Identity Formation, Gender Differences, and the Perpetuation of Stereotypes

Erin Giffin*

Colby College

December 4, 2018

Abstract

Gender differences in economic decisions are well-documented and span a variety of important choices. Laboratory experiments have been used to identify potential mechanisms to explain these differences, and the results have most frequently been attributed to men and women having different preferences, especially when subjects' choices are anonymous. In this paper, I propose a theoretical model that highlights that persistent gender differences can arise without differences in preferences. I show that if two groups are identical ex ante but there exists a stereotype about one of the groups, then groups will behave in ways consistent with this stereotype in equilibrium. Extending this to a multi-period model, I show that if individuals endogenously form group identities through habit formation, these differences will persist in the long-run, even after choices are no longer observed. The model thus depicts a mechanism through which external constraints are eventually internalized and captures how social norms can become self-enforced by individuals. Using multiple existing experimental datasets where gender data were collected but never analyzed, I find evidence consistent with my model's predictions. I then conduct a new experiment to directly test the proposed mechanism. I show that by exposing subjects to external constraints in initial decisions, I mitigate gender differences in altruism. Moreover, this remains true even when those external constraints are removed. However, when subjects are not initially exposed to these constraints, women are significantly more generous than men.

*I would like to thank Jim Andreoni, Isabel Trevino, and Joel Watson for their feedback throughout the course of this project. I am grateful to Kate Antonovics, Craig McKenzie, and Shanthi Manian for particularly helpful comments. I would also like to thank Jim Andreoni, B. Douglas Bernheim, and Justin Rao for making their data available. I am grateful to the Department of Economics and the Frontiers of Innovation Scholarship Program at UC San Diego for financial support.

1 Introduction

Gender differences in economic decisions are well-documented and span many important economic choices. Men and women differ in their consumption and savings behaviors (LIMRA, 2016), human capital investments (Ceci et al., 2014), choice of college major (National Center for Education Statistics, 2016), and occupational choice (Sapienza et al., 2009). At the household level, there are gender differences in the division of labor within the household (Bertrand et al., 2015) and expenditure on children (Thomas, 1990). Gender differences have also been documented in economic outcomes, with the greatest attention on the gender wage gap (e.g., Bertrand et al., 2010). While the results from observational data have established empirical facts, they frequently do not provide an explanation for these differences. However, understanding the mechanisms behind these differences is important both to interpret and understand results from observational data as well as to inform the optimal policy response. Experimentalists have studied gender differences in laboratory settings to examine potential mechanisms in a controlled environment. Experimental results that find that women are less competitive than men have been used to explain gender differences in occupational choice, namely why there are not more women in top executive positions (Niederle and Vesterlund, 2007; Saccardo et al., 2017). Results on how women are less likely to negotiate have been used to explain part of the gender gap in earnings (Babcock and Laschever, 2003). Results that women are more likely to accept requests have been used to explain why women are more likely than men to complete non-promotional tasks at work (Babcock et al., 2017).

There are two potential explanations for these results: either men and women face different constraints, or men and women have different preferences. In anonymous laboratory settings, differences in observable choices are most often attributed to differences in preferences, because constraints that individuals face outside the laboratory should not apply (e.g., Croson and Gneezy, 2009).

In this paper, I propose a novel mechanism that can explain gender differences in anonymous lab settings without assuming different preferences. I propose that external costs, which are different for men and women, become internalized over time through habit formation. As a result, individuals will adhere to behaviors dictated by social norms even when no one is watching. In this paper, I focus on altruistic choices, as this is the focus of a large portion of experimental papers on gender differences (see, for example, Bolton and Katok, 1995; Eckel and Grossman, 1998; Andreoni and Vesterlund, 2001). I then test the model in two ways: I first conduct an empirical analysis to test the model's predictions using existing experimental datasets where gender data were collected but never analyzed, and second I design and implement a new experiment as a direct test of the model's mechanism. Using both of these methods, I find empirical support for the model's validity.

My theoretical model begins with the assumption that men and women are identical ex ante. In the model, a decision-maker, who is either a man or a woman, chooses to act either selfishly or fairly, and this choice and their gender is observed. Individuals care about their own consumption as well as how others view them. Based on the decision-maker's choice, observers make inferences about the decision maker's character. I show that if there is at least one observer who draws harsher

inferences about a female decision-maker's character if she chooses to act selfishly, then women will be more likely to behave generously in equilibrium.[1] The model thus predicts that stereotypes will perpetuate: men and women behave differently ex post because of the stereotype, even though they were identical ex ante.

I then extend this to a multi-period model and allow individuals to endogenously form gender identities. Through habit formation, as decision-makers behave in a way that is stereotypical of their gender, the association between those behaviors and their own gender strengthens. Through identity formation, individuals internalize external constraints. I show that after gender identities are formed, gender differences in behaviors will persist, even after choices are no longer observed. So although initial group differences were driven by observers' beliefs about men and women, these differences will be perpetuated in the long-run through identity formation.

I then conduct an empirical analysis using existing experimental data where gender data were collected but never analyzed and find evidence that is consistent with the model's predictions. Specifically, I find that women are more generous than men when their decision is observed, even when given the opportunity to hide selfish actions, and that women are significantly more generous than men in an anonymous dictator game where they are asked to give a particular allocation. I also find an interesting secondary result: that although these datasets were not collected with the intention of examining gender differences, the results of the papers that originally used these datasets were partly or entirely driven by only one gender (men in one and women in the other). I find that the results of the original papers were only statistically significant because either only men or only women were responsive to the experimental treatment and the result was strong enough to make the pooled result statistically significant.

I finally design and implement an experimental test of the model's mechanism. In the experiment, subjects made a series of decisions on how to allocate $30 between themselves and their partner. To generate variation in external constraints, I manipulate how likely the audience is to blame the subject for a selfish allocation. In some decisions subjects' choices were perfectly observed by others in the experiment, while in others, subjects had plausible deniability. For these decisions, there was a chance that subjects could not make a choice and an allocation where they kept everything was made for them. Higher plausible deniability results in more forgiving audience judgements, because if others in the experimental session saw that the subject was allocated everything, they could not be sure if the subject made this choice or if this choice was made for them.

Experimental treatments varied only in the order subjects made decisions. Subjects' first choice either offered no opportunity for plausible deniability (high external constraint) and this opportunity increased in subsequent decisions or their first choice offered the greatest opportunity for plausible deniability (low external constraint) and this opportunity decreased in subsequent decisions. I find evidence of persistence in behavior, as I find that subjects' decisions are relatively

[1] I show that this is also true even if all observers draw identical inferences for both genders, but women anticipate that there is at least one observer who will draw harsher inferences against them.

stable over the series of decisions. I also find that by imposing stricter constraints on subjects' initial action, male subjects make more generous allocations and continue to behave similarly to women even in later decisions when these constraints are relaxed. Specifically, I find that when subjects' first decision has low external constraints, at every level of nature intervening, women are more likely to choose equal allocations than men. However, by simply changing the order of decisions so early decisions have higher external constraints, I mitigate gender differences, as men and women are equally likely to choose a 50-50 split of the pie in this treatment.

This paper provides two important contributions to the gender differences literature. I first introduce a novel mechanism for understanding gender differences. This is the first model (to the best of my knowledge) that shows persistent gender differences without assuming differences in fundamentals. This contributes to the gender differences literature that examines the relationship between beliefs and stereotypes (Coffman, 2014; Bordalo et al., 2018; Coffman et al., 2018). I also provide additional evidence of gender differences, even in contexts where the researchers were not looking for them. This suggests gender differences, and more largely adherence to social norms, may be more prevalent than we realize.

This paper additionally contributes to the literature on social norms and social prescriptions. These two are largely viewed as distinct, with the former relating to behaviors that are externally punished if not followed (e.g., Akerlof, 1976; Kandori, 1992; Cole et al., 1992) and the latter relating to behaviors that are self-enforced (e.g., Akerlof and Kranton, 2000; Huang and Wu, 1994). I connect these two literatures, as I propose a mechanism where one is generated by internalizing the other. This also suggests a powerful way in which social norms can perpetuate, as eventually external enforcement is no longer necessary for an individual to continue adhering to the norm.

Relatedly, this paper contributes to the literature on identity economics. There is a well-established literature (beginning with Akerlof and Kranton (2000)) on identity economics–the idea that individuals have an identity and derive disutility from taking an action inconsistent with that identity. While this mechanism makes good predictions for many behaviors, it does not address how these identities may form. It assumes that an individual is endowed with both a group membership and an identity with that group and does not want to deviate from the behavioral norms associated with that group. My model, in contrast, takes a step back. It does not assume that identities are endowed, but rather are endogenously formed. I assume that group membership is randomly assigned, but then individuals are incentivized to behave in ways consistent with the norms of their group membership. As agents continue taking actions consistent with their group, the association between themselves and the behaviors associated with their group strengthens through habit formation. Then, over time, gender identities are solidified. After this point, agents will continue to act in accordance with the prescriptions of their group membership, even if actions are not observed (so there are no external incentives for adhering to the social norm).

The most closely related paper in the theoretical literature is Coate and Loury (1993). Coate and Loury determine that even if two identifiable groups are identical ex ante, an affirmative action policy can create a situation in which employers correctly perceive the groups to be unequally

productive ex post. This relates to my model in that both Coate and Loury (1993) and I are able to generate differences in observable behaviors without assuming differences in fundamentals about the groups. The most important distinction between their model and my own is that in their model, differences only persist as long as observers (in their model, employers) are able to observe an individual's group membership. If employers were not able to observe a potential employee's group membership, groups would behave identically. In my model, because of the addition of habit formation, I show that group differences can persist even when observers cannot observe an individual's group membership.

With respect to the experimental literature, my empirical analysis is most closely related to Andreoni and Vesterlund (2001) and DellaVigna et al. (2013). Both of these papers re-analyze an existing dataset and test for gender differences. Andreoni and Vesterlund find that men are more sensitive to the price of giving, while women appear more egalitarian, even when giving is expensive. DellaVigna et al. find that men and women are equally generous in a door-to-door solicitation, but that women become less generous when it is easy to avoid the solicitor. While both papers report significant gender differences, each of these papers re-analyzes only one dataset. In this paper I analyze multiple datasets, which allows me to come to different conclusions than one of these papers. Notably, DellaVigna et al. conclude from their analysis that women are more likely to be on the margin of giving, and are therefore more sensitive to experimental treatments. Using a larger number of datasets, I do not find support for this claim, as I find that men were more sensitive to experimental treatments in one of datasets I analyze as well as in my own experiments.

The paper proceeds as follows: In Section 2 I construct and analyze the model and develop a set of testable predictions. Section 3 presents the empirical analysis. Section 4 presents the experimental design, and the experimental results are presented in Section 5. Implications for identification are discussed in Section 6. Section 7 concludes. All proofs appear in the Appendix.

2 Model

I develop a model based on Andreoni and Bernheim (2009) to analyze an individual's decision to make altruistic choices. An individual may behave altruistically either because they care about fairness or because they desire others to perceive them as fair. In the model, individuals make a choice–to act either selfishly or fairly–and this choice is observed. Observers, after seeing the individual's choice make an inference about their character, which is unobservable. Individuals may then act fairly because they inherently care about fairness to varying degrees and because they care about the inferences others make about their character. Individuals' gender is visible and observers may form different inferences based on the individual's gender. These different inferences provide different constraints for men and women, causing them to behave differently. Throughout an individual's lifetime, they continue to face these same types of choices. As they continue to do so, they begin to internalize these different constraints. Eventually, individuals begin to self-enforce these norms as these constraints become internalized.

This model shows how gender differences can be perpetuated, as I show that even when members of the two groups are identical ex ante, if there exists a stereotype that influences observers' beliefs about the groups, group members will behave in ways consistent with this stereotype in equilibrium. Then, due to habit formation, these group difference will persist, even after choices are no longer observed.

I extend the model in Andreoni and Bernheim (2009) by relaxing their assumptions that observers hold common, correct priors and that observers form the same posterior for any decision maker that makes the same allocation. I allow observers to hold non-common priors and I allow these priors to be incorrect. I also allow for observers to form different posteriors for different decision makers conditional on observing the same allocation (in the model, observers may update their beliefs differently based on the decision maker's gender). Unlike Andreoni and Bernheim, I assume decision makers belong to different groups (which I interpret as genders). While Andreoni and Bernheim only consider a single decision, I extend the model to multiple periods and also introduce a habit formation mechanism.

2.1 Setup

Two players–a decision-maker (D) and a receiver (R)–split a prize normalized to have unit value. D transfers $x \in [0,1]$ to R and consumes $1-x$. Decision-makers belong to one of two groups and have label $L \in \{M, W\}$ that discloses group membership. L is visible, making D's group membership public information. Decision-makers are differentiated by a parameter, t, that indicates the importance D places on fairness; t is D's private information. The distribution of t has full support over the interval $[0, \bar{t}]$. K denotes the CDF, and I define K_T as the CDF obtained from T, conditioning on $T \leq t$. Groups are randomly assigned, so groups are identical ex ante.

D cares about consumption $(1-x)$ as well as their social image (s), as perceived by an Audience ($\mathcal{A}$), which is composed of a set of audience members that includes R. $F(1-x, s)$ is a utility function of $1-x$ and s. It is unbounded in both arguments, twice continuously differentiable, strictly increasing, and strictly concave in $1-x$. The decision-maker also cares about fairness, which is determined by the extent to which the outcome departs from the fair alternative, x^F.[2] D's total payoff is:

$$U(x, s, t) = F(1-x, s) + tG(x - x^F)$$

G is twice continuously differentiable, strictly concave, and reaches a maximum at zero. D's social image, s, depends on $\mathcal{A}$'s perception of D's fairness. I normalize s so that if $\mathcal{A}$ is certain D's type is $\hat{t}$, then D's social image is $\hat{t}$.

$Q_L(x)$ denotes the CDF that represents $\mathcal{A}$'s belief about D's type and $S(Q_L(x))$ is the associated social image, which is D's belief about how they are perceived by $\mathcal{A}$. $\mathcal{A}$ forms an inference $Q_L(x)$ about t after observing x and L. S is continuous and satisfies $S(Q_L^1(x)) > S(Q_L^2(x))$ if $Q_L^1(x)$

[2] x^F is most commonly $\frac{1}{2}$, but I allow it to be a free parameter for generality.

first-order stochastically dominates (FOSD) $Q_L^2(x)$. One possible functional form that the social image may take is $\mathbb{E}_D[\mathbb{E}_{\mathcal{A}}(t)]$, so D's social image is their expectation of $\mathcal{A}$'s expectation of their type.

While t for both groups is drawn from the same distribution (K), the audience does not observe K and forms a prior about the distribution of types, P_L. If the audience believes groups are drawn from the same distribution, then $P_M = P_W$. Additionally, the decision-maker does not observe the inference ($Q_L(x)$) directly, but they know that $\mathcal{A}$ will judge them based on x, so they account for this when choosing x. I restrict attention to pure strategy equilibria.

2.2 One Period Model

I first analyze the model where the game lasts only one period. For simplification, I restrict the decision-maker's choice to $x \in \{0, x^F\}$. Since the decision-maker's choice is binary but there is a continuum of types, this precludes perfect separation. The following lemma shows that there is a threshold type, t_L^*, and all types above this threshold will choose to transfer the fair allocation while all types below the threshold will choose to transfer zero.

Result 1. *For each $L \in \{M, W\}$, there exists a unique t_L^* such that $\forall t \geq t_L^*$, D chooses $x = x^F$ and $\forall t < t_L^*$, D chooses $x = 0$.*

I first examine the case where all audience members believe groups are identical and the decision-maker knows $\mathcal{A}$ holds these beliefs. In this case, the threshold type will be the same across groups, as the next result shows.

Result 2. *(Benchmark) Let t_W^* denote the threshold type for group W and t_M^* denote the threshold type for group M. If all audience members make inference $Q_M(x) = Q_W(x)$ and these beliefs are common knowledge, then $t_W^* = t_M^*$.*

When all audience members make inferences independent of D's group membership and the decision-maker knows this, then there will be no differences in group behavior. However, if even one audience member believes groups are different, this result breaks down.

I now introduce that the audience may form different inferences after observing the same value of x for the different groups. I will refer to this as a *stereotype*.

Definition 1. *Stereotype: $Q_M(x) \neq Q_W(x)$, given x*

Since the decision-maker does not directly observe $Q_L(x)$, even if all audience members make the same inference about the groups, the decision-maker may believe that audience members will make different inferences based on group membership. I refer to this as a *perceived stereotype*.

Definition 2. *Perceived Stereotype: $Q_M(x) = Q_W(x)$ and $S_M(Q_M(x)) \neq S_W(Q_W(x))$, given x*

If there exists an audience member who holds a stereotype, or if there exists a perceived stereotype, then groups will behave differently in equilibrium, as the next result shows.

Result 3. *If (i) there exists at least one audience member who holds a stereotype, or (ii) there exists a perceived stereotype, then* $t^*_W \neq t^*_M$.

This section examined an equilibrium where actions are perfectly observed. We can easily imagine scenarios where this is not the case. The next section examines the case where the observation of the decision-maker's choice is noisy.

2.3 One Period Model with Plausible Deniability

I now examine the case where the observation of the decision-maker's choice, x, is noisy. Suppose now that nature intervenes with probability $p \in (0, 1)$. If nature intervenes, $x = 0$ is transferred regardless of the decision-maker's choice. p is common knowledge, but R and $\mathcal{A}$ cannot observe if nature intervened. This grants the decision-maker some degree of plausible deniability, because if $\mathcal{A}$ observes the allocation $x = 0$, there is some chance that nature, and not the decision-maker, made this allocation.

The following result demonstrates that introducing some plausible deniability decreases the threshold type. This is because the higher the chance that nature intervenes, the more likely it is that nature is responsible for an allocation of $x = 0$, and the audience will be less likely to blame the decision-maker, resulting in less harsh inferences. As a result, a lower fraction of decision-makers will choose $x = x^F$, resulting in greater pooling at the bottom.

Result 4. t^*_L *is increasing in* p.

Although the threshold type falls when decision-makers can "hide" behind nature, unless the decision-maker and all audience members believe that groups are identical, at each level of p, the threshold will differ between groups, as demonstrated by the next result.

Result 5. *Let* $t^*_{p,L}$ *denote the threshold* t *for group* L *when the probability of intervention is* p. *If there exists at least one audience member who holds a stereotype or if there exists a perceived stereotype, then* $t^*_{p,W} \neq t^*_{p,M}$ *for any* $p \in (0, 1)$.

The above result shows that group differences will still exist even when there is an opportunity for plausible deniability. Although the fraction of both groups voluntarily giving $x = 0$ grows, at every level of p this fraction will be smaller for one group.

2.4 Multi-period Model with Habit Formation

I show above that when there are stereotype-based ideas about groups and these ideas influence beliefs about the groups, then individuals will behave consistently with this stereotype in equilibrium. That is, even when the two groups are ex ante identical, expectations can result in group differences. Now I want to determine if these differences can persist in the long-run even in contexts where social image is not a concern (for example, because the decision-maker's choice is not observed in some period).

D participates in a sequence of dictator games, getting rematched with a different receiver and audience in each game. Each game is denoted by $g \in [1, \bar{g}]$. The sequence consists of two phases: in the first phase ($g \in [1, \hat{g}]$) actions are observed, and in the second phase ($g \in [\hat{g}+1, \bar{g}]$) actions are not observed. I assume that the decision-maker has habit formation, so the more times he has taken an action in the past, the more likely he is to take that action in the current period. Let x_g denote D's transfer in game g and s_g denote D's social image in game g (there is no transfer of social image between games because the audience is different in each game). $r \in [0, \bar{r}]$ is the weight D places on habit formation. The decision-maker places more weight on more recent actions, so past actions are time-discounted by a factor $\delta \in (0, 1)$. D's utility function for each game can be written as the following:

Phase 1:

$$U = F(1 - x_g, s_g) + tG(x_g - x^F) + rH(\sum_{j=1}^{g-1} \delta^j \mathbb{1}\{x_{g-j} = x_g\})$$

Phase 2:

$$U = F(1 - x_g) + tG(x_g - x^F) + rH(\sum_{j=1}^{g-1} \delta^j \mathbb{1}\{x_{g-j} = x_g\})$$

I assume H is twice continuously differentiable, strictly increasing, non-negative, and $H(0) = 0$.

Note that the above utility functions differ in that s does not enter the utility function in Phase 2. Since actions are not observed in this phase, the audience cannot draw inferences about D's type and so social image is not a concern.

The following result demonstrates that although initial group differences are due to contexts where social image is relevant, habit formation can eventually make these differences permanent, so members of the two groups behave differently even when choices are anonymous.

Result 6. *For $r > 0$, if there exists at least one audience member who holds the same stereotype or D believes in the same perceived stereotype $\forall g \in [1, \bar{g}]$, then $\exists \hat{g}^*$ such that $\forall \hat{g} > \hat{g}^*$, D chooses $x_g = x_{g-j}$ with probability 1.*

This result illustrates that my model gives rise to behavioral differences between groups that persist in the long-run, even in contexts where choices are anonymous, despite the assumption that groups were identical ex ante. Group differences are initially driven by the difference in inferences, but these initial differences will eventually become permanent due to habit formation.

2.5 Discussion

This model proposes a mechanism by which individuals internalize external constraints. While the external constraints were initially necessary for group differences to arise, eventually these external constraints become internalized. Individuals then self-enforce social norms and adhere to the norm even when no one is watching.

This model also allows for gender identities to form endogenously. Previous papers on identity assume either that identities are exogenously endowed ex ante (Akerlof and Kranton, 2000) or

that another exogenous event, for example puberty, causes individuals to form gender identities (Bharadwaj and Cullen, 2017). My model does not require either of these, as in the model identities are formed entirely through habit formation. Thus, simply behaving in a way that is consistent with the norms of a particular group over time causes individuals to form a group identity.

2.6 Testable Predictions

In the model I define a stereotype as anytime an audience member makes different inferences after observing the same allocation dependent on the decision-maker's group. In order to generate precise testable predictions, I need to make more specific assumptions about the direction of the stereotype. There is empirical evidence that women are judged negatively for not taking an altruistic action while men are not. For example, Heilman and Chen (2005) find withholding an altruistic action at work negatively affects women's, but not men's, evaluations and recommendations.

If women are judged more harshly or believe they will be judged more harshly if they behave selfishly ($Q_M(x)$ first order stochastically dominates (FOSD) $Q_M(x)$ if $x = 0$ or $S_M(Q_M(x)) > S_W(Q_W(x))$ if $x = 0$), then

1. Women will be more generous when their choice is observable, even when they are offered opportunities for plausible deniability.

2. If women have sufficient experience, women will be more generous even when no one is watching.

3 Empirical Analysis

I conduct an empirical analysis to test for evidence of the model's predictions. I use existing data on dictator games where gender data were collected but never analyzed. This is a cleaner test of the model's findings than using published results from the gender differences literature.

The empirical analysis uses data from two previous experiments that involve dictator games. I do not rely only on the results of these papers, but I use their raw data to perform new analysis. These datasets are Andreoni and Bernheim (2009) "Social Image and the 50-50 Norm: A theoretical and experimental analysis of audience effects" and Andreoni and Rao (2011) "The Power of Asking: How communication affects selfishness, empathy, and altruism". Going forward, these studies will be referred to as AB and AR. Dataset AB allows me to test the model's first prediction that women will be more generous than men when offered plausible deniability and dataset AR allows me to test the model's second prediction that women will be more generous even in anonymous settings.

For each of these datasets, I first discuss the key features of the experimental design as well as the original paper's main result for comparison to my new analysis. Then, I present my new analysis using gender data.

3.1 AB

AB examines preferences for fairness versus preferences for being perceived as fair. The experimental design allowed individuals to "hide" their selfish actions by giving them plausible deniability. At the beginning of the experiment, subjects were divided into pairs, and partners were seated opposite one another, so all subjects knew with whom they were paired. Allocators needed to decide how to split \$20 between themselves and their partner. For 9 separate dictator games, there was a probability that nature intervened, which varied between 0, 0.25, 0.5, and 0.75. If nature intervened, the allocator could not choose the allocation, and instead a predetermined amount (x_0 or $20 - x_0$) was transferred. There were two treatments, one where $x_0 = 0$ and one where $x_0 = 1$.[3] At the end of the experiment, one of the decisions was randomly selected and the outcome for each pair was made public.[4] The experiment involved 120 subjects (60 men and 60 women), all undergraduates at the University of Wisconsin–Madison.[5]

3.1.1 Original Results

Figures 1 and 2 show the distributions of dictators' voluntary choices in the two conditions ($x_0 = 0$ and $x_0 = 1$, respectively). Values of x are grouped into five categories: $x = 0$, $x = 1$, $2 \leq x \leq 9$, $x = 10$, and $x > 10$. Looking at Figure 1, when $p = 0$, 57 percent of allocators transfer half the prize. As p increases, this fraction steadily declines, and when $p = 75$, only 28 percent of subjects split the prize equally. As p increases, the fraction of subjects transferring nothing grows, starting at 30 percent when $p = 0$ and ending at 70 percent when $p = 75$.

Looking at Figure 2, a large fraction of subjects choose to split the prize evenly when $p = 0$ (69 percent) and, like in the previous condition, this fraction declines at p increases, shrinking to 34 percent when $p = 75$. Conversely, the fraction of subjects transferring 1 to their partner grows substantially as p increases, beginning at only 3 percent when $p = 0$ and growing to 48 percent when $p = 75$.

Table 1 reports the results of two linear probability models. Looking at the first column of Table 1, the probability of choosing $x = x_0$ increases by approximately 27 percentage points when p increases from 0 to 0.25, and increases by approximately 15 percentage points when p increases from 0.25 to 0.5. This suggests that there is a significant increase in pooling at x_0 at these increases in p but not when p rises from 0.5 to 0.75. Looking at the second column, the coefficients imply that there is a significant decrease in pooling at $x = 10$ when p increases from 0 to 0.25, as the probability of choosing $x = 10$ decreases by nearly 24 percentage points, but there is no significant decline when p increases from 0.25 to 0.5 or 0.5 to 0.75. Similar results hold when I separate by condition (estimates reported in Table 2).

[3] Each subject participated in only one of the treatments.

[4] The experimenter wrote the final allocation on the board at the front of the room. This decision sheet was also used to determine payments.

[5] One pair in condition $x_0 = 1$ did not complete the experiment, so only 118 subjects are included in analysis.

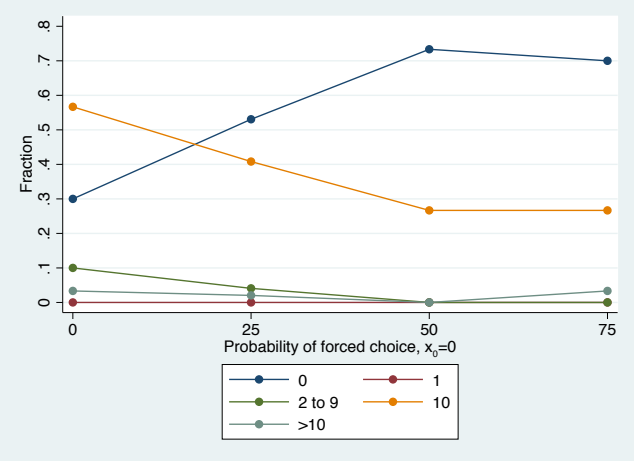


Figure 1: Distribution of amounts allocated to partners, condition $x_0 = 0$

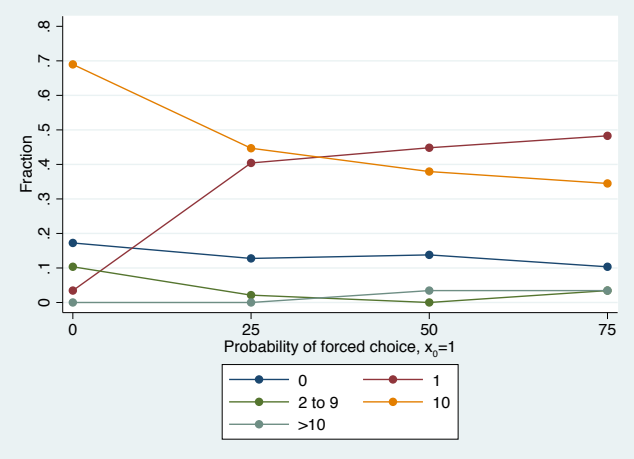


Figure 2: Distribution of amounts allocated to partners, condition $x_0 = 1$

3.1.2 Gender Analysis

This dataset allows me to test the model's first prediction that women will be more generous than men even when offered an opportunity to hide a selfish action behind a noisy signal.

Figures 3 and 4 show the distributions of dictators' voluntary choices in the two conditions ($x_0 = 0$ and $x_0 = 1$, respectively) separately for men and women. The differences in these distributions is particularly striking in Figure 3. Nearly 40 percent of men transfer nothing when $p = 0$ and this increases to over 80 percent when $p = 75$. By contrast, only half as many women (approximately 20 precent) choose $x = 0$ when $p = 0$ and this fraction increases to 57 percent when $p = 75$. Looking at even-splits, 56 percent of men transfer half the prize when $p = 0$ and this shrinks to 12 percent when $p = 75$. This decrease is less substantial for women, as 57 percent transfer half the prize when $p = 0$ and this only shrinks to 43 percent when $p = 75$. This means in the decision with the highest level of plausible deniability, compared to men, over 3.5 times as many women are still opting to share the pie equally.

Table 1: Linear Probability Models

	Probability of Choosing $x = x_0$	Probability of Choosing $x = 10$
$p \geq 25$	0.271***	-0.237***
	(0.0786)	(0.0761)
$p \geq 50$	0.153***	-0.0678
	(0.0549)	(0.0476)
$p = 75$	0.000	-0.0169
	(0.0487)	(0.0525)
Constant	0.169***	0.627***
	(0.0549)	(0.0514)
Observations	236	236

Standard errors (clustered at the individual level) in parentheses. All specifications include individual fixed effects.
*** p<0.01, ** p<0.05, * p<0.1

Table 2: Linear Probability Models by Condition

	Probability of choosing $x = x_0$		Probability of choosing $x = 10$	
	$x_0 = 0$	$x_0 = 1$	$x_0 = 0$	$x_0 = 1$
$p \geq 25$	0.233**	0.310**	-0.233*	-0.241**
	(0.108)	(0.118)	(0.121)	(0.0946)
$p \geq 50$	0.200**	0.103	-0.0667	-0.0690
	(0.0869)	(0.0673)	(0.0780)	(0.0560)
$p = 75$	-0.0333	0.0345	0.000	-0.0345
	(0.0683)	(0.0707)	(0.0793)	(0.0707)
Constant	0.300***	0.0345	0.567***	0.690***
	(0.0714)	(0.0860)	(0.0769)	(0.0701)
Observations	120	116	120	116

Standard errors (clustered at the individual level) in parentheses. All specifications include individual fixed effects.
*** p<0.01, ** p<0.05, * p<0.1

It is also interesting to note where these increases/decreases come from. When p increases from 0 to 0.25, the same fraction of women give $x = 0$ and the fraction of women giving intermediate amounts ($x \in [1, 9]$) decreases to 0 when $p \geq 25$. For men, however, the fraction giving intermediate amounts stays relatively constant when p increases from 0 to 0.25. This illustrates an interesting pattern in "switching" behavior. The increase in pooling at $x = 0$ for men when p increases from 0 to 0.25 is driven by men switching from giving equal divisions to giving zero when there is an opportunity for plausible deniability. The increase in pooling at $x = 0$ for women is driven by women who were giving intermediate amounts when choices were perfectly observable.

These results also suggest that women who switch from making equal divisions need a greater degree of plausible deniability before they are willing to change their behavior. While men changed

their behavior from giving half to giving nothing at any positive level of plausible deniability, women needed this probability to be 0.5 in order for a majority fraction to choose $x = 0$. The willingness to take advantage of plausible deniability is clearly blunted for women compared to men.

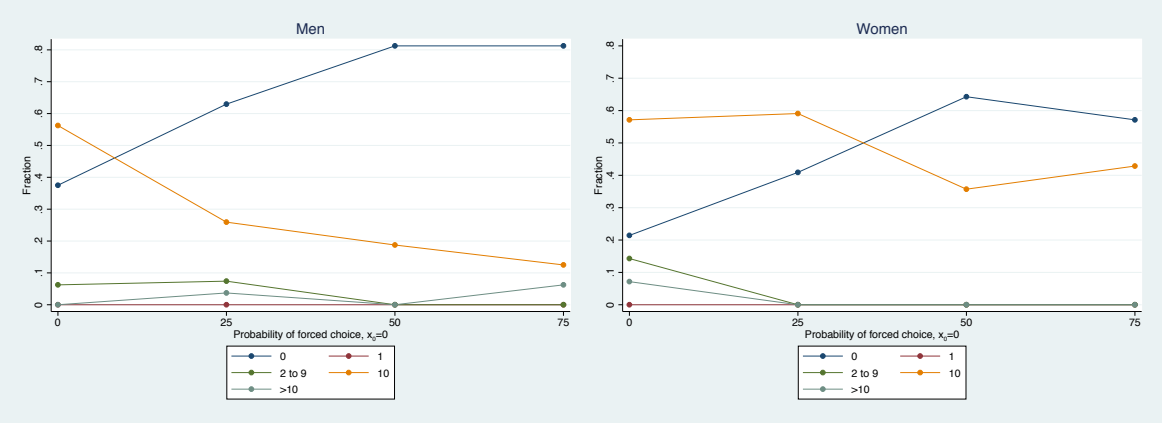


Figure 3: Distribution of amounts allocated to partners by gender, condition $x_0 = 0$

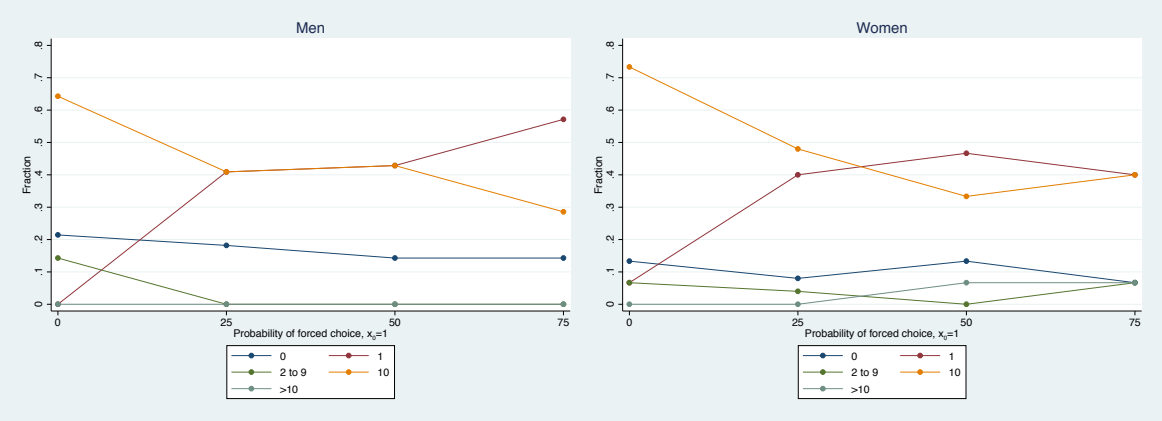


Figure 4: Distribution of amounts allocated to partners by gender, condition $x_0 = 1$

Table 3 reports the results of linear probability models. Columns 1 and 3 report results for the $x_0 = 0$ condition and columns 2 and 4 report results for the $x_0 = 1$ condition. Looking at the first column, there is a statistically significant increase in pooling at $x = 0$ when p increases from 0 to 0.25 for women, but not for men. Conversely, there is a statistically significant increase when p increases from 0.25 to 0.5 for men but not for women. The coefficient for both is insignificant for $p = 75$. Looking at the third column, none of the coefficients are statistically significant for women. However, when p increases from 0 to 0.25, the probability that a man divides the prize equally decreases by over 37 percentage points. This coefficient is statistically significant and over five times the magnitude of the coefficient for women.

Looking at the second and fourth columns ($x_0 = 1$ condition), gender differences are not as stark. The main notable difference is that there is a significant increase for men giving $x = 1$

Table 3: Linear Probability Models by Condition

	Probability of choosing $x = x_0$		Probability of choosing $x = 10$	
	$x_0 = 0$	$x_0 = 1$	$x_0 = 0$	$x_0 = 1$
$p \geq 25$	0.187	0.357**	-0.375**	-0.214
	(0.159)	(0.155)	(0.147)	(0.133)
$p \geq 50$	0.250*	0.0714	-0.000	0.000
	(0.131)	(0.0835)	(0.107)	(2.63e-09)
$p = 75$	-0.000	0.143	-0.0625	-0.143
		(0.113)	(0.0733)	(0.113)
$p \geq 25 \times$ Female	0.0982	-0.0905	0.304	-0.0524
	(0.216)	(0.237)	(0.241)	(0.192)
$p \geq 50 \times$ Female	-0.107	0.0619	-0.143	-0.133
	(0.173)	(0.135)	(0.156)	(0.106)
$p = 75 \times$ Female	-0.0714	-0.210	0.134	0.210
	(0.148)	(0.138)	(0.165)	(0.138)
Constant	0.300***	0.0345	0.567***	0.690***
	(0.0727)	(0.0870)	(0.0754)	(0.0712)
$p \geq 25$ if Female	0.286*	0.267	-0.0714	-0.267*
$p \geq 50$ if Female	0.143	0.133	-0.143	-0.133
$p = 75$ if Female	-0.0714	-0.0667	0.0714	0.0667
Observations	120	116	120	116

Standard errors (clustered at the individual level) in parentheses. All specifications include individual fixed effects.
*** p<0.01, ** p<0.05, * p<0.1

when p increases from 0 to 0.25. Similarly, there is a significant decrease in pooling at $x = 10$ as p increases from 0 to 0.25 for women, but not for men.

Comparing condition $x_0 = 0$ to $x_0 = 1$, women behave relatively similarly between the two conditions. Even at the highest level of plausible deniability $p = 75$ in condition $x_0 = 1$, 40 percent of women chose an even split while another 40 percent chose to transfer x_0. This is similar to what happened in condition $x_0 = 0$, where these percentages were 57 and 43, respectively. On the other hand, 29 percent of men chose even splits and 48 percent chose $x = x_0$ when $p = 0.75$ while these percentages were 12 and 81, respectively in the $x_0 = 0$ condition.

3.1.3 Summary

There are clear differences in men's and women's behavior in the $x_0 = 0$ condition. A larger fraction of men, compared to women, chose to transfer nothing to their partner when choices were perfectly observable. While the pooling at $x = 0$ increased for both genders as subjects were able to "hide" their selfishness, at every level of plausible deniability, the fraction of men choosing to transfer zero was larger than it was for women. Conversely, while the fraction of men choosing to split the

prize evenly sharply decreased as the probability of nature intervening increased, this decline didn't begin until after p was greater than 25 and the degree of decline was blunted compared to men.

Turning to condition $x_0 = 1$, the results were relatively similar between men and women. Women behaved relatively similarly between the two conditions. Thus, the lack of a real difference between the groups stems from men acting more similarly to women under this condition rather than women acting more similarly to men.

These results are in line with the model's prediction that women will be more generous than men when provided opportunities to hide their selfishness behind noisy signal.

3.2 AR

AR examines the role of communication in giving decisions. The experiment involved an anonymous dictator game where they systematically varied who in the pair could speak. Pairs and roles were randomly assigned, and allocators decided how to split \$10 between themselves and their partners.[6] Pairs communicated via written messages that contained both a pass allocation (numerical request) and a free response message.[7] There were five experimental treatments: Baseline (no communication), Ask (only the recipient sent a message), Explain (only the allocator sent a message), Ask-Explain (both sent a message, but the recipient sent theirs first), and Explain-Ask (both sent a message, but the allocator sent theirs first). Subjects made two allocations (with different partners) and participated in only one experimental treatment. The experiment involved 258 subjects (117 men and 141 women), all undergraduates at the University of California, San Diego.

3.2.1 Original Results

Andreoni and Rao find that anytime the recipient spoke, giving increased. In the Baseline (no-communication) condition, subjects passed 15.3 MU on average. Giving was higher in the Ask condition, with subjects passing 23.25 MU on average, and this difference becomes statistically significant when only requests for an even division or less are considered (Wilcoxon rank-sum $z = 1.965, p < 0.049$). Giving was highest in the two-way communication conditions, and this difference is significantly different from Baseline (AE: $z = 3.29, p < 0.001$, EA: $z = 2.04, p < 0.041$). Figure 5 (left panel) presents mean pass values.[8]

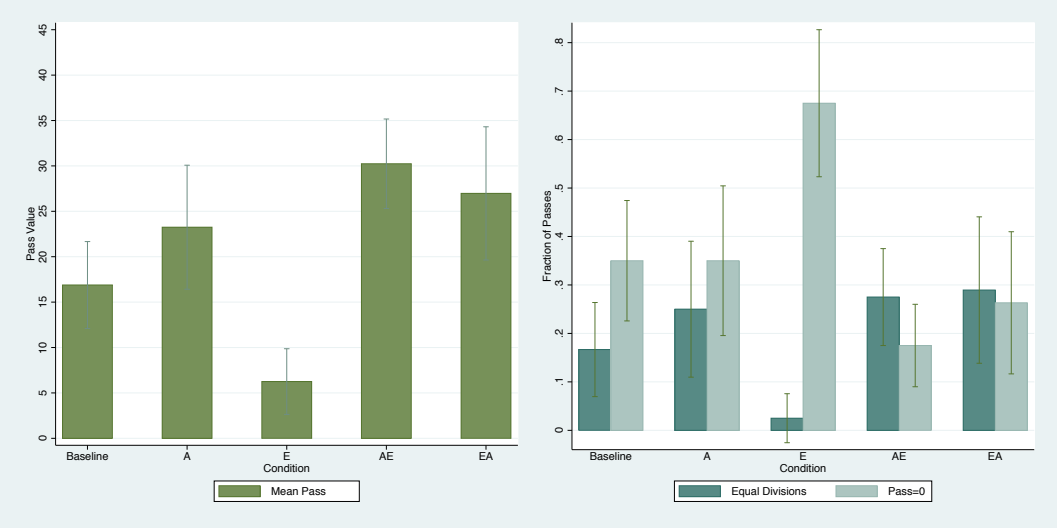
3.2.2 Gender Analysis

This dataset allows me to test the second prediction that women will be more generous even when choices are anonymous. Figure 6 (left panel) presents mean pass values and the fraction of subjects who chose equal divisions and to pass zero (right panel) separately for men and women. When

[6] Subjects divided 100 monetary units (MU) at an exchange rate of 1 MU = \$0.10.

[7] The only restriction on messages was that they could not contain identitying information or promises outside the lab.

[8] This is a recreation of Figure 2 from Andreoni and Rao (2011).



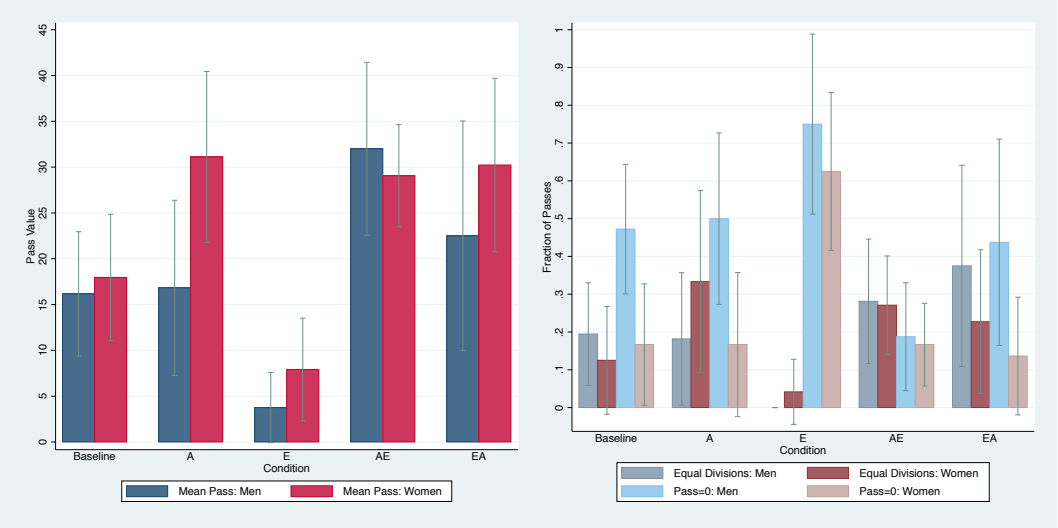
(Left panel) Means of pass value by condition: Baseline (no communication), A (ask by recipients), E (explain by allocators), AE (ask then explain), EA (explain then ask). (Right panel) Fraction of equal divisions and pass=0 by condition. The allocator determined the final allocation of 100 MU between him/herself and an anonymous receiver. Bars give +/- 2 s.e.

Figure 5: Means of pass values and fraction of equal divisions and passes of zero by condition

subjects did not communicate with one another (Baseline condition), men and women were equally generous on average (16.2 MU vs. 17.96 MU, respectively). However, compared to women, nearly three times as many men chose to allocate nothing to their partners (47.2 percent of men vs. 16.67 percent of women; Fisher's Exact Test: $p = 0.026$).

Differences between men and women become stronger when receivers are allowed to speak. When only recipients send a message, women are approximately twice as generous as men on average, as men give 16.8 MU on average while women give up 31.1 MU on average–nearly one-third of the total pie (t-test: $t = -2.21, p = 0.033$). Again in this condition, women are substantially less likely to give nothing to their partners (50.0 percent of men vs. 16.67 percent of women; Fisher's Exact test: $p = 0.046$). Comparing the distributions of allocations between men and women in this condition is even more striking. Figure 7 presents smoothed kernel densities of pass values for the Baseline and Ask conditions. The distributions for men and women in the Ask condition are both visibly and statistically significantly different (Wilcoxon rank-sum $z = -1.99, p = 0.046$; Kolmogorov-Smirnov $D = 0.42, p = 0.031$). Women were also more generous than men in two-way communication when allocators spoke first (Explain-Ask condition), as they were again significantly less likely to make zero allocations (43.8 percent of men vs. 13.6 percent of women; Fisher's Exact test $p = 0.062$). Men and women were equally generous in the Ask-Explain condition, but this was due to men being more generous in this condition compared to the others. Namely, a much smaller fraction of men gave zero in this condition compared to all the others (18.8 percent in Ask-Explain compared to a minimum of 44 percent across the remaining conditions).

Men and women also respond differently to numerical pass requests. Looking at the difference



(Left panel) Means of pass value by condition: Baseline (no communication), A (ask by recipients), E (explain by allocators), AE (ask then explain), EA (explain then ask). (Right panel) Fraction of equal divisions and pass=0 by condition. The allocator determined the final allocation of 100 MU between him/herself and an anonymous receiver. Bars give +/- 2 s.e.

Figure 6: Means of pass values and fraction of equal divisions and passes of zero by condition and gender

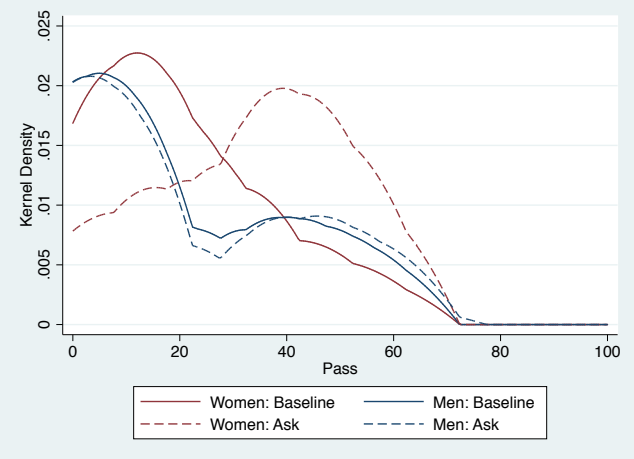


Figure 7: Smoothed kernel densities of pass values–Baseline and Ask conditions by gender

between the recipient's numerical request and the allocator's pass value, again reveals large and significant gender differences. Women gave, on average, amounts closer to the request. In the Ask condition, the mean difference between the request men receive and what they give is more than twice that for women (35 MU vs. 14.5 MU), and this difference is statistically significant($z = 2.20, p = 0.028; D = 0.38, p = 0.07$). This size of this difference is heavily driven by a large number of men receiving requests of 50 MU (the modal request) and responding by giving nothing. This result is not due to men receiving higher pass requests (or conversely women receiving more "reasonable"

requests), as the requests allocators' received did not differ by gender in any condition.[9]

This difference stays relatively stable for women between one- and two-way communication (Ask-Explain: 18.6 MU, Explain-Ask: 14.0 MU), but decreases for men (Ask-Explain: 20.4, Explain-Ask: 25.6). However, the decrease between Ask and Ask-Explain is marginally insignificant ($D = 0.31, p = 0.102$), while the decrease between Ask and Explain-Ask is not statistically significant.

3.2.3 Summary

These results are consistent with the model's prediction that if given sufficient experience, women will be more generous than men even in anonymous settings. Since the subjects in this experiment are college students, it is reasonable to believe that the women in the study have had enough experience to generate generous habits. Women were, in general, less likely to make perfectly selfish allocations. And when receivers were permitted to "speak," women were substantially more generous than men. Women were responsive to this social norm even when their identity was unknown to all those involved in the study, including the beneficiary of their generosity.

Additionally, considering gender leads to a very different conclusion of the original results drawn from this dataset. Andreoni and Rao found that whenever the recipient spoke, giving increased. However, this conclusion is only true for women. For male subjects to give more generous allocations, there needed to be two-way communication *and* the recipient needed to speak first. This challenges their finding that giving was highest under two-way communication.

3.3 Summary of Results

In a public setting, women were less likely to exploit an opportunity to hide their selfishness when they were offered some degree of plausible deniability. Women were less likely to make perfectly selfish allocations and were substantially more generous in response to the presence of requests, even though choices were anonymous. These results provide empirical support consistent with the model's predictions.

Another interesting finding from this analysis is that in both of the datasets in the empirical analysis, one gender was responsible for driving some or all of the published results. The measured average treatment effect was not representative of the sample. Instead, it was an average of two extremes–one group that was strongly affected by the treatment and another group that was either not affected at all or was affected to a significantly lesser degree. This analysis provides strong evidence that heterogenous treatment effects due to behavioral differences between men and women may be responsible for many experimental results. This suggests that even if an experimental treatment was not designed with the intention of examining gender differences and even if it is not clear that the environment being studied should have differential effects on men and women, additional analysis to examine heterogenous treatment effects by gender should be performed.

[9]Since partners were anonymous to one another, and receivers therefore didn't know the gender of their partners, this is not surprising.

4 Experimental Design

The empirical analysis provides evidence in support of the model's predictions. However, these results would also be consistent with a model that assumed that men and women just had different fairness preferences. In order to disentangle these competing explanations, I design and implement a new experiment. The experiment is designed to test where the model of stereotypes and the model of different fairness preferences make different predictions. While the model proposed in this paper is designed to capture a complex process that takes place over an individual's lifetime, I distill this down into a key feature that can be tested in a laboratory setting: early decisions can have persistent effects even when the constraints of those decisions change. In the experiment, subjects make a series of dictator game allocations. The games vary in the chance that nature intervenes and forces subjects to either keep everything or give everything to their partner with equal probability. If there is a chance that nature intervenes, this gives subjects an opportunity for plausible deniability if they choose to keep everything (because if others in the experiment observe an allocation where the subject keeps everything, they will be unable to determine if the subject made that choice or if nature forced that allocation). Experimental treatments vary only in the order that subjects make decisions. Subjects' first choice either (i) offers no opportunity for plausible deniability and this opportunity increases in subsequent decisions or (ii) offers the highest level of plausible deniability and this opportunity decreases in subsequent decisions. In the experiment, I examine if exposing subjects to high external constraints in initial decisions mitigates gender differences even when subjects can take advantage of plausible deniability in later decisions.

4.1 Procedures

All sessions were conducted at the EconLab at the University of California, San Diego using undergraduate students recruited via email. Instructions were read aloud to subjects and they submitted all responses via experimental software. Subjects were divided into pairs, with partners and roles assigned randomly. Within each pair, one subject was designated as the decision-maker and the other pair the receiver. The decision-maker determined how the pair divided $30.

Each session proceeded as follows: Subjects were randomly divided into pairs, and partners were seated opposite one another. One-at-a-time, pairs stood up and greeted one another in order to identify themselves to their partner. Decision-makers made 27 decisions for how to split $30 between themselves and their partner. Decisions differed in the probability that they were forced to make a particular allocation. If a decision was "forced," the decision-maker kept all $30 and transferred nothing to their partner or kept nothing and transferred all $30 to their partner with equal probability.[10] The probability that a decision was forced varied between 10 values (0, 0.01, 0.02, 0.03, 0.05, 0.10, 0.25, 0.50, 0.75, and 0.90). For each decision, decision-makers knew whether

[10]This was done to make the ex ante outcome of being forced equal for both the decision-maker and the partner. This was to ensure that individuals did not try to maximize ex ante fairness by being more generous in decisions where they were able to make an allocation in order to make up for forced decisions in which they were forced to make a selfish allocation.

they were "forced" or free to make an allocation. This was to highlight for decision-makers that they knew whether their choice was forced but no one else did. After all subjects had submitted their decisions, one decision was selected at random to determine payments. At the end of the session, the outcome for all groups of this selected decision was written on the board at the front of the room. There were two treatment groups: one treatment where subjects made decisions in increasing order of being forced (starting with a zero probability of being forced and ending with 0.90) and another treatment where subjects made decisions in decreasing order of being forced (starting with 0.90 and ending with zero). I will refer to these as the Increasing treatment and the Decreasing treatment, respectively. This is a between subjects design (all subjects within a single session were in the same treatment and each subject participated in only one treatment).

At the end of the session, subjects were paid in cash. Sessions lasted approximately one hour, and subjects earned an average of $20, including a $5 show-up fee for their participation. 9 sessions (5 sessions of the Increasing treatment and 4 sessions of the Decreasing treatment) of 16-20 subjects per session were conducted, resulting in a total of 166 subjects (41 men and 42 women decision-makers).

5 Experimental Results

I seek to answer two questions: First, do individuals exhibit persistence in their choices–is what individuals choose in each decision relatively stable even though the opportunity for plausible deniability varies? Second, does the order of the decisions matter–if individuals are initially exposed to a low probability of nature intervening, are they more generous initially and does this generosity extend to later decisions where the opportunity for plausible deniability is high?

I formalize these questions into three hypotheses:

Hypothesis 1: Choices will be relatively stable even though the opportunity for plausible deniability varies. This means that as subjects move to the next decision in the series, they will not be significantly more likely to change their allocation.

Hypothesis 2: Women in the Decreasing treatment will be more generous than men in the Decreasing treatment.

$$Pr(Pass = 15|W, D) > Pr(Pass = 15|M, D)$$

Hypothesis 3: Men and women in the Increasing treatment will be equally generous.

$$Pr(Pass = 15|W, I) = Pr(Pass = 15|M, I)$$

When subjects are initially exposed to a high probability of intervention, I predict men will be more likely to take advantage of this plausible deniability. These differences will persist through the series of decisions, so even when there are low or no opportunities for plausible deniability, men will still be less likely than women to choose equal allocations. However, when subjects' initial decisions have no probability of intervention, I predict that men will give equal allocations

at approximately the same rate as women, and these initial generous actions will persist in later actions, even subjects are given the opportunity to hide a selfish action behind nature. These hypotheses mean that I predict that there will be gender differences in the Decreasing condition but these differences will be mitigated in the Increasing condition. In contrast, the model that men and women have different fairness preferences would predict that the order in which subjects make decisions should be irrelevant. This model of stereotypes makes different hypotheses for the Increasing and the Decreasing treatments, while the model of different preferences would predict that the Increasing and Decreasing treatments should look the same.

Looking first at Hypothesis 1, subjects' behavior appears to exhibit persistence to a high degree. When regressing the probability of choosing to pass 15 (an even split of the pie) or pass zero on the probability that the choice was forced using linear probability models, only one coefficient is statistically significant. Looking at the first column of Table 4 (the outcome variable is the probability that the decision-maker passed 15), only one of the coefficients is statistically significant. This is the interaction term on the probability of forced being greater than $0.50 \times$ Female. Although, choices seem to return back to their previous level, as the coefficient on $p \geq 75 \times$ Female is almost equal in magnitude but opposite in sign (it is not quite statistically significant). Moreover, the point estimates are very close to zero, with only two being greater than 0.10. Looking at the second column of this table (the outcome variable is the probability that the decision-maker passed zero), none of the coefficients are statistically significant. Similarly, the point estimates are very small in magnitude, with approximately one-third of them being approximately 0.03 or less in magnitude. Given that the opportunity for plausible deniability across choices varies greatly, the degree of stability of subject's choices is surprising.

Turning to Hypothesis 2, large gender differences are apparent when comparing men and women in the Decreasing treatment. Figure 8 depicts the fraction of subjects who chose equal allocations (pass 15) in this treatment. These results are also available in Table 5. Note that in the figure, the order of decisions goes from right to left (starting with 0.90 and ending with 0). As evidenced in the figure, the faction of women who chose to split the pie equally is greater than the fraction of men who chose this allocation at every level of intervention. That is, women are always more likely than men to choose equal allocations, and these differences are significant. Looking at subjects' first choice ($p = 0.90$), 56 percent of women chose to allocate 15 while only 21 percent of men did (two-sided Fisher's Exact test: $p = 0.045$). Even in subjects' last choice, where there no opportunity for plausible deniability, women were nearly twice as likely as men to choose to pass 15 (71 percent vs. 37 percent, two-sided Fisher's Exact test: $p = 0.054$).

While the differences between men and women's choices in the Decreasing condition are large, when subjects made decisions in the opposite order, gender differences are mitigated. Looking at Hypothesis 3, men and women's behavior looks much more similar in the Increasing condition. Figure 9 depicts the fraction of subjects who chose 50-50 splits (pass=15) in this treatment. Note that in this figure the order of decisions goes from left to right (beginning with 0 and ending with 0.90). The fraction of men and women who chose equal divisions is not statistically different. In

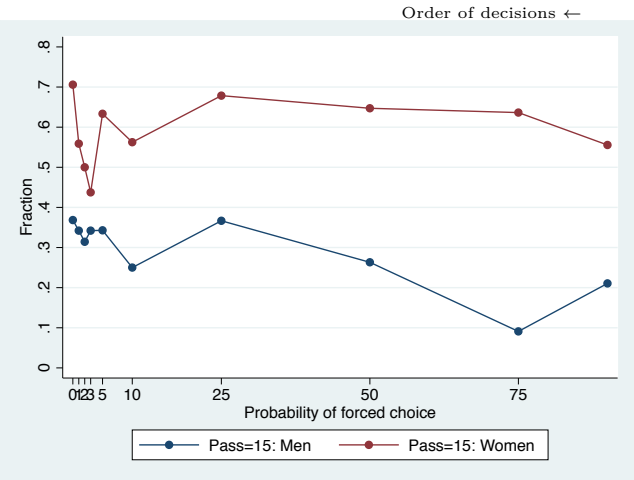


Figure 8: Fraction of 50-50 allocations to partners, Treatment D by gender

subjects' first choice, although a larger fraction of women choose to pass 15 to their partner–68 percent of women compared to 57 percent of men, this difference is not statistically significant (two-sided Fisher's Exact test: $p = 0.545$). Even when subjects are offered a large opportunity for plausible deniability in their last decision ($p = 0.90$), men are still as likely as women to give equal allocations (38 percent of men vs. 41 percent of women; two-sided Fisher's Exact test: $p = 1.00$)

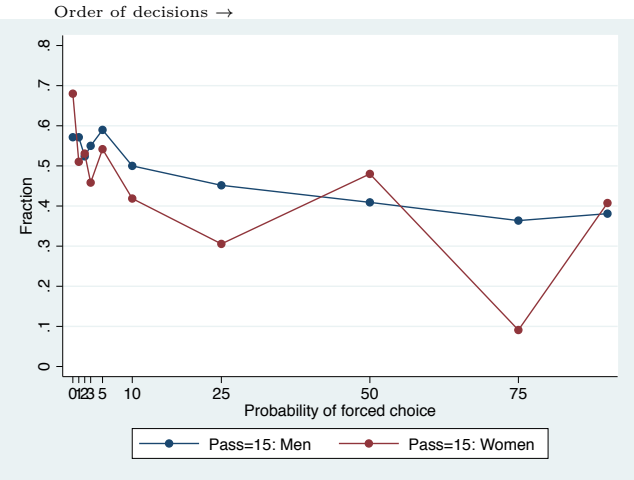


Figure 9: Fraction of 50-50 allocations to partners, Treatment I by gender

The experimental results are in line with the hypotheses and illustrate that the the order of subjects' decisions has a large influence on their behavior. The difference in the parameters of the initial decision not only changed subjects' choices for that decision, but also their subsequent decisions. By initially exposing individuals to a high degree of plausible deniability, I relaxed the external constraints if subjects chose to act selfishly. This caused men to be less likely to give equal allocations in that decision, but this behavior persisted over the series of decisions, even when there was no opportunity for plausible deniability. However, by exposing subjects to stricter

external constraints on their first action, I mitigated gender differences, as men continued to behave generously even when they had ample opportunity to take advantage of plausible deniability. By simply changing the order in which subjects made decisions, I mitigated gender differences in subjects' behaviors. The results of this experiment present evidence in support of the model's mechanism and inconsistent with the model of different fairness preferences.

6 Implications for Identification

One of the implications of the mechanism proposed in this paper is that if we observe men and women behaving differently, we cannot identify the source of these differences by looking only at choices. This is because three possibilities all lead to the same behavior: (i) men and women "are" different, (ii) people think men and women are different (i.e., stereotypes), or (iii) decision-making agents think people think that men and women are different (i.e., perceived stereotypes). In fact, modeling these formally generates the same behavioral predictions. While observed gender differences are frequently attributed to the first possibility, this paper proposes that the second and third possibilities: different expectations or anticipated expectations could be responsible for these differences. This additionally highlights the complexity of stereotypes and how their effects are difficult to identify and tease apart from competing explanations. Although these are complex questions, identifying the source of these differences is important, as attributing observed differences to underlying differences between men and women instead of to stereotype-driven expectations has different implications for the interpretation of empirical results in the literature as well as the optimal policy response.

7 Conclusion

I have proposed a theory of behavior that captures how the external constraints individuals face can eventually become internalized. This shows how social norms that are initially externally enforced later become self-enforced by the individual. This mechanism provides insight into gender differences in observed behaviors and provides an alternative explanation for behavioral differences between men and women.

This mechanism is important in the study of gender differences for two primary reasons. First, this mechanism provides a different interpretation for data on gender differences. Instead of differences in observables being due to differences in fundamentals, differences in men and women's choices could be indicative of men and women facing different constraints and these constraints becoming internalized over time. This analysis also provides evidence for the power and prevalence of social norms. A collection of experiments that did not set out to study gender differences actually captured very strong gender differences, so much so that the significance of their pooled results relied on the treatment effect to only one gender. In these data, even when choices were anonymous, the power of an internalized social norm was present.

Table 4: Linear Probability Models

	Probability of choosing Pass = 15	Probability of choosing Pass = 0
$p \geq 1$	-0.0750	0.0250
	(0.0700)	(0.0806)
$p \geq 2$	0.0000	0.0250
	(0.0538)	(0.0600)
$p \geq 3$	0.0250	0.0000
	(0.0464)	(0.0538)
$p \geq 5$	0.0500	-0.100
	(0.0531)	(0.0742)
$p \geq 10$	-0.100	0.100
	(0.0742)	(0.0834)
$p \geq 25$	0.0500	-0.0250
	(0.0531)	(0.0711)
$p \geq 50$	-0.0763	0.110
	(0.0692)	(0.0910)
$p \geq 75$	-0.0319	0.102
	(0.0858)	(0.0969)
$p = 90$	-0.0168	-0.113
	(0.0899)	(0.0949)
$p \geq 1 \times$ Female	-0.0917	0.142
	(0.0935)	(0.108)
$p \geq 2 \times$ Female	-0.0238	-0.0726
	(0.0785)	(0.0938)
$p \geq 3 \times$ Female	-0.0488	0.0714
	(0.0736)	(0.0777)
$p \geq 5 \times$ Female	0.0452	0.0286
	(0.0807)	(0.0930)
$p \geq 10 \times$ Female	-0.0190	0.0667
	(0.0985)	(0.110)
$p \geq 25 \times$ Female	-0.0500	-0.0226
	(0.0738)	(0.0945)
$p \geq 50 \times$ Female	0.172*	-0.158
	(0.0921)	(0.110)
$p \geq 75 \times$ Female	-0.139	0.0725
	(0.105)	(0.116)
$p = 90 \times$ Female	0.0959	0.0376
	(0.112)	(0.112)
Constant	0.583***	0.283***
	(0.0385)	(0.0431)
Observations	786	786

Standard errors (clustered at the individual level) in parentheses. All specifications include individual fixed effects. *** p<0.01, ** p<0.05, * p<0.1

Table 5: Fraction of passes by treatment and gender

Probability of forced choice	Increasing						Decreasing					
	Number of Observations		Pass = 15		Pass = 0		Number of Observations		Pass = 15		Pass = 0	
	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women
0	21	25	57.1	68.0	28.6	24.0	19	17	36.8	70.6	42.1	17.6
1	42	49	57.1	51.0	26.2	34.7	38	34	34.2	55.9	44.7	35.2
2	42	49	52.4	53.1	28.6	30.6	35	34	31.4	50.0	45.7	41.1
3	40	48	55.0	45.8	30.0	41.7	38	32	34.2	43.8	36.8	46.9
5	39	48	59.0	54.2	23.1	37.5	35	30	34.3	63.3	37.1	26.7
10	40	43	50.0	41.8	32.5	51.2	36	32	25.0	56.3	47.2	40.6
25	31	36	45.2	30.6	32.2	55.6	30	28	36.7	67.9	50.0	28.6
50	21	25	40.9	48.0	45.5	44.0	19	17	26.3	64.7	52.6	35.2
75	11	11	36.4	9.1	54.5	81.8	11	11	9.1	63.6	81.8	36.4
90	21	25	38.1	40.7	47.6	55.6	19	17	21.1	55.6	47.4	38.9

Second, the results of this paper suggest that there is room for policy intervention. The danger of attributing gender differences to differences in fundamental characteristics between men and women is that is suggests that policy will be ineffectual. There is no need to construct policy if different choices are because men and women "are" different. My mechanism suggests that policy can be effective, specifically policies that either target established beliefs about men and women in order to relax the constraints put on women's behavior and policies that are targeted at habit breaking for women who have already learned to internalize social norms. There already exist a few policies that may be effective in achieving these ends. In July 2017, Britain's advertising regulator, the Committee on Advertising Practice, announced that new rules would be developed to ban advertising that promotes gender stereotypes or mocks those who do not conform to them. For example, one of the types of ads the UK policy is targeting is advertisements involving cleaning products, typically featuring women using them, which subtly enforce the association between women and domestic labor. Another potential for policy would be habit-breaking for women who have already formed habits for particular behaviors. Within economics, a group of female economists formed the "I just can't say no club" in order to address the frequent difficulty of women being able to say "no" to work requests that are often non-promotable in nature. Founding members include Linda Babcock and Lise Vesterlund, and the group has since spread to three national clubs. Educating women on how to effectively decline requests is a promising potential policy.

While the idea that external constraints become internalized has clear applications to gender differences research, it is also a mechanism that could apply to other social norms. From a general policy perspective, potential research could examine how we might encourage socially desirable or welfare-improving behaviors, and eventually these behaviors will become self-perpetuating through habit formation and self-enforcement. Further examining this mechanism and its application to the way economists think about how individuals make decisions is a promising area of future theoretical, experimental, and applied research.

References

Akerlof, G. A. (1976). The Economics of Caste and of the Rat Race and Other Woeful Tales. *The Quarterly Journal of Economics 90*(4), 599–617.

Akerlof, G. A. and R. E. Kranton (2000). Economics and Identity. *Quarterly Journal of Economics CXV*(3), 715–753.

Andreoni, J. and B. D. Bernheim (2009). Social Image and the 50-50 Norm: A Theoretical and Experimental Analysis of Audience Effects. *Econometrica 77*(5), 1607–1636.

Andreoni, J. and J. M. Rao (2011). The power of asking: How communication affects selfishness, empathy, and altruism. *Journal of Public Economics 95*(7-8), 513–520.

Andreoni, J. and L. Vesterlund (2001). Which Is the Fair Sex? Gender Differences in Altruism. *Quarterly Journal of Economics 116*(February), 293–312.

Babcock, L. and S. Laschever (2003). *Women Don't Ask: Negotiation and the Gender Divide*. Princeton University Press.

Babcock, L., M. P. Recalde, L. Vesterlund, and L. Weingart (2017). Gender differences in accepting and receiving requests for tasks with low promotability. *American Economic Review 107*(3), 714–747.

Bertrand, M., C. Goldin, and L. F. Katz (2010). Dynamics of the Gender Gap for Young Professionals in the Corporate and Financial Sectors. *American Economic Journal: Applied Economics 2*(3), 228–255.

Bertrand, M., E. Kamenica, and J. Pan (2015). Gender Identity and Relative Income Within Households. *The Quarterly Journal of Economics 130*(2), 571–614.

Bharadwaj, P. and J. B. Cullen (2017). Coming of Age: Timing of Adolescence and Gender Identity Formation.

Bolton, G. E. and E. Katok (1995). An experimental test for gender differences in beneficent behavior. *Economics Letters 48*, 287–292.

Bordalo, P., K. Coffman, N. Gennaioli, and A. Shleifer (2018). Beliefs about gender.

Ceci, S. J., D. K. Ginther, S. Kahn, and W. M. Williams (2014). Women in Academic Science. *Psychological Science in the Public Interest 15*(3), 75–141.

Coate, S. and G. C. Loury (1993). Will Affirmative-Action Policies Eliminate Negative Stereotypes? *The American Economic Review 83*(5), 1220–1240.

Coffman, K. (2014). Evidence on self-stereotyping and the contribution of ideas. *Quarterly Journal of Economics 129*(4), 1625–1660.

Coffman, K., C. Exley, and M. Niederle (2018). When gender discrimination is not about gender.

Cole, H. L., G. J. Mailath, and A. Postlewaite (1992). Social Norms , Savings Behavior , and Growth. *Journal of Political Economy 100*(6), 1092–1125.

Croson, R. and U. Gneezy (2009). Gender Differences in Preferences. *Journal of Economic Literature 47*(2), 448–474.

DellaVigna, S., J. A. List, U. Malmendier, and G. Rao (2013). The Importance of Being Marginal. *American Economic Review: Papers and Proceedings 103*(3), 586–590.

Eckel, C. C. and P. J. Grossman (1998). Are Women Less Selfish Than Men?: Evidence from Dictator Experiments. *The Economic Journal 108*(448), 726–735.

Heilman, M. E. and J. J. Chen (2005). Same Behavior, Different Consequences: Reactions to Men's and Women's Altruistic Citizenship Behavior. *Journal of Applied Psychology 90*(3), 431–441.

Huang, P. H. and H.-M. Wu (1994). More Order without More Law: A Theory of Social Norms and Organizational Cultures. *Journal of Law, Economics, & Organization 10*(2), 390–406.

Kandori, M. (1992). Social Norms and Community En orcement. *The Review of Economic Studies 59*(1), 63–80.

LIMRA (2016). Men vs. Women: Who makes the financial decisions?

National Center for Education Statistics (2016). Bachelor's, master's, and doctor's degrees conferred by postsecondary institutions, by sex of student and discipline division.

Niederle, M. and L. Vesterlund (2007). Do women shy away from competition? do men compete too much? *Quarterly Journal of Economics 122*(3), 1067–1101.

Saccardo, S., A. Pietrasz, and U. Gneezy (2017). On the Size of the Gender Difference in Competitiveness. *Management Science*.

Sapienza, P., L. Zingales, and D. Maestripieri (2009). Gender differences in financial risk aversion and career choices are affected by testosterone. *Proceedings of the National Academy of Sciences 106*(36), 15268–15273.

Thomas, D. (1990). Intra-Household Resource Allocation: An Inferential Approach. *The Journal of Human Resources 25*(4), 635–664.

Appendix

Proof of Result 1. *Let s_x denote D's social image upon choosing x. Denote $U(x^F, s_{x^F}, t)$ as U_F and $U(0, s_0, t)$ as U_0. If we assume $G(-x^F) < 0$ and $G(0) > 0$, then $\frac{\partial U_F}{\partial t} > 0$ and $\frac{\partial U_0}{\partial t} < 0$. If we allow the domain of $U(x, s, t)$ to include $t \in (-\infty, \infty)$, then $U_F = U_0$ for some value of t. Call this value of t t^*.*[11]

Take any $\hat{t} > t^*$. Since $U_F = U_0$ at t^* and $\frac{\partial U_F}{\partial t} > 0$, then $U_F > U_0$ for $\hat{t}$. This means that any type $\hat{t}$ will choose $x = x^F$. A parallel argument holds for $t < t^*$ and choosing $x = 0$. Since I only consider pure strategy equilibria, assume that if the decision-maker is indifferent, he breaks ties by choosing $x = x^F$. □

[11] This shows that t^* exists, but with only these assumptions, it could fall outside of the interval $[0, t^*]$. If it is the case that $t^* \geq \bar{t}$ or $t^* \leq 0$, then the equilibrium is a pooling equilibrium. If we want to examine the cases where there is partial separation, $t^* \in (0, \bar{t})$, then the assumptions that $U(0, s_0, 0) > U(x^F, s_{x^F}, 0)$ and $U(x^F, s_{x^F}, \bar{t}) > U(0, s_0, \bar{t})$ are needed.

Proof of Result 2. *As in Lemma 1, denote t^* as the t that satisfies $U(0, s_0, t^*) = U(x^F, s_{x^F}, t^*)$. If all members of $\mathcal{A}$ make inferences such that $Q_M(x) = Q_W(x)$ and this is common knowledge, then $s_{0,W} = s_{0,M}$ and $s_{x^F,W} = s_{x^F,M}$. Then, for any t, $U(0, s_{0,W}, t) = U(0, s_{0,M}, t)$ and $U(x^F, s_{x^F,W}, t) = U(x^F, s_{x^F,M}, t)$. Therefore, $U(0, s_{0,W}, t^*) = U(0, s_{0,M}, t^*) = U(x^F, s_{x^F,W}, t^*) = U(x^F, s_{x^F,M}, t^*)$ and $t^*_W = t^*_M$.* □

Proof of Result 3. *First examine the case of one audience member holding a stereotype ($Q_M(x) \neq Q_W(x)$, given x). Then, $S(Q(t; W, x = 0)) \neq S(Q(t; M, x = 0)) \implies s_{0,W} \neq s_{0,M}$. Suppose that $t^*_W = t^*_M$. This would imply that $U(0, s_{0,W}, t^*_W) = U(x^F, s_{x^F,W}, t^*_W) = U(0, s_{0,M}, t^*_M) = U(x^F, s_{x^F,M}, t^*_M)$. But this cannot be true because $s_{0,W} \neq s_{0,M}$.*

Next examine the case of the decision-maker believing one audience member holds a stereotype ($Q_M(x) \neq Q_W(x)$ and $S_M(Q_M(x)) \neq S_W(Q_W(x))$, given x). Then, $s_{0,M} \neq s_{0,W}$ and $t^*_M \neq t^*_W$. □

Proof of Result 4. *If an audience member observes $x = 0$, then he knows there is some probability that nature, and not the decision-maker, made this allocation. I assume that upon observing $x = 0$ the audience member takes p into account and updates such that he believes that the probability D chose $x = 0$ conditional on observing $x = 0$ and p is decreasing in p. Take any $p_1, p_2 \in (0, 1)$ with $p_1 > p_2$. Then, $Q(t, L, 0, p_1)$ FOSD $Q(t, L, 0, p_2)$ and $S(Q(t, L, 0, p_1)) > S(Q(t, L, 0, p_2))$. Denote the social image for a given x and p as $s_{x,p}$.*

Define $t^*_{p_1}$ to be the type such that $U(0, s_{0,p_1}, t^*_{p_1}) = U(x^F, s_{x^F,p_1}, t^*_{p_1})$. Since $s_{0,p_1} > s_{0,p_2}$, $U(0, s_{0,p_1}, t^*_{p_1}) > U(0, s_{0,p_2}, t^*_{p_1})$. Then, for $U(0, s_{0,p_2}, t^*_{p_2}) = U(x^F, s_{x^F,p_2}, t^*_{p_2})$, $t^*_{p_1} < t^*_{p_2}$. □

Proof of Result 5. *Suppose $t^*_{p,W} = t^*_{p,M}$. This would imply that $U(0, s_{0,p,W}, t^*_W) = U(x^F, s_{x^F,p,W}, t^*_W) = U(0, s_{0,p,M}, t^*_M) = U(x^F, s_{x^F,p,M}, t^*, M)$. But this cannot be true because $s_{0,p,W} \neq s_{0,p,M}$.* □

Proof of Result 6. *Without loss of generality, I focus on the actions of group W. Define $\tilde{t}$ to be the type such that $F(1 - x^F) + \tilde{t}G(x^F - x^F) = F(1 - 0) + \tilde{t}G(0 - x^F)$. By Lemma 1, $\forall t > \tilde{t}$, D will choose $x = x^F$. Individuals of these types will give x^F in phase 2 even without habit formation. In phase 1, members of group W with type $t < t^*_W$ transfer 0, so they do not have any incentive to switch actions in phase 2. Then, restrict attention on decision-makers who are of are of types $t \in [t^*_W, \tilde{t}]$. These are types who would rather pick 0, but gave x^F in phase 1 because actions were observable.*

Looking at continuation payoffs,[12] *D will choose $x = x^F$ in all g iff the continuation payoff from giving x^F is greater than or equal to the continuation payoff from giving $x = 0$. If D transfers $x = x^F$, D's utility is:*

$$U = \sum_{g=\hat{g}+1}^{\bar{g}} [F(1 - x^F) + tG(x^F - x^F) + rH(\sum_{j=1}^{g-1} \delta^j)] \tag{1}$$

[12] For this proof, I assume no future discounting, as this is a stronger result. The result will obviously still hold if the decision-maker discounts future periods.

If D transferes $x = 0$, D's utility is:

$$U = F(1-0) + tG(0-x^F) + rH(0) + \sum_{g=\hat{g}+2}^{\bar{g}} [F(1-0) + tG(0-x^F) + rH(\sum_{j=\hat{g}+1}^{g-1} \delta^j)] \qquad (2)$$

D will choose x^F in all periods iff $(1) \geq (2)$.

Simplifying (1), we obtain

$$U = [\bar{g} - (\hat{g}+1)][F(1-x^F) + tG(x^F - x^F)] + \sum_{g=\hat{g}+1}^{\bar{g}} [rH(\sum_{j=1}^{g-1})]$$

Simplifying (2) yields

$$U = F(1-0) + tG(0-x^F) + [\bar{g} - (\hat{g}+2)][F(1-0) + tG(0-x^F)] + \sum_{g=\hat{g}+2}^{\bar{g}} [rH(\sum_{j=\hat{g}+1}^{g-1} \delta^j)]$$

$$= [\bar{g} - (\hat{g}+1)][F(1-0) + tG(0-x^F)] + \sum_{g=\hat{g}+2}^{\bar{g}} [rH(\sum_{j=\hat{g}+1}^{g-1} \delta^j)]$$

As $\hat{g}$ increases, the incentive to switch from 0 to x^F decreases, because the habit formation term for staying with x^F increases and the number of periods to collect extra benefit of $F(1-0)+tG(0-x^F)$ decreases . So as $\hat{g}$ increases (approaches $\bar{g}$), (2) gets smaller and the second term of (1) gets larger. Then, if we make $\bar{g}$ arbitrarily large, there will be some $\hat{g}^*$ such that for $\hat{g} > \hat{g}^*$, (1)>(2). Then in games $g > \hat{g}$, D will choose $x = x^F$. Thus, for types $t \in [0, t_W^*)$, D chooses $x = 0$ $\forall g \in [1, \bar{g}]$, for types $t \in [t_W^*, \bar{t}]$, D will choose $x = x^F$ $\forall g \in [1, \bar{g}]$. □