Supplemental Material:
Characterizing and modeling the dynamics of online popularity

Jacob Ratkiewicz[1], Santo Fortunato[2], Alessandro Flammini[1], Filippo Menczer[1,2], Alessandro Vespignani[1,2]

[1] *School of Informatics and Computing, Indiana University, Bloomington, IN, USA*

[2] *Complex Networks and Systems Lagrange Lab, Institute for Scientific Interchange, Torino, Italy*

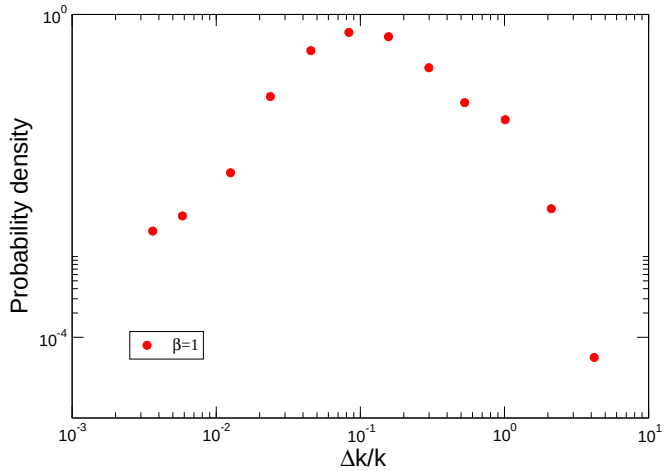

Figure 1. Distribution of popularity bursts for the rank-shift model, where the probability to jump from a rank r_i to a lower rank r_f is proportional to $|r_i - r_f|^{-\beta}$, with $\beta = 1$. The distribution is not broad, resembling the one obtained without reranking (Fig. 4c of main text).

Alternative reranking strategies. In the version of the rank-shift model we have used to describe the data, and which we have discussed so far, a node receives a new rank, chosen at random with equal probability among the lower ranks. This causes very large "jumps" (on average) in the rankings. On the other hand, one may wonder what happens if the probability to jump to a new (lower) rank is a decreasing function of the rank shift Δr. We have explored this possibility, by introducing a probability to make a shift Δr proportional to $(\Delta r)^{-\beta}$, with $\beta > 0$. If $\beta = 0$ we recover a shift-independent jump probability. On the other hand, if $\beta \to \infty$, no reranking is possible. In Fig. 1 we show the distribution of popularity bursts for the rank-shift model, with $\beta = 1$. The fat tail obtained for $\beta = 0$ has disappeared. Therefore, to account for large popularity bursts it is crucial to have $\beta \ll 1$, i.e., to allow for large rank shifts.