

## Propositions on Motivating Truck Drivers in Research Crowdsourcing

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### Abstract

*Crowdsourcing projects that engage intrinsically motivated volunteers and are aimed at endeavors such as policy making, research, and social activism, need to understand how to create sustained engagement in their initiatives. We explore what happens when a group of homogeneous volunteers are exposed to heterogeneous beneficiaries. Previous research has presented anecdotal evidence suggesting that truck drivers have strong opinions against foreigners. However, our study finds no support for such notion, as it appears that truck drivers' view their profession as a stronger group in line with social identity theory.*

### 1. Introduction

Given the increasing challenges of traditional data gathering [1, 2] the supply chain management (SCM) and operations domain researchers are resorting to novel alternatives to gather data to inform their research questions. For example, Sternberg and Lantz [3], collected data on truck positions in Scandinavia to study the relation between under-paid drivers and trucking crime. In other domains, crowdsourcing (defined as the acquisition of information or services from users at low or zero economic cost) has leveraged mobile technology and a large group of participants to gather unique data related to critical topics such as air quality [4], crime and public safety [5], and poaching and illegal logging [6, 7]. It should be noted that crowdsourcing frequently refers to gig work, such as Uber [8], but this manuscript focus on crowdsourcing of research data.

A key challenge to crowdsourcing data is managing sustained participant contribution [9], especially in projects with a long lapse between participation and visible results. Many data collection projects wither and die before achieving their goals, as for example a project on collecting contract data from motor carrier CEOs [9]. The limited participant perception of involvement impact, can reduce their motivation [10]. Hence, participant motivation and continued contribution are cause for major concern to crowdsourcing project organizers [2].

While some principles can be drawn from studies of IT specialists on Stackoverflow [11], we know from the SCM [e.g., 12] and ethnology [e.g., 13, 14] literature

that truck drivers exhibit unique characteristics. Many truck drivers have chosen the industry for the freedom, and they are hesitant to various forms of organized participation [15].

Participant effort is higher and sustained longer when the participants perceive that an entity or individuals of their liking benefit from their involvement [16-18]. Unsurprisingly, early research on volunteerism found that participants in the experimental lab were less likely to sustain effort when their contribution benefited an organization perceived as contrary to their own ideology [19]. Work on behavioral bias shows that individuals may exhibit negative behaviors toward groups that have different ethnicity, gender, age or other observable characteristics [20]. There is a growing interest in the SCM community about diversity in organizations, work environments, and crowdsource environments [21] to increase our understanding of the effects of diversity such as ethnicity [22, 23], age, and gender [24] on behavior. However, scant evidence and little understanding of the diversity mechanism highlight the need for more research in this area – in particular for homogenous groups in SCM.

Although crowdsourcing projects may entice participants to contribute to a “good cause,” the saliency of beneficiary information could turn those positive feelings into negative ones and trigger participant disengagement. The perceived impact could increase participant motivation when they like who receives the benefit. However, it may also enable discriminatory behavior when the beneficiary is perceived as not worthy of the effort [25], thus jeopardizing the crowdsourcing initiative's success. The potential heterogeneity of crowdsourcing initiative beneficiaries could be challenging in a setting where populism and nationalism is on the rise [26, 27]. Hence, we pose the research question:

*How does providing information about beneficiaries' ethnicity affect participant motivation and does beneficiary ethnicity play a role?*

To investigate our research question, we combine two classic theories of motivation and inter-group relationships. Our framing draws from self-

determination theory [25, 28] to elucidate the effect of perceived contact (when individuals have exposure to the people beings affected by their contributions) on behavior. Additionally, it draws on social identity theory [29] to explain how realizing who benefits from the initiative affects participant motivation. We investigate whether participants' efforts will increase as they are presented with a message of their beneficiaries, regardless of their ethnicity, and second, that the individual characteristics of the volunteers, in this case union membership, will be related to higher participant effort. We investigate this in the context of the Cabotagestudien (Eng: "The cabotage study", cabotagestudien.com), a citizen science project that is crowdsourcing research data about international road traffic in Europe since 2013. Cabotagestudien attracted thousands of participants, influenced the implementation of increased legal control and enforcement to those companies that infringed the law, and affected the deceleration rate for deregulation in Europe [9]. The project's contributions were not only beneficial to its main participants, truck drivers, but benefited foreign drivers who were able to sign a labor contract to provide them with fair labor conditions [e.g., 30].

This current study makes several contributions to the literature. First, it contributes to the body of self-determination theory focusing on prosocial motivation (Grant 2007). We contribute by expanding the research on performance feedback types that speaks to cooperative, altruistic motives for user participation. By highlighting the effects of both participant and beneficiary heterogeneity, we explore how ethnicity may affect crowdsourcing volunteering behavior. Second, we offer practical implications for the operations and supply chain management researchers, revealing the importance for participants not only to feel that they are making a difference, but to realize whom their involvement benefits. These are important results relevant to other digitalization efforts involving supply truckers. The rise of populism makes this finding critical for research dependent upon motivating participation of a large, increasingly diverse crowd to be successful.

## **2. Motivation and engagement**

The need for motivating crowdsourcing participants has been a recurrent topic for research [18, 31]. A large part of this research has used self-determination theory (SDT) to discuss the participants' source of motivation [32]. SDT is reviewed in the next section.

### **2.1. Self-determination theory**

SDT is one of the most widely researched and applied theories in psychology. SDT suggests that individuals are more motivated towards self-determined behaviors, i.e., those driven by internal forces of the individual such as curiosity, interest, and enjoyment [28]. The more internally driven the behaviors, the greater sense of autonomy individuals will feel when performing them. These behaviors are associated with positive emotional experiences and are usually related to higher effort and satisfaction with the behavior [28]

SDT categorizes three types of motivation: intrinsic, identified, and extrinsic motivation, ranging from the most to the least internally driven [33]. According to SDT, behavior can become more internally motivated if individuals realize the importance of performing the behavior even though they may not intrinsically enjoy the behavior itself. This is referred to as an identified motivation. Identification occurs when the individual consciously values the goal or outcome of the behavior, such as the behavior is regarded as personally important [28]

The literature of crowdsourcing has leveraged SDT to investigate the effectiveness of intrinsic, identified, and extrinsic motivation [32]. Participant's motivation has been found critical since, without it, most projects struggle and are left with no other alternative than shutting down [34]. Studies have found that participants were motivated intrinsically by the delight of solving problems, taking part in exciting projects, thus finding their participation enjoyable [35]. Many people were also found to participate for extrinsic reasons such as building a reputation to enhance their career prospects [36], demonstrate ability [37], increase status [38] and receive recognition [39]. Most recently, the literature found that a critical motivation for the crowd is identified motivation, as they realize the impact that they have in their community [18] and that they are contributing to a worthy cause [17].

Grant [25, p. 402] identified two key factors that determine the level that individuals will be motivated by and find meaning in the social impact of their work. 1) Beneficiary contact - when individuals have "vivid, proximal exposure to the human beings affected by their contributions." Such interactions allow individuals to see how their work affects other people, which in turn encourages individuals to try harder and put more effort into their tasks. 2) Information about the beneficiaries. The information received about beneficiaries provide cues as to whether they are worthy of that benefit of their work, by considering the "beliefs, emotions, behaviors, group memberships, and intrinsic worth of beneficiaries".

### **2.2. Ethnicity and social identity theory**

While SDT highlights the need to consider beneficiaries, it falls short of predicting the reaction of participants to beneficiaries in the absence of conflict. Social identity theory (SIT) is often used as a robust explanation for how individuals perceive and react to the social information of others. Individuals tend to categorize themselves and others into various social groups such as organizational membership, gender, and age cohort [40]. As individuals identify with a particular group, they develop “social identity” [41], and will tend to act toward others as group members rather than as unique individuals. Individuals sharing a common identity cooperate with each other (ingroup) and compete with those who do not share the same attributes (outgroup) [42].

SIT has been used to explain the motivation of crowdsourcing participants towards ingroups. Participants feel a sense of identification with their community as they share similar characteristics as age, ethnicity, or occupation. The evidence of positive bias towards beneficiaries that share observable traits such as gender, age and ethnicity has been found repeatedly in laboratory and field settings [20].

SIT has been used as well to explain reactions towards outgroup, such as when the participant or employee differs in some category with the beneficiary. That is the case with observable traits mismatches such as gender, age and ethnicity, as well as with not observable traits such sexual orientation [22]. Ta, et al. [23] used SIT to explain why customers would expect lower service levels from delivery drivers with a different ethnicity from their own in a crowdsourcing service. Unfortunately, in a society which populism is on the rise [26], negative bias towards different ethnicities [20], is still prevalent and constitutes a critical aspects to direct behavior. In the dissertation by Nehls [14], several anecdotes of truck drivers making strongly racist comments are elaborated on (e.g., open sympathies for Hitler).

Finally, SIT considers that individuals may have multiple social identities, and any of those could be more salient depending on the context [41]. People can be seen as belonging to multiple groups. Individuals hold many identities such as their gender and race, occupational and organizational membership, but those that are more important or central to one’s self are more likely to predict how one processes information and enacts social behavior [43].

### 3. Theory and propositions

Building on self-determination theory, social identity theory, and insights from prior literature in crowdsourcing, we investigate the effects of priming contact with beneficiaries on participant's effort and

willingness to participate in the future. The main arguments of the set of propositions are first, that the volunteer effort will increase as they are presented with a message of their beneficiaries, regardless of their ethnicity, and second, that the individual characteristics of the volunteers, in this case union membership, will be related to higher participant effort.

#### 3.1. Motivation by priming contact

The first proposition is based on the core theory of self-determination theory, more specifically on identified motivation. Identification occurs when the individual consciously values the goal or outcome of the behavior, such as the behavior is regarded as personally important (Ryan & Deci, 2000). However, to be motivated for behavior the participants need to perceive that their contribution leads to an outcome.

The time-lag between individual involvement and social change (such as new legislation) may make participants feel that their contribution may not impact actual results [10]. To remedy this problem, having vivid exposure to the human beings affected by their contributions could help remind the participants that their participation is making a societal impact. Contact with beneficiaries has been associated to perceived social impact [44]; the realization that participant’s behavior is helping other people, is expected to be a strong motivator for crowdsourced participants to be energized, direct and maintain their efforts toward contributing to the project. Previous research recommends to crowdsource initiatives that aim to receive user generated content to highlight aspects of reciprocity and altruism such as the benefit to the community [45]. Recent research in crowdsourcing has found that participants are more motivated when they are primed that they are helping their community [18]. Participants that received messages with the number of people that they helped were found to be more active in the crowdsourced platform contributing with more content. Based on the self-determination theory and previous findings we expect that providing the participants with contact with the beneficiaries will increase their effort in the project.

*P1: Exposing participants to beneficiaries will lead to increased effort reporting logistics data.*

#### 3.2. Beneficiary information

As noted in the theoretical framework, the connection between perceived social impact and behavior can be moderated by the beneficiaries’ social information. Here we consider the multiple social identities of the participants [41]. Faced with

considerations of outgroup comparisons when they realize the unintended beneficiaries of their participation, we expect different effects towards mismatching ethnicity between the participant and the beneficiary. SIT explains behavior between groups. It proposes that individuals categorize themselves and others in in-groups (which are similar to them) and out-groups (which are not). That suggests that Scandinavian participants may reduce their effort when they are primed that the beneficiary is an international driver (typically from Eastern Europe).

However, an argument from theory that points in a different direction is that local or lower order identities are more likely to predict how individuals process information and behave. For example, feeling part of a department (local) vs being part of a company (global) [41]. Occupational identity also could be considered as a lower-level identity compared to ethnic group. As a lower-level identity, occupational identity could become more salient than ethnicity and supersede the potential ethnic bias.

Another argument relates to the perception of the magnitude of the benefit received by the beneficiary. Magnitude is higher if the participant believes that their contribution has important and long-lasting effects on the beneficiary [25]. The magnitude of helping an international driver, who has poor conditions, could be perceived as higher than helping a Scandinavian driver, who already has good working conditions. Hence:

*P2: Exposing participants to similar or dissimilar ethnic beneficiaries will lead to similar effort change in reporting logistics data.*

### 3.3. Individual characteristics

Finally, we consider the effect of individual characteristics of the participant. The inclination to help others should be related to higher and sustained participation. One characteristic that has been related to helping others is union membership. Union membership has been observed as they shown higher prosocial behavior -such as donations and helping others- [46] and showed lower ethnic bias [47]. Hence, we suggest:

*P3: Union membership will be related to larger effects on increasing effort reporting logistics data.*

## 4. Methodology

We extracted primary data on the user activities in the crowdsourcing project Cabotagestudien. To analyze the different factors that determine crowdsourcing engagement (our unit of analysis), we developed and

adapted scales from the IS literature. These scales were tested in a pilot survey with randomly chosen users. In addition to surveying motivational factors, we also collected descriptive data on the characteristics of the participants, for example, union membership.

### 4.1. The crowd

The Cabotagestudien volunteers (67% of the crowd are truck drivers [48], with some of the remainders not being related to trucking at all) contributed by reporting observations using mobile devices. The purpose was to create a snapshot of all national and international truck traffic. When the users saw a truck, they used the app to report its license plate number, referred to as “tagging” the truck (See Figure 1 for screenshots of the app). The aggregated observations of all trucks were published on the study website ([www.cabotagestudien.se](http://www.cabotagestudien.se)), but with their license plates anonymized. The website included a leaderboard, with most of the discussion about the project was carried out in Facebook groups (one group for each language of the users: Swedish, Danish, Norwegian and German).



**Figure 1. Screenshots of the Cabotagestudien mobile app (latest version at [app.cabotagestudien.com](http://app.cabotagestudien.com)).**

The number of observations (using the app) signifies the individual level of sustained engagement. Cabotagestudien has been conducted from 2013 to 2020, in four periods from 2 to 6 weeks each. The study has engaged over 10,000 participants and collected over 600,000 tags. To participate, the contributors log into a website to report the plate number and the location of the truck they have observed.

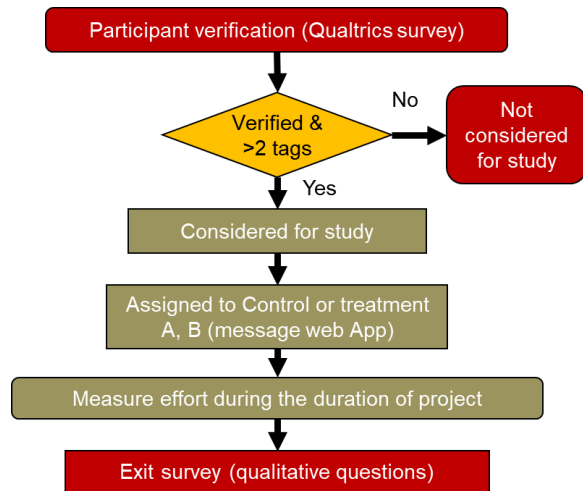
### 4.2. Experimental design

Given the nature of the research question, we designed a field experiment. We randomly assigned participants to the one of the treatments and administered the experiment manipulations through the mobile web application of Cabotagestudien. During the Fall 2020 period of Cabotagestudien, we validated 1,766 users that contributed 58,232 tags. We selected and

treated 153 participants. Three outliers ( $\text{tags}/\sigma > 6$ ) were removed.

Messages were transmitted to the participant's interface (mobile phone). When a message was sent to a participant, the message button on the home screen turned red to call the attention of the participant. Pressing the button "messages," the website showed the message sent by Cabotagestudien administrators.

The study was conducted for four weeks. Only participants that were verified (completed a verification survey from the web-app) and had reported more than two license plates by the day of sending the message, were considered for the study. The flow and decision tree for the being considered in the study is presented in Figure 2. The technology allowed us to confirm if the participant read the message and when the participants read the message.



**Figure 2. Study flow**

The four-week design allowed us to reach participants that received the treatment and gather their daily tagging activity before and after the treatment. The messages were designed based on the literature trying to elicit the task impact of the participant [44]. The names and pictures of the treatments are from real people involved in Cabotagestudien. The Swedish driver message featured an actual Swedish driver that is a contact of the authors. The picture used for the Romanian driver is an actual driver whose contact was provided by collaborators from the Transport Division of the International Transport Workers' Federation. The Romanian driver had been previously featured in the news for gaining better working conditions [e.g., 49], in part thanks to the visibility created by Cabotagestudien in previous years [9]. The pictures were revised by the authors to assure they had a similar angle and facial expression to minimize likeability bias. Several photo shoots were made to be as homogenous as possible and

representative of the characters – a Scandinavian and an international driver. Additionally, five individuals close to Cabotagestudien further reviewed the pictures and the messages to validate their clarity and realism. The messages are shown in the appendix.

While participation in the study as such had no incentives to it, everyone in the study had to complete the exit survey in order to be eligible for a raffle and the possibility to win a cell phone (two cell phones were given away).

## Empirical approach

In the design stage of this study, it was our intention to statistically analyze the results. However, as some volunteers will do 1 tag (our dependent variable) and others thousands, the within-group variance of activity is so large that between group variance diminishes in comparison. As the number of participants possible to involve (without risking cross contamination) is limited, so are the possibilities of finding statistical significance. This is further addressed in the discussion section of the paper.

## 5. Results

Our preliminary results indicate that contact with the beneficiary in the shape of an electronic message produced variation in the expected direction, increasing the number of average tags for those that saw the message. Results supporting Proposition 1 are shown in Table 1 and Table 2 below, comparing activity in the study prior to after being exposed to the beneficiaries of the study. The two means denote number of tags seven days before and seven days after the treatment.

The value of  $p$  is .00396. The result is significant at  $p < .01$ . Testing for the mean differences between before and after treatment for the control and treatment groups using Anova:

	Treatments		Total
	1	2	
N	54	96	150
$\sum X$	-267.00	1,225.00	958.00
Mean	(4.94)	12.76	6.39
$\sum X^2$	354,467.00	185,843.00	540,310.00
Std. Dev.	81.63	42.33	59.88

**Table 1. Treatment Statistics**

Source	SS	df	MS	F
Between-treatments	10,833.25	1	10,833.2504	3.064*
Within-treatments	523,358.32	148	3,536.2049	
Total	534,191.57	149		
P-value < .10				

**Table 2. Statistics Throughout Treatments**

The elaboration on the Proposition 2 revealed similar effects on effort when exposed to national or international beneficiary. Participants in our dataset increased their average participation regardless of receiving a message from a Swedish or an international driver. Results supporting Proposition 2 are shown in Table 3 below, with the difference denoting number of tags seven days before and seven days after the treatment.

Treatment	Sw. Driver	Ro. Driver
Tags Before	1024	935
Tags After	1382	1570
Count	50	46
Mean Before	20.48	20.33
Mean After	32.28	34.13
% Change	158%	168%

**Table 3. The two treatments**

Regardless of the test run, the difference in activity between the two-group treatment receiving the Romanian driver treatment and the group receiving the Swedish driver groups treatment is not significant (e.g., Mann-Whitney U-test results in a z-score of -0.63671, p-value of .52218 (far from significant at  $p < .05$ )).

These results show a promising direction that is contrary to the discrimination studies. While previous literature has found negative bias towards other ethnicities, these preliminary results did not find disparities in behavior when the beneficiary is a different ethnicity.

Finally, for Proposition 3 the results for union membership (again: proxy for prosocial behaviour) show a large, although not statistically significant difference (Tables 4-6). We can see that the effects are on the proposed direction, but more data is needed to test properly the statistical significance of the relationship.

Treatment	Sw. Driver	Sw. Driver	Total
Union	NO	YES	
Tags Before	321	708	1029
Tags After	592	979	1,571
Count	21	29	50
Mean Before	15.29	24.41	20.58
Mean After	28.19	33.76	31.42
% Change	184%	138%	153%

**Table 4. Treated with Swedish Drivers Based on Union Membership**

Treatment	Ro. Driver	Ro. Driver	Total
Union	NO	YES	
Tags Before	498	444	942
Tags After	499	1,016	1,515
Count	22	24	46
Mean Before	22.64	18.5	20.48
Means After	22.68	42.33	32.93
% Change	100%	229%	161%

**Table 5. Treated with Romanian Drivers Based on Union Membership**

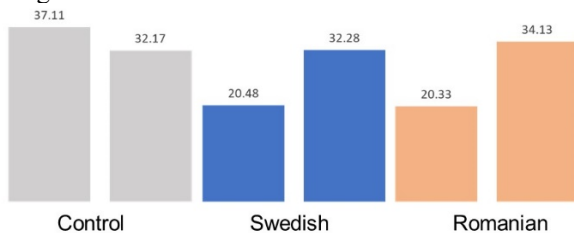
Group		Mode 11	Mode 12
(Intercept)	Coefficient	-13.93	-19.67
	t-stat	-1.452	-1.646
	p-value	(.149)	(.102)
GroupRo.Driver	Coefficient	18.28	19.71
	t-stat	1.556	1.141
	p-value	(.122)	(.256)
GroupSw.Driver	Coefficient	15.76	32.57
	t-stat	1.371	1.862
	p-value	(.172)	(.065)



Union	Coefficient	15.53	25.87
	t-stat	1.614	1.613
	p-value	(.109)	(.109)
GroupRo.Driver:Union	Coefficient		-2.08
	t-stat		-.088
	p-value		(.93)
GroupSw.Driver:Union	Coefficient		-29.43
	t-stat		-1.268
	p-value		(.207)
Multiple R-Squared		0.0036	0.049
F-Statistics		0.143	0.197
Observation		150	150

**Table 6. Union Statistics**

Figure 3 illustrates the effects.



**Figure 3. Left column = average observations before treatment. Right column = average observations after treatment**

## 6. Concluding discussion

Crowdsourcing is a promising, and within the realm of operations and SCM, new data collection approach. Researchers in other sciences are already tapping on the potential of the crowd to gather and process data that would be otherwise impossible to achieve [50-52]. This manuscript provides an example of data gathered by a crowd, and how that crowd is motivated for the purpose of research.

A key to a successful crowdsource is sustained participation, which we explore on a subset of supply

chain frontline workers – truck drivers. Our results indicate that providing participants with contact to the beneficiaries could be a powerful motivation tool to sustain and increase participant's effort and contribution. This is important as many crowdsourcing platforms suffer of under contribution problems [18], and many crowdsource projects fail without achieving their objectives [34].

### 6.1. Theoretical implications

Our preliminary results align with previous finding in the work environment [44] and crowdsourcing environment [18], extending the applicability of beneficiary contact as a motivator to a context in which the main task serves to the purpose of SCM and operations research. Additionally, this manuscript extends previous findings relating contact with beneficiary and participant's behavior by considering individual traits of participants and the effect of beneficiaries' heterogeneity.

The effect of beneficiary's social information has been scantily researched in the literature, but as shown in our preliminary results, it could be a critical contributor to make crowdsourcing data project successful. These findings tie with the growing interest of the management and operations management community about diversity in organizations, work environment, or crowdsource environment [21], by increasing our understanding of the effects ethnicity [22, 23], age, and gender [24], and sexual orientation [22]. We found that the reaction towards individuals from different ethnicities does not seem to be negative in our case. This partially contradicts some anecdotal evidence of SCM front line workers' attitude to heterogeneity [cf., 14] and their masculinity [13].

### 6.2. Future research

The results presented in this manuscript need to be taken with caution, as more tests will be needed to evaluate the overall validity of the models and the moderation effect of beneficiaries' social information and individual receptiveness to opposing views. This study uses a field study to explore the propositions. Although the data collection followed existing protocols for rigorous behavioral research, we cannot discount that other factors affected the behavior of the participants.

The treatments we used in this study attempted to manipulate the perception of beneficiaries' contact and its social information. We acknowledge that those constructs are multidimensional, and further research is needed to distinguish if the factors have different effects. Contact is composed of frequency, duration,

physical proximity, depth, and breadth [25]. Our manipulation elicited contact with the beneficiaries by making them more personable and having similar levels of all the factors. Our participants were primed only with one kind of beneficiary. Future studies in the context of crowdsourcing could evaluate if priming the participant with a wide range of beneficiaries could have higher effects than focusing their attention on only one type of beneficiary.

Finally, more research is needed to evaluate how can we actively curb ethnic and social discrimination to motivate individuals to participate in or use crowdsourcing services [22]. Although predispositions related to receptiveness are considered fairly stable individual characteristics, an interesting avenue is to study manipulations focused on empathy or perspective-taking that could increase more receptive attitudes in the participants [53]

As crowdsourcing becomes a critical tool to gather and process information to solve the most pressing problems of business and society [51], we need to be aware of the complexity of motivating a diverse crowd of individuals that serve a diverse type of beneficiaries. This study provides evidence of the positive impact of increasing perceived social impact for participants and finds preliminary promising findings suggesting that the ethnicity does not play a role in discrimination.

### 6.3. Managerial implications

Our findings provide some hope on the case that in crowdsource initiatives in which the participants have a sense of community, are able to draw a larger circle and consider as ingroups those beneficiaries that do not share their ethnicity. This is important, because it provides preliminary results that managers trying to engage SCM frontline workers, such as truck drivers, may be able to leverage by priming contact with beneficiaries to stimulate motivation. These managerial implications complement those of previous driver motivation studies, e.g., Prockl et al. [54].

Furthermore, the case itself speaks to the possibilities and usefulness of crowdsourcing in supply chain and transportation, by showing how volunteers can collect novel datasets. Hereby we meet the call for exploration on how crowdsourced data collection by Hofmann, et al. [55] can add to existing methods.

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## Appendix

