

Modelling contact mode and frequency of interactions with social network members using the multiple discrete-continuous extreme value model

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Online appendix

In this appendix, we present the results of our MDCEV model for mode and frequency of interaction when different assumptions about the cost of the different modes of communication and the budget are used. We also show that such assumptions do not have a large impact on forecasts from the model.

Model estimation

Price differentiation

In the paper, we assume that all the modes of communication have equal unitary cost. We now modify the assumption, and assume that face-to-face is more expensive (with a cost equal to 2), followed by phone (with cost of 1) and that SMS and e-mail are cheaper, costing, respectively, 0.1 and 0.5. The model results are presented in Table 1. Statistical testing shows that the only parameters that are significantly different between the two models at the 0.05 level are the translation parameters, the distance coefficient for face-to-face and the baseline utility constant for email.

Budget change

In the paper, we assume that the budget for a person is equal to the overall number of interactions for that person. We compute the mean of the sample budget and add it to the budget of each individual, so that a generic fixed increase is perceived by everyone. The model results are presented in Table 2. In this case, the only parameters that are significantly different are the baseline utility constants (the δ parameters) for all modes, which all change by the same amount. This is in line with expectations, given the constant increase in the budget for all individuals. That increased budget is then necessarily allocated to the outside good, as the total consumption across all inside and outside goods needs to equal the budget. An increased consumption for the outside good would be accommodated through an increase in the δ for the outside good, but as this is fixed to zero as the base, we see an equal negative change for the δ for all inside goods.

Model forecasting

We adopt the same price differentiation and change in the budget as above and apply the forecasting procedure. Table 3 shows that the elasticities are of the same sign and magnitude in the three model applications (except for the case of the Overall elasticity of the frequency of interaction, but this tends to zero anyway).

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Table 1

	face-to-face		phone		e-mail		sms	
	est	t-stat	est	t-stat	est	t-stat	est	t-stat
<i>Gamma parameters (γ)</i>	1.04	22.4	4.07	44.46	7.12	43.85	9.89	40.59
<i>Baseline constants (δ)</i>	4.38	17.4	1.32	5.295	-2.36	9.176	-0.29	1.12
<i>Ego characteristics</i>								
<i>Age</i>								
Age = 18	0.09	0.17	-0.05	0.10	-1.90	3.51	0.64	1.25
Age 19-30	-0.12	0.58	-0.34	1.60	-0.44	2.03	0.66	3.04
Age 31-45	-0.03	0.23	-0.08	0.57	0.06	0.45	0.50	3.41
Age 46-60	-0.09	0.68	-0.17	1.25	-0.02	0.18	0.36	2.54
<i>Education duration (years)</i>	-0.01	1.42	-0.01	0.99	0.03	2.67	-0.02	1.86
<i>Civil status</i>								
Married	-0.07	0.56	-0.24	1.87	-0.36	2.81	-0.52	4.07
Widowed	-0.06	0.29	-0.30	1.38	-0.81	3.54	-0.39	1.74
Divorced	-0.15	0.88	-0.26	1.48	-0.44	2.49	-0.35	2.00
Living separately	-0.23	0.69	-0.05	0.14	-0.57	1.64	-0.28	0.79
<i>Employment status</i>								
Student	0.23	0.86	-0.17	0.66	0.31	1.17	0.08	0.32
Homemaker	-0.04	0.37	-0.07	0.54	-0.20	1.62	-0.14	1.13
Retired	-0.16	1.05	-0.17	1.11	-0.43	2.70	-0.40	2.45
Looking for work	-0.28	1.00	-0.06	0.22	0.12	0.41	-0.06	0.21
<i>Number of contacts</i>	-0.01	2.41	-0.01	3.48	0.00	0.57	0.00	0.20
<i>Ego-alter characteristics</i>								
<i>Distance</i>	-0.29	43.97	-0.07	10.82	0.05	7.48	-0.05	5.43
<i>Distance=0</i>	0.44	6.92	-0.56	8.68	0.00	0.05	-0.04	0.58
<i>Relationship duration</i>	-0.21	18.94	0.03	2.76	-0.09	6.29	-0.20	12.39
<i>Sex homophily</i>								

Both male	0.06	2.46	0.06	2.18	0.28	8.93	-0.24	6.37
Both female	0.01	0.30	0.22	10.03	0.08	2.72	0.41	13.94
Age difference	0.01	10.83	0.00	5.32	-0.01	8.06	-0.01	6.57
<i>Help & Problems</i>								
Ask for help	0.25	5.40	0.41	8.33	0.29	4.69	0.27	3.78
Discuss problems	0.21	9.54	0.39	16.27	0.20	6.77	0.43	13.18
Ask for help x Discuss problems	0.14	2.82	-0.05	0.96	-0.12	1.81	-0.12	1.56
<i>Type of relationship</i>								
Spouse	2.08	30.34	1.07	15.83	0.19	2.26	0.87	10.62
Relative 1st degree	0.45	15.37	0.46	14.84	0.01	0.24	0.31	7.35
Relative	-0.03	0.69	0.05	1.39	-0.34	6.17	-0.06	1.16
Married into family	0.10	2.75	0.12	3.05	-0.49	8.34	-0.29	4.67
Acquaintance	-0.21	9.43	-0.33	13.95	-0.10	3.57	-0.50	14.95
Same level of education	-0.04	2.04	-0.02	1.02	0.11	4.30	0.09	3.56
Same citizenship	0.09	3.85	0.02	0.83	0.02	0.77	0.09	2.71
<i>Missing values coefficients</i>								
<i>Ego education duration</i>	0.76	1.54	-0.38	0.77	0.72	1.43	-0.44	0.85
<i>Distance</i>	-0.89	29.04	-0.21	7.00	-0.04	1.04	-0.12	3.03
<i>Relationship duration</i>	-0.54	6.58	0.30	3.69	-0.61	5.63	-0.79	7.33
<i>Age difference</i>	-0.42	7.49	-0.44	7.25	0.40	5.33	0.03	0.36
<i>Ask for help</i>	0.17	1.68	0.32	2.88	-0.38	2.42	-0.40	2.15
<i>Discuss problems</i>	0.35	2.99	-0.10	0.76	0.32	2.01	-0.59	2.57
<i>Type of relationship</i>	-0.02	0.25	-0.16	1.48	-0.09	0.67	-0.03	0.24
<i>Same level of education</i>	-0.09	2.66	-0.14	4.13	0.04	1.08	-0.07	1.58
<i>Log-likelihood: -161681.9</i>								

Table 2

	face-to-face		est	phone		est	e-mail		est	sms	
	est	t-stat		t-stat	t-stat		t-stat	t-stat			
<i>Gamma parameters (γ)</i>	0.55	23.93	3.01	51.77	5.59	47.46	7.68	43.48			
<i>Baseline constants (δ)</i>	-3.39	11.55	-6.28	21.46	-7.87	26.14	-7.34	23.97			
<i>Ego characteristics</i>											
<i>Age</i>											
Age = 18	0.05	0.08	-0.06	0.10	-2.20	3.48	0.76	1.26			
Age 19-30	-0.13	0.53	-0.39	1.54	-0.50	1.97	0.78	3.05			
Age 31-45	-0.03	0.21	-0.09	1.54	0.08	0.47	0.58	3.42			
Age 46-60	-0.10	0.60	-0.19	1.19	-0.02	0.15	0.42	2.55			
<i>Education duration (years)</i>	-0.01	1.27	-0.01	0.91	0.03	2.68	-0.02	1.82			
<i>Civil status</i>											
Married	-0.08	0.56	-0.27	1.82	-0.41	2.76	-0.60	4.02			
Widowed	-0.08	0.33	-0.36	1.39	-0.94	3.51	-0.45	1.72			
Divorced	-0.17	0.83	-0.30	1.48	-0.51	2.48	-0.42	2.01			
Living separately	-0.25	0.63	-0.04	0.10	-0.67	1.63	-0.32	0.78			
<i>Employment status</i>											
Student	0.25	0.81	-0.20	0.65	0.36	1.16	0.10	0.31			
Homemaker	-0.05	0.38	-0.07	0.52	-0.23	1.62	-0.16	1.12			
Retired	-0.19	1.03	-0.19	1.03	-0.49	2.66	-0.47	2.42			
Looking for work	-0.30	0.89	-0.05	0.15	0.16	0.46	-0.04	0.12			
<i>Number of contacts</i>	-0.01	2.09	-0.01	3.24	0.00	0.43	0.00	0.06			
<i>Ego-alter characteristics</i>											
<i>Distance</i>	-0.33	43.42	-0.08	10.28	0.06	7.49	-0.05	5.33			
<i>Distance=0</i>	0.39	5.22	-0.64	8.51	0.00	0.01	-0.05	0.52			
<i>Relationship duration</i>	-0.24	17.92	0.04	3.04	-0.11	6.21	-0.23	12.27			
<i>Sex homophily</i>											

Both male	0.07	2.32	0.07	2.19	0.32	8.94	-0.27	6.28
Both female	0.01	0.38	0.25	9.79	0.09	2.65	0.47	13.84
Age difference	0.01	10.17	0.01	4.96	-0.01	8.10	-0.01	6.55
<i>Help & Problems</i>								
Ask for help	0.27	5.03	0.47	8.18	0.34	4.65	0.30	3.69
Discuss problems	0.24	9.07	0.45	16.07	0.23	6.65	0.49	13.07
Ask for help x Discuss problems	0.15	2.58	-0.07	1.12	-0.15	1.84	-0.14	1.54
<i>Type of relationship</i>								
Spouse	2.15	26.85	1.19	15.18	0.22	2.25	0.99	10.37
Relative 1st degree	0.50	14.46	0.51	14.03	0.01	0.27	0.35	7.25
Relative	-0.03	0.69	0.06	1.35	-0.39	6.15	-0.08	1.20
Married into family	0.12	2.65	0.14	2.95	-0.58	8.32	-0.34	4.69
Acquaintance	-0.22	8.82	-0.39	13.86	-0.12	3.52	-0.58	14.91
Same level of education	-0.04	2	-0.02	1.049	0.13	4.298	0.11	3.515
Same citizenship	0.11	3.90	0.03	0.95	0.03	0.76	0.11	2.70
<i>Missing values coefficients</i>								
<i>Ego education duration</i>	0.79	1.36	-0.42	0.73	0.85	1.43	-0.48	0.80
<i>Distance</i>	-0.98	27.87	-0.24	6.70	-0.04	0.97	-0.13	2.89
<i>Relationship duration</i>	-0.59	6.18	0.35	3.67	-0.72	5.60	-0.91	7.24
<i>Age difference</i>	-0.46	7.09	-0.49	6.97	0.47	5.35	0.03	0.34
<i>Ask for help</i>	0.19	1.59	0.36	2.79	-0.44	2.44	-0.48	2.17
<i>Discuss problems</i>	0.40	2.91	-0.12	0.79	0.36	1.96	-0.70	2.60
<i>Type of relationship</i>	-0.02	0.18	-0.18	1.42	-0.10	0.62	-0.03	0.18
<i>Same level of education</i>	-0.10	2.70	-0.17	4.14	0.05	0.99	-0.08	1.65
<i>Log-likelihood: -166397.9</i>								

Table 3

	ORIGINAL MODEL	BUDGET CHANGE	PRICE CHANGE
<i>Elasticities of the frequency of interaction by each mode</i>			
face-to-face	-0.004	-0.006	-0.002
phone	0.002	0.000	0.004
e-mail	0.008	0.005	0.011
SMS	0.003	0.000	0.006
<i>Elasticities of the frequency of interaction with relocated alter by each mode</i>			
face-to-face	-0.162	-0.164	-0.149
phone	-0.037	-0.041	-0.032
e-mail	0.052	0.049	0.056
SMS	-0.028	-0.033	-0.023
<i>Overall elasticity of the frequency of interaction</i>	-8.00E-06	-0.002	0.003
<i>Elasticity of the frequency of interaction with the relocated alter</i>	-0.075	-0.081	-0.064
<i>Elasticity of consumption of the outside good</i>	0.006	0.001	0.008
<i>Distance elasticity</i>	0.007	0.004	0.010
<i>Distance elasticity for relocated alter</i>	-0.011	-0.014	-0.006