

## **WEB APPENDIX**

### **DETERMINING INFLUENTIAL USERS IN INTERNET SOCIAL NETWORKS**

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This appendix includes figures and tables which were omitted from the main manuscript due to space consideration.

**Table WA1. Complications with Traditional Shrinkage**

In the scanner panel situation, the variable set (e.g., price and advertising), whose effects we are trying to determine, is constant across households. In the social network situation, the variables correspond to friends and different users have different sets of friends. This means that the variable set differs, often completely, across users. We illustrate this in Table WA1. To predict Allison’s behavior, the predictor variables are *Allison’s* friends’ behaviors. To predict Emily’s behavior, the predictor variables are *Emily’s* friends’ behaviors. Because the variable set differs, we cannot use the standard form of Bayesian shrinkage.

Allison’s friends	Ana $\beta_1$	Bret $\beta_2$	John $\beta_3$	Noel $\beta_4$	Danny $\beta_5$	Stan $\beta_6$	Earl $\beta_7$
Emily’s friends	Cindy $\beta_1$	Gordon $\beta_2$	Felix $\beta_3$	Rita $\beta_4$			

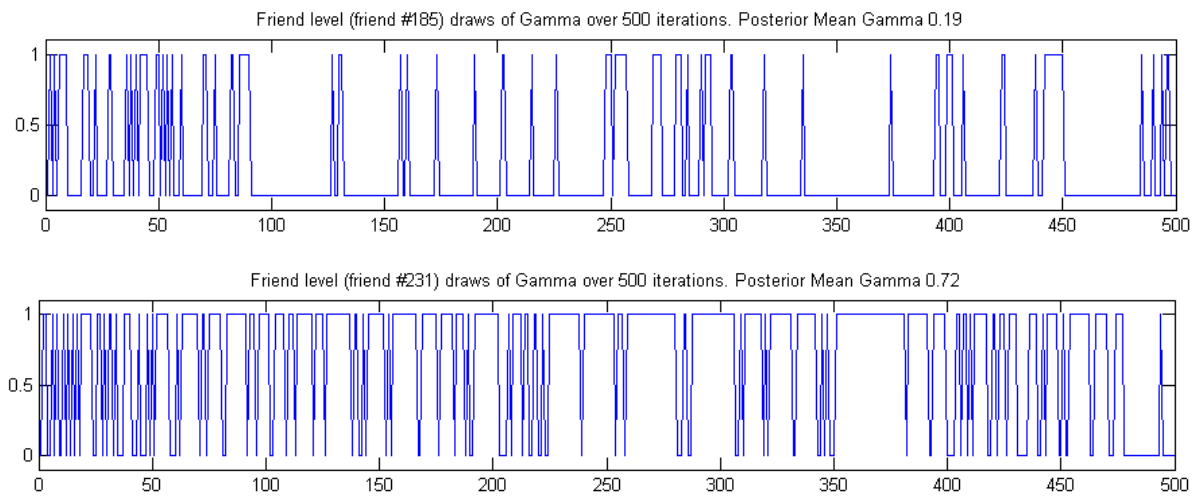
**Table WA2. Sample Descriptive Statistics**

Table WA2 provides some descriptive statistics taken from user profiles.

<i>Profile Information</i>	<i>Share</i>
Males	45%
Married	29%
Networking goals:	
- Friendship	73%
- Dating	24%
- Serious Relationships	15%
Ethnicity	
- Whites	62%
- Hispanic	24%
- African-Americans	7%
- Asians	6%
- Others	1%

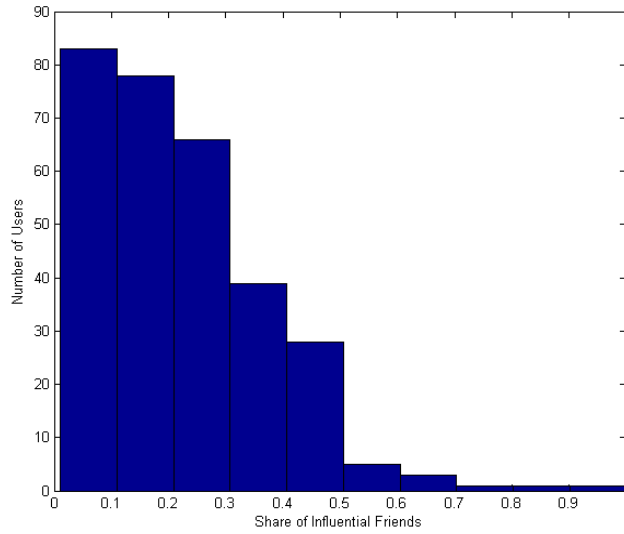
**Figure WA1. Draws from Posterior Distribution of Gamma  
for Two Friends of the Same User**

In each iteration of the Gibbs sampler, a friend-specific  $\gamma_{uf}$  is drawn as a Bernoulli random variable, with the success probability based on the ratio of the likelihood with friend  $f$ 's effect included (i.e., with  $\gamma_{uf}=1$ ) to model likelihood without friend  $f$  (i.e., with  $\gamma_{uf}=0$ ). For example, after 500 iterations for each friend, we observe 500 draws of  $\gamma_{uf}$ . Figure WA1 shows some examples.



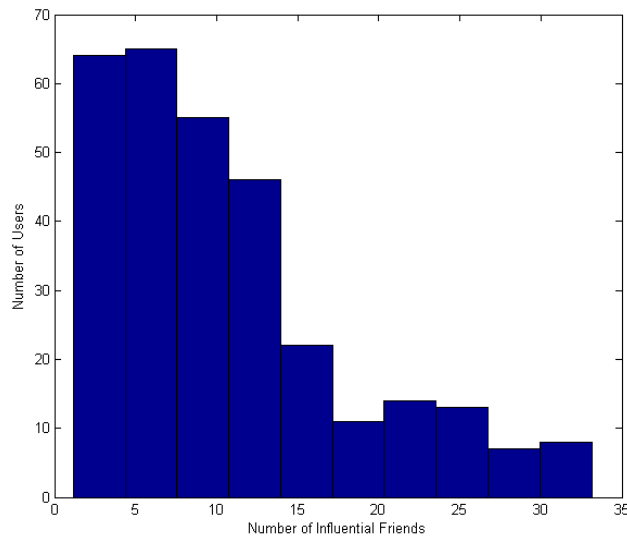
**Figure WA2. Share of Influential “Friends” across Users**

The integral in equation 9 - the total number of influential friends for user  $u$  - is estimated by using the draws of  $\gamma_{uf}$  over the MCMC iterations. The resulting empirical distribution is depicted in Figure WA2.



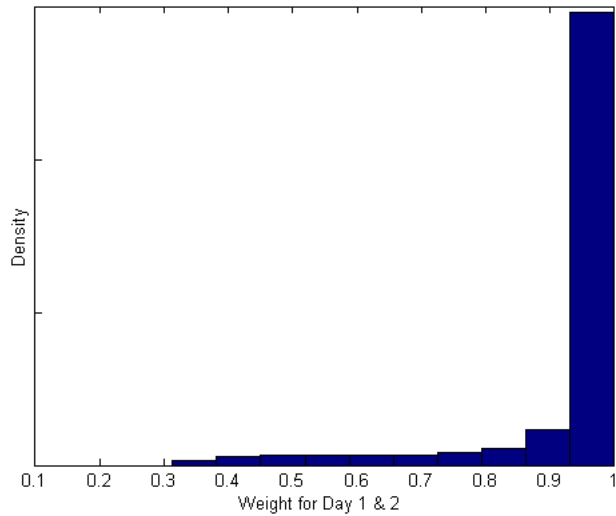
**Figure WA3. Number of Influential “friends” across Users**

To aid interpretability, we compute  $S_u = Infl_u / F_u$  which is a point-estimate for the fraction of friends that influence user  $u$ . The empirical distribution is depicted in Figures WA3.



**Figure WA4 Distribution of Weight Given to the Two Most Recent Days**

In the paper we looked at the distribution of the smoothing parameter  $\rho_u$  across users (refer to Figure 7). It might be interesting to note that the distribution of  $\rho_u$  implies a certain distribution for  $w_u(d)$  in equation 5.  $w_u(1)$  represents the weight given to the most recent day of evidence and  $w_u(1) + w_u(2)$  is the weight given to the two most recent days. The distributions of these two are depicted in Figure WA4.



**Figure WA5. Distribution of Marginal Network Impact Across Users**

Figure 18 shows that the majority of users have very little impact on the behavior of others (left side of the distribution). Some, however, do show a significant influence.

