\theta_1}{\omega_1},\frac{\mu_j-h'\theta_2}{\omega_2}\right) \tag{13}$$

and the likelihood function corresponds to that of the bivariate ordered probability model considered by Butler and Chatterjee (1997) and Calhoun (1989).

We calculate marginal effects of explanatory variables on the following probabilities:

$$\Pr(y_1=1)=1-F_1\left(\frac{0-h'\theta_1}{\omega_1}\right) \tag{14}$$

$$\Pr(y_2>0)=1-F_2\left(\frac{0-h'\theta_2}{\omega_2}\right) \tag{15}$$

$$\Pr(y_1=1\,|\,y_2>0)=\frac{\Pr(y_1=1,y_2>0)}{\Pr(y_2>0)} \tag{16}$$

$$\Pr(y_2>0\,|\,y_1=1)=\frac{\Pr(y_1=1,y_2>0)}{\Pr(y_1=1)} \tag{17}$$

where

$$\Pr(y_1=1,y_2>0)=\Pr(y_1=1)-\Pr(y_1=1,y_2=0) \tag{18}$$

Also of interest is the (marginal effects on the) mean of money reward, conditional on donation:

$$\begin{aligned}&E(y_2\,|\,y_1=1)\\&=\Pr(y_2=1\,|\,y_1=1)M_1+\Pr(y_2=2\,|\,y_1=1)M_2+\Pr(y_2=3\,|\,y_1=1)M_3\\&=\sum_{j=1}^{3}\Pr(y_2=j\,|\,y_1=1)M_j\end{aligned} \tag{19}$$

where M_j is the monetary value associated with category j of y_2, and

$$\Pr(y_2=j\,|\,y_1=1)=\Pr(y_1=1,y_2=j)/\Pr(y_1=1) \tag{20}$$

such that $\Pr(y_1=1,y_2=j)$ is given in (9) and $\Pr(y_1=1)$ in (14).

3. Results

From the tables attached.

4. Conclusion

Monetary rewards are negatively correlated with donation but non-monetary rewards are not

To deal with blood shortages, policies geared towards the provision of non-monetary incentives should be implemented.

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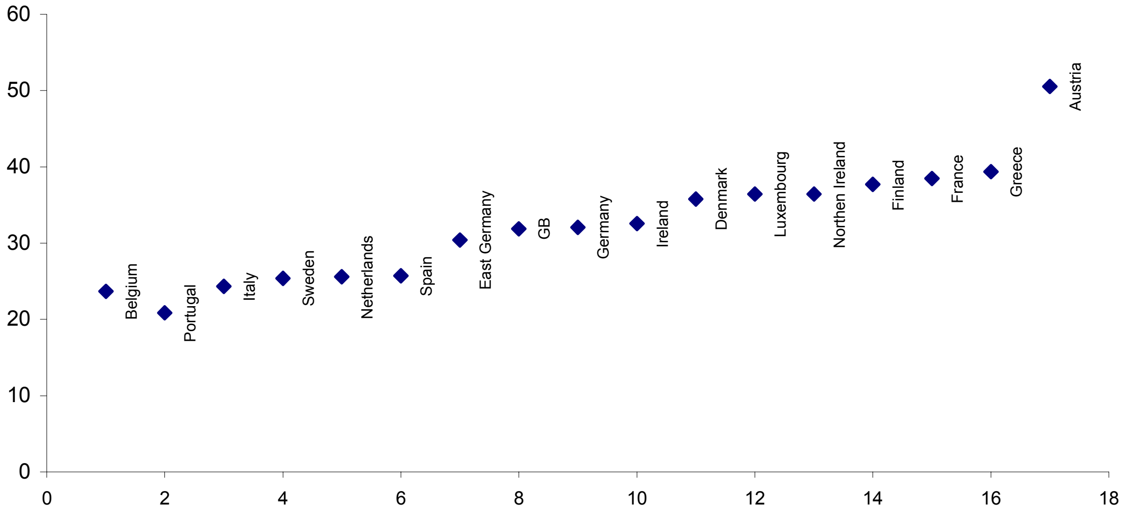
Figure 1. Have you ever given blood?



Source: Eurobarometer 58.2.

Table 1. Maximum-Likelihood Estimates of Ordered Probability Model of Monetary Reward with Binary Endogenous Switching: Clayton Copula with Gaussian Margins

	Switching Equation: Blood Donation		Money Reward: Donors		Money Reward: Non-Donors	
Variable	Estimate	S.E.	Estimate	S.E.	Estimate	S.E.
Constant	−0.822***	0.177	−0.578***	0.180	−2.102***	0.226
log(Income / 1000)	−0.107	0.057	−0.052	0.059	0.037	0.069
Age / 10	0.102***	0.012	0.066***	0.015	0.053***	0.020
Male	0.249***	0.030	0.281***	0.036	0.245***	0.048
High school	0.275***	0.040	0.287***	0.048	0.187***	0.063
College	0.309***	0.043	0.275***	0.052	0.084	0.068
Still in school	0.061	0.081	0.097	0.089	0.177	0.124
Married	0.013	0.037	−0.046	0.044	−0.062	0.060
Divorced	0.167***	0.062	0.161**	0.075	0.239***	0.090
Separated	0.051	0.115	−0.065	0.158	−0.355*	0.198
Widowed	−0.114	0.070	0.010	0.080	0.045	0.110
Village	−0.038	0.037	−0.281***	0.046	−0.192***	0.056
Town	−0.058	0.036	−0.202***	0.043	−0.255***	0.055
Employed	0.198***	0.037	0.082*	0.046	−0.014	0.055
Self-employed	0.211***	0.060	0.115	0.078	0.082	0.093
As safe	0.016	0.038				
Safer	0.144***	0.033				
Threshold ($\mu_{2};\ \xi_{2}$)			0.306***	0.020	0.283***	0.020
Threshold ($\mu_{3};\ \xi_{3}$)			0.875***	0.052	0.812***	0.044
Concordance (θ)			1.742***	0.107	3.982***	0.395
Kendall’s τ			0.741***	0.021	0.964***	0.014
Log likelihood	−10537.920					

Note: Asymptotic standard errors in parentheses. Asterisks indicate levels of significance: *** = 1%, ** = 5%, * = 10%.

Table 2. Average Treatment Effects f Blood Donation on the Conditional Probabilities and Levels of Money Reward with Alternative Model Specifications (Clayton-Gaussian Model)

SNAP Effect on	Clayton-Gaussian
Pr(Reward = 0)	0.372
	(0.010)
Pr(Reward = EU 15)	–0.089
	(0.007)
Pr(reward = EU 25)	–0.143
	(0.008)
Pr(reward = EU 100)	–0.139
	(0.015)
E(Reward)	–18.400
	(1.410)

Note: Asymptotic standard errors in parentheses. All effects are significant at the 1% significance level.

Table 3. Marginal Effects of Explanatory Variables on the Probability of Donation (Clayton-Gaussian Model)

Variable	Estimate	S.E.
Income / 1000	−0.281*	0.150
Age	3.753***	0.448
Male	9.150***	1.096
High school	9.811***	1.383
College	11.103***	1.516
Still in school	2.061	2.753
Married	0.491	1.355
Divorced	6.302***	2.370
Separated	1.876	4.298
Widowed	−4.052*	2.453
Village	−1.399	1.366
Town	−2.126	1.325
Employed	7.217***	1.330
Self-employed	7.749***	2.249
Less safe	0.568	1.337
As safe	5.221***	1.166
Belgium	−18.260***	2.263
Denmark	−5.850***	1.828
W. Germany	−20.538***	1.836
Greece	5.420***	2.085
Italy	−10.681***	2.246
Spain	−8.397***	2.336
France	−3.293	2.117
Ireland	−2.485	2.812
N. Ireland	−2.214	3.561
Luxembourg	−8.531***	2.464
Netherlands	−9.339***	2.025
Portugal	−10.412***	2.391
Britain	−2.600	2.373
E. Germany	−26.894***	1.758
Sweden	−24.860***	1.718
Austria	−9.729***	2.281

Note: All probabilities are multiplied by 100. Asterisks indicate levels of significance: *** = 1%, ** = 5%, * = 10%.

Table 4. Marginal Effects of Explanatory Variables on the Conditional Probabilities of Money Reward: Clayton-Gaussian Model

	Conditional on Non-Donation, Probability of				Conditional on Donation, Probability of			
Variable	Rew = 0	Rew=EU 15	Rew=EU 25	Rew=EU 100	Rew = 0	Rew=EU 15	Rew=EU 25	Rew=EU 100
Continuous explanatory variables								
Income / 1000	0.146	−0.015	−0.048	−0.083	−0.025	0.010	0.010	0.004
	(0.166)	(0.018)	(0.055)	(0.095)	(0.048)	(0.020)	(0.023)	(0.010)
Age / 10	−2.588***	0.274***	0.849***	1.465***	−0.497***	0.202***	0.205***	0.090***
	(0.578)	(0.070)	(0.201)	(0.349)	(0.189)	(0.078)	(0.080)	(0.034)
Binary explanatory variables								
Male	−10.940***	1.124***	3.549***	6.268***	−2.335***	0.944***	0.963***	0.427***
	(1.386)	(0.211)	(0.565)	(0.892)	(0.459)	(0.194)	(0.198)	(0.095)
High school	−11.008***	1.318***	3.719***	5.971***	−1.707***	0.699***	0.704***	0.305***
	(1.792)	(0.292)	(0.700)	(1.019)	(0.552)	(0.229)	(0.234)	(0.103)
College	−10.533***	1.279***	3.572***	5.682***	−0.695	0.291	0.286	0.119
	(1.973)	(0.285)	(0.713)	(1.183)	(0.559)	(0.235)	(0.231)	(0.095)
Still in school	−3.606	0.525	1.288	1.793	−1.598	0.656	0.659	0.284
	(3.367)	(0.469)	(1.188)	(1.725)	(1.225)	(0.491)	(0.508)	(0.231)
Married	1.800	−0.197	−0.595	−1.008	0.565	−0.232	−0.233	−0.101
	(1.718)	(0.190)	(0.573)	(0.962)	(0.557)	(0.227)	(0.230)	(0.101)
Divorced	−6.355**	0.512**	1.944**	3.899**	−2.795**	1.070***	1.159**	0.566**
	(2.965)	(0.219)	(0.893)	(1.913)	(1.153)	(0.435)	(0.484)	(0.251)

Separated	2.514	−0.281	−0.836	−1.397	2.512***	−1.082**	−1.026***	−0.404***
	(6.085)	(0.738)	(2.072)	(3.279)	(0.992)	(0.459)	(0.404)	(0.147)
Widowed	−0.398	0.041	0.129	0.229	−0.445	0.178	0.184	0.083
	(3.119)	(0.315)	(1.011)	(1.793)	(1.116)	(0.445)	(0.462)	(0.210)
Village	10.960***	−1.083***	−3.519***	−6.358***	1.974***	−0.784***	−0.817***	−0.374***
	(1.751)	(0.261)	(0.717)	(0.979)	(0.573)	(0.231)	(0.245)	(0.113)
Town	7.951***	−0.701***	−2.485***	−4.765***	2.496***	−1.002***	−1.031***	−0.463***
	(1.693)	(0.203)	(0.629)	(0.978)	(0.540)	(0.221)	(0.234)	(0.113)
Employed	−3.182*	0.342*	1.047*	1.793*	0.127	−0.052	−0.052	−0.023
	(1.771)	(0.192)	(0.582)	(1.018)	(0.504)	(0.206)	(0.208)	(0.090)
Self-employed	−4.496	0.462	1.462	2.572	−0.827	0.331	0.342	0.154
	(3.074)	(0.285)	(0.969)	(1.846)	(0.978)	(0.386)	(0.407)	(0.186)

Note: Asymptotic standard errors in parentheses. Asterisks indicate levels of significance: *** = 1%, ** = 5%, * = 10%.

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