The effect of social influence on the intention-action gap of sustainable consumption

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Introduction

In the wake of today's environmental problem, reduction of consumption's negative impacts on climate and the environment has become more and more crucial. Sustainable consumption, defined as a decision-making process of considering both consumer's social responsibility as well as individual needs (Meulenberg, 2003), has been fostered by many organizations. Among various initiatives of sustainable consumption, the purchases of sustainable organic food products or fair-trade products are widely advocated in many societies. Yet a puzzle at the heart of green consumption is that customers who have favorable attitudes towards eco-friendly products do not actually take the action to buy those products with sustainability claims. This is generally acknowledged as the "attitude-behavior gap" or "intention-action gap" by various marketing journals, referring to a fact that attitudes can not predict the behavioral intention or behavior in a marketplace (Vermeir&Verbeke, 2006). Empirical research finds that this gap can be narrowed through the raise of perceived consumer effectiveness, availability, certainty, and social norm (Vermeir&Verbeke, 2006). They claim that even customers with very low attitudes towards sustainable products can generate the intention to buy because of the social pressure from others. And, in this project, I will mainly study how social influence narrows the "attitude-behavior" gap at individual-level behavior and affects the global adoption of sustainable products based on certain types of networks through the application of agent-based modeling. The main goal is to understand why the diffusion processes of sustainable consumption can be accelerated by network influence. Findings could be utilized by any organization that wants to promote eco-friendly products to customers.

Agent-based modeling is an approach that can be used to generate complex phenomena based on simple rules of individual behavior (Wilensky& Rand, 2015). With respect to marketing-related research, agent-based modeling has been often applied to the study of the diffusion model of innovation with the integration of network science (Rand & Rust, 2011). Under this domain, agent-based modeling is an appropriate method for this project. Firstly, the marketplace is constituted with a population of individual customers. They make their

own purchasing choice and these choices can influence others. Secondly, the interactions between individual customers can be complex. Some customers may decide to buy a green product because one of his or her friends already used it. While considering a large number of customers on the market, the complexity of the social networks and social influence warrant the application of agent-based modeling. Thirdly, there are heterogenetic agents in the marketplace. For example, customers may have different local networks and attitudes on green products, even value the importance of the agent's peer on his or her decision differently. Fourthly, agent-based modeling can represent rich network-based space (Gilbert, 2008), which can facilitate the exploration of a consumer's peer network in this project. Finally, agent-based modeling can capture the dynamic process of sustainable consumption. It can examine how the global market change over time. Therefore, agent-based modeling is an ideal method for the purpose of this project.

Model description

The model is to study the effect of social influence in the adoption of a green product in different social networks. Specifically, I assume that the purchasing process is binary, which means that the consumer either adopts or waits to adopts. There is a constant maximum potential number of consumers, and all of them will eventually purchase the product. No repeat purchase will occur at each round. The output will mainly focus on the rate of purchase instead of the percentage of green buyers. The purpose is to find an effective approach to narrow the intention-action gap and make more potential consumers adopt green products.

In the beginning, agents are placed in different nodes of the social networks — random, small-world, and preferential attachment — where links represent a friendship between individual customers. A certain percentage of agents are specified as “greeners” who have a strong conviction of sustainability and are assumed to adopt the product. Other agents are identified as “regular”, who are assumed to be trapped in the “intention-action” gap. It means that they do have a favorable attitude towards green products and wait for actions. At each time step, both types of agents will make their decisions to either purchase the green product or not.

Greeners’ decision on giving up the purchase depends on the global social influence. This procedure considers the “backfire effect” of social influence that the sustainable behavior may not appear to be socially approved if only a few people engage in it, then discouraging purchase (White et al., 2019). Thus, greeners will drop their purchase if they can’t notice a sizable proportion of buyers in the population. Note that this negative effect of social influence doesn’t depend on the network structure or the places where agents are in the network. The threshold of this effect will take a random number between 0 and 1 considering the heterogeneity of greeners. Once greeners drop the purchase at one round, they become regulars and follow the same rules as regulars do.

As for regulars, the decision to purchase depends on the external marketing influence and internal word-of-mouth process. This part of the model is inspired and based on Delre et al.’s(2007) model, which is an extended model of Bass’s model of innovation diffusion. Delre et al.’s model is applied in this procedure:

$$D_i = \begin{cases} 1, & U_i \geq U_{i,\min} \text{ or } \lambda > s_i \\ 0, & \text{otherwise} \end{cases}$$

where D_i represents the decision of agent i. An agent makes a purchase either his susceptibility to marketing(s_i) is less than the amount of marketing effort(λ), or his current utility(U_i) is above the minimum utility($U_{i,\,min}$), which is derived from the level of social influence. The agents' susceptibility to marketing is specified by a random number between 0 and 1, given every time an agent is about to make a decision. The marketing effort is a global parameter that captures the resources that an organization used to promote green products such as advertising. The minimum utility is an individual variable, drawn from a uniform distribution from 0 to 1.

The calculation of an agent current utility is captured by the following formula:

$$U_{Li} = \beta \cdot x_i + (1 - \beta) \cdot y_i$$

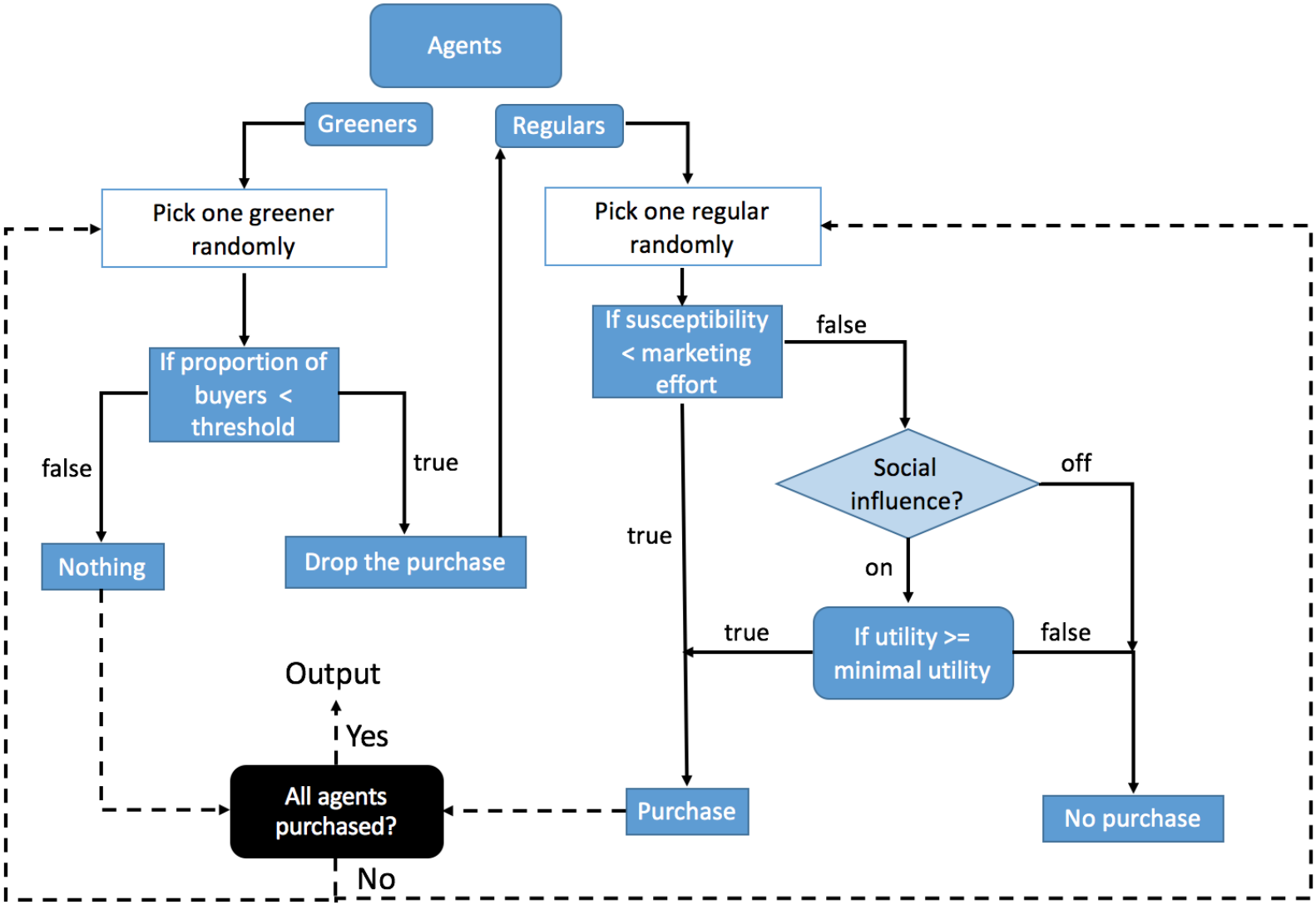
$$x_i = \begin{cases} 1, & A_i \geq h_i \\ 0, & \text{otherwise} \end{cases}$$

$$y_i = \begin{cases} 1, & p_i \leq q \\ 0, & \text{otherwise} \end{cases}$$

where β is the coefficient of social influence, measuring how important an agent's peers on his decision. A_i is the proportion of green buyers among his linked neighbors (closest friends). In the first round of the simulation, this will capture the percentage of linked greeners. h_i is the exposure threshold that drives regulars to make a purchase under social pressure. p_i is the individual preference for the product, and q represents the quality of the product. h_i and p_i is set for each agent at the beginning varying from 0 and 1. β and q are global parameters drawn from values between 0 and 1.

Note that in order to compare the effect of social influence, there is a switcher in the global environment to control the intervention of social influence. If there is no social influence, agents will only make their decision based on their susceptibility to marketing and the level

of marketing effort. If there is social influence, Delre et al.’s formula of personal utility will be taken into calculation. The general flow chart is displayed on the following page.


Agents
Greeners
Regulars
Pick one greener randomly
Pick one regular randomly
If proportion of buyers < threshold
false
true
Nothing
Drop the purchase
If susceptibility < marketing effort
false
true
Social influence?
off
on
true
If utility >= minimal utility
false
Output
Yes
All agents purchased?
Purchase
No purchase
No

Results

The model is implemented for a population of one thousand agents with 26% percent of greener based on an empirical finding that 65% of people claim they want to purchase the sustainability-driven brand, while only 26% actually take action (White et al., 2019). Each of the simulations contains ten runs.

(1) Effects of social influence

Firstly, I investigate the overall effect of social influence by varying the social influence parameter. In Fig.1, on average it's faster for a market to have 100% purchase if the mechanism of social influence can take effect. Without social influence, the purchasing decision totally depends on marketing effort, leading to large variance. In Fig.2, the effect of social influence on different networks in a moderate market and social environment(λ=0.4, β =0.5) is examined. It shows the acceleration effect of social influence on the rate of purchasing is strongest when the network structure is preferential attachment.

Fig.1 Time to 100% purchase

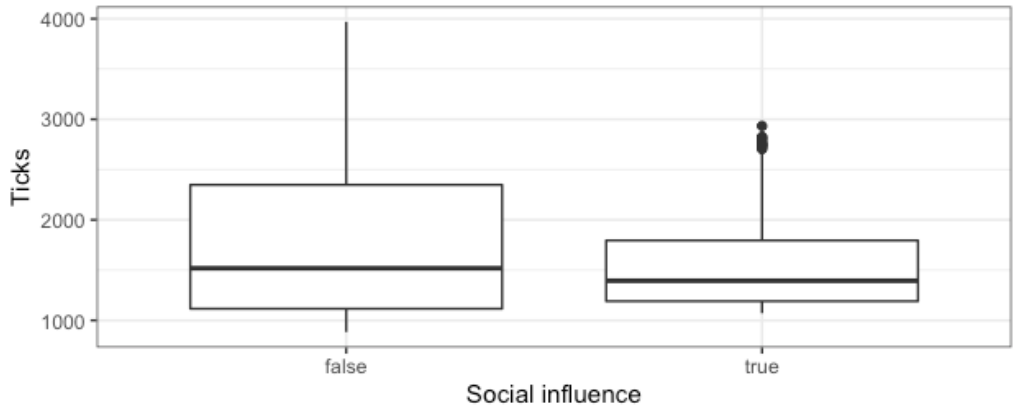
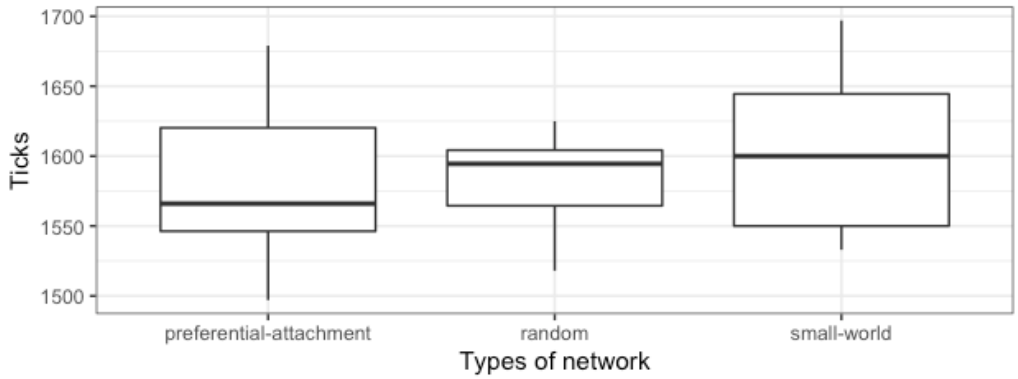


Fig.2 Time to 100% purchase

(Social influence T, Marketing effort 0.4, Coefficient of social influence 0.5)



(2) Effects of marketing effort

In the following simulations, I control the coefficient of social influence at 0.5 to investigate the robustness of previous results by varying the parameter of market effort. In Fig.3, when the marketing effort is between 0.2 and 0.6, social influence has significant effects on the spread of purchasing behavior. However, this effect keeps decreasing as the marketing effort becomes larger. When an organization invests its effort at a significantly high level, marketing can have a better acceleration effect.

(3) Effects of coefficient of social influence

In the last simulation, I control the marketing effort at 0.4 instead to specifically examine the acceleration effect of social influence by varying the parameter of the social influence coefficient. Fig.4 shows that as the coefficient becomes larger, the spread of purchasing becomes faster. Finally, by varying both marketing effect and social influence coefficient, Fig.5 presents that when the coefficient is very low at 0.3, the increase of marketing effort from 0.2 to 0.4 has a significant effect on the rate of purchasing. But when the coefficient is extremely high at 0.7, heavy investments in marketing seem less effective.

Fig.4 Time to 100% purchase

(Marketing effort 0.4, Social influence T)

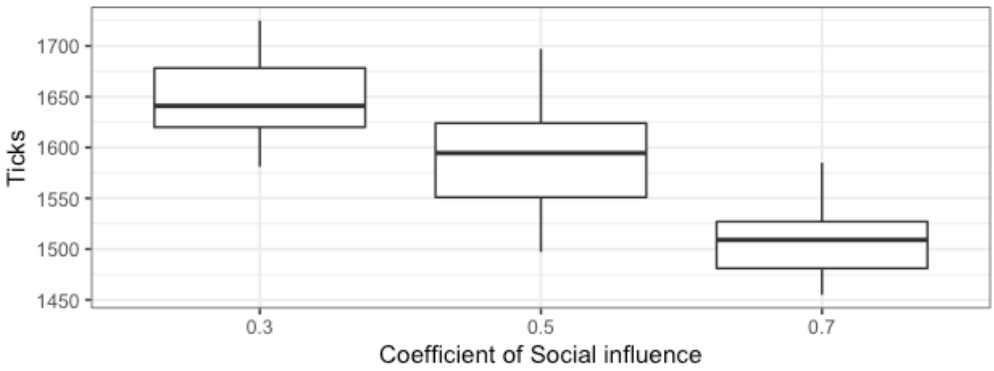
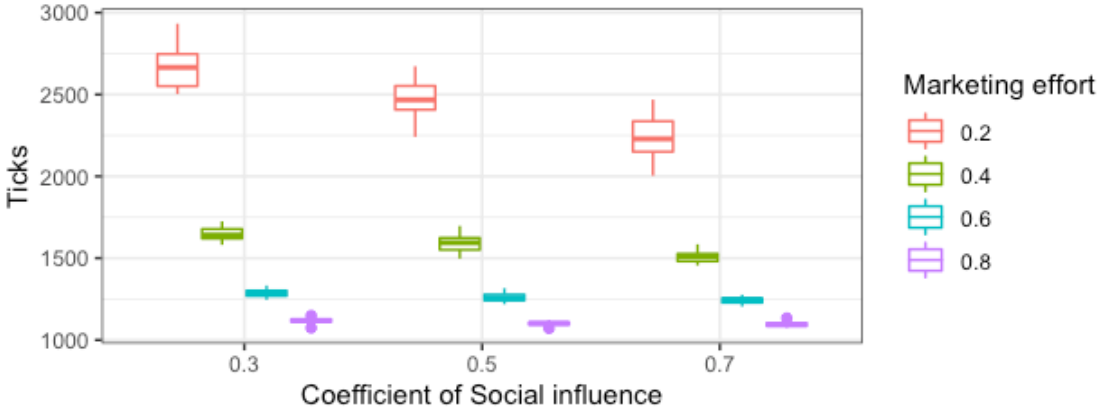


Fig.5 Time to 100% purchase

(Social influence T)



Discussion and discussion

This project models the spread of sustainable consumption under certain assumptions. Results show the power of social influence can effectively foster sustainable consumption narrowing the intention-action gap even considering the negative social influence from backfired greener. It is not trivial to foresee this effect is most influential in preferential attachment networks. Implication for organizations is to present social information to potential customers leveraging their motivations on sustainability.

However, traditional thoughts regarding the failure of marketing campaigns to foster sustainable behavior are not supported by the results. A high level of marketing efforts can have an effect on changing sustainable behavior, and when the consumer does not value the importance of friends' decisions, marketing tactics are significantly effective. This implicates organizations to reconsider the effectiveness of marketing tactics such as advertising, with a more appropriate design of the message. And towards certain demographics, it could be more effective than social influence.

Finally, considering the simplicity of this project, there certainly are many limitations as well as possibilities. Firstly, other important factors such as economic factors including price and budget that can crucially affect consumers' purchasing decisions are not taken into consideration. The intention-action gap could also be due to customers' uncertainty on the sustainable credence attributes of the product, which is difficult to offset by marketing campaigns. Secondly, the application of Delre et al.'s (2007) model may not be original enough to answer this complex question. Because Delre et al.'s model is derived from the Bass model of innovation, which assumes the decision-making process of a new product. However, promoting new innovation is not completely the same as changing customers' preferences or behavior, which may include more barriers. Future work could address these aspects to improve the validity of this project.

References:

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