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On the Internet you can be anyone: An experiment on strategic avatar choice in online marketplaces☆

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ABSTRACT

In order to decrease social distance and increase trust on their platforms, many online marketplaces allow traders to be represented by profile pictures or avatars. In a laboratory experiment, we investigate whether the presence of seller avatars affects trading behavior in a market. We contrast markets without avatars with markets where avatars genuinely represent traders and markets where avatars can be freely changed at any time and may thus be chosen strategically. At the aggregate level, we find that the presence of genuine avatars increases the trustworthiness of sellers, but that this effect is undone when avatars can be chosen strategically. We do not detect aggregate effects on buyers' trusting choices. Female avatars are more trusted, and correspondingly in the treatment with free avatar choice men are more likely to represent themselves with a female avatar than vice versa.

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1. Introduction

In the pervasive presence of incomplete contracts, most market transactions require a certain amount of trust. In the offline world, trust is built through repeated relationships, word-of-mouth, and product sampling, for example. Building trust is a particular challenge for online markets, with larger spatial and social distance between transaction partners, partial anonymity, less legal oversight, and no face-to-face social interactions.

To support trustworthy behavior, online markets employ feedback and reputation systems, where traders leave ratings about each other which are then aggregated and displayed to potential future transaction partners. These systems are often effective in incentivizing cooperative behavior (see Resnick and Zeckhauser, 2002 and Bolton et al., 2004 for field and laboratory evidence, respectively), but they are also subject to strategic and informational issues. For example, product or transaction reviews may be faked, user profiles can be traded, new sellers are disadvantaged, and strategic rating behavior and feedback reciprocity hamper the informativeness of reputation information (see, exemplarily, Bolton et al., 2013 for the case of eBay and Ert et al., 2016 for the case of Airbnb).

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Many platforms support the building of trusting interaction relationships by allowing users to increase their *social* presence on the market, e.g., by providing more information about themselves or using graphical representations with user profile pictures or avatars. As we review below, there is robust evidence that such a reduction of social distance to transaction partners leads to higher trust and cooperativeness, both in general and on online markets, and in excess of reputation effects.

An aspect that is however largely ignored by the existing literature is that such social and graphical representations can be *strategically* chosen. For example, if a certain type of representation or avatar is particularly effective in increasing buyers' trust, other sellers have incentives to copy that picture (and thus to represent themselves untruthfully). The social representations become 'cheap talk', and should not carry any informational value in equilibrium, and thus not affect behavior. On the other hand, the empirical literature on cheap talk in experimental games suggests that it may, nonetheless, have positive effects on cooperation (see below).

In this paper, we study the issue of original and endogenously chosen social representations in online markets with the help of a laboratory experiment. Participants engage in 30 rounds of a buyer-seller trust game modeled after Bolton et al. (2004). In particular, in each round a buyer first chooses whether he sends money to the seller, and the seller then decides whether she sends the product or not. Since the product is more valuable to the buyer than to the seller, a transaction would be efficient and socially beneficial, but the moral hazard opportunities for the seller make it difficult for the buyer to trust. In a between-subjects design, we vary whether 1) the seller has no avatar representation, 2) the seller has an avatar she chose as representing her *before* knowing the rules of the game, and 3) the seller can freely choose (and change) her avatar at the beginning of each round. Through these experimental treatments we attempt to understand how the display of (genuine) avatar representations of sellers affect cooperation in the market, and how those effects change if the avatar representation can be strategically changed, thus becoming cheap talk.

In our experiment, we focus on avatars as social representations of traders (rather than profile pictures or self-descriptions) for several reasons. First, they allow us to isolate the pure social effects of graphical representation from issues of anonymity or attractiveness, that would have plagued any experimental design that employed real photos. Second, avatars are used widely in online platforms[1] and communities (e.g., quite prominently, Facebook's envisioned Metaverse), either for social or for privacy reasons, as well as in game-based (e.g., Eve Online, Neopets, World of Warcraft) and non-game (e.g. Gaia, Habbo, IMVU, Second Life) virtual worlds. Typically, avatars have similar social effects as using photos or face-to-face interactions (see our review below). Third, we can carefully limit available features of the avatar, such as gender, hair color, or attire, while holding other features constant. And fourth, avatars can be more easily chosen strategically, while misrepresentation with own photos, while feasible, is more difficult. This makes avatars a useful instrument for studying social interactions on (market) platforms.

Our main hypotheses are that displaying seller avatars increases trust and trustworthiness in our markets, but that these effects vanish at least partly once sellers can freely choose their avatars in every round. Since females are generally regarded as more trustworthy, we may see a shift towards female avatars in that treatment. Overall, our experimental results weakly support our main hypotheses. While we do not find significant differences in buyers' trust across treatments, we do observe a significant increase in sellers' trustworthiness as a result of displaying their (genuine) avatar to buyers. This effect is undone when sellers can choose their avatars freely and strategically in each round. We further observe that in the free-choice treatment, men are more likely to represent themselves by female avatars, who are also rated as more trustworthy and elicit more trusting choices.

Our results fit squarely into the literature on social presence in cooperation and market transactions. Experimental studies show that trust and cooperation are increased with a reduction in social distance (e.g., knowing each other longer, having more friends in common, being from the same country, having the same race: Glaeser et al., 2000; lesser sense of anonymity to transaction partners: Hoffman et al., 1996). Eckel and Petrie (2011) report that showing participants their transaction partner's photo increased trust, and consequently participants were willing to pay to see these photos. Wilson and Eckel (2006) find that more attractive faces are trusted more. Studies in psychology suggest that a tenth-of-a-second exposure to a photo of a transaction partner may be sufficient to form a robust assessment of their trustworthiness (Todorov et al., 2009), and Eckel and Wilson (2004) demonstrate that even simpler social cues such as the choice of a common representation icon are able to affect trust and trustworthiness in an experimental game. These effects seem to be applicable to market interactions even when reputation information is available. Both Rezlescu et al. (2012) and Bente et al. (2012) study experimental buyer-seller trust games with fictitious sellers and find that seller profile photos affect buyer behavior beyond existing reputation information about past behavior. Ert et al. (2016) manipulated seller profile pictures on an experimental AirBnB platform and find that while the effect of these photos is strongest in the absence of reputation information, it is still existent and significant even when information about past behavior is provided. There is also existing evidence on the effect of social presence on trustworthiness. Ismayilov and Potters (2016) find that one-way communication improves trustworthiness due to a feeling of "closeness" after the message was delivered. Andrighetto et al. (2015) report that verbal one-way communication from trustee to trustor increases trustworthiness, possibly due to the formation of the trustor's normative expectations. Similarly, in the dictator game (a decision situation that is strate-

[1] Many market platforms such as eBay or the Austrian platform Shpock assign gendered/genderless avatars as default profile pictures, while Facebook Marketplace requires and uses the Facebook account. However, all these platforms permit the use of an avatar picture as a profile picture, and there are popular services/apps within platforms (e.g., on Facebook) or externally (e.g., ToonApp) that help users create avatars.

gically similar to the return choice in the trust game), Balafoutas and Sutter (2017) observe that guilt aversion is invoked when there was some form of pre-play communication.

Avatar pictures can be effective in replacing profile photos (for example for privacy reasons). In a laboratory experiment, Bente et al. (2008) find no difference in perceived interaction success, perceived social presence, and level of affect-based trust in a treatment with avatar communication compared to video communication. Bente et al. (2014) use computer-generated avatars rather than real photos and replicate the positive effects of personal representations on trusting a seller, even when reputation information is present. Based on an online experiment, Holzwarth et al. (2006) report that using an avatar sales agent leads to consumers being more satisfied with the retailer, having a more favorable attitude toward the product and a higher purchase intention compared to those who did not interact with an avatar. Teubner et al. (2014) observe that an increase in the level of "humanization" of graphical representations (generic silhouette indicating only gender, avatars generated from user pictures, or profile photos) in experimental gift-exchange games translates to increased perceived social presence and higher cooperation levels. In the laboratory, Fiedler and Haruvy (2009) find that the use of avatars combined with pre-play communication increases levels of trust and trustworthiness. Greiner et al. (2014), on the other hand, could not detect an effect of avatar-to-avatar communication on cooperation in a virtual world that would be comparable to face-to-face communication in the real world, the observation of which however was hampered by very high per-se cooperation levels in the virtual world. Our experiment complements this literature by reporting evidence that showing simple non-strategically self-chosen avatars to buyers increases the trustworthiness of sellers, albeit we do not find effects on trusting decisions of buyers.

Females are often rated as more trustworthy than males, as Kleisner et al. (2013) observe when showing photographs to their subjects. Wright and Sharp (1979) report that trust attitudes obtained in a survey are higher towards women compared to men. Boltz et al. (2010) let participants rate the (perceived) truthfulness of statements in a conversation where they systematically varied the gender of the speaker, and find that female speakers are perceived as telling fewer lies for their own benefit (but more lies for the benefit of others), compared to male speakers. Based on a field survey, Johnson et al. (2018) report that amateur investors view female entrepreneurs as more trustworthy than male entrepreneurs. Consistent with that, experimental laboratory studies indicate that women send back a larger proportion of their wealth in investment/trust games and also feel obligated to do so (Croson and Buchan, 1999; Buchan et al., 2008) and are less likely than men to lie to secure a monetary benefit (Dreber and Johannesson, 2008). Based on a broader sample between the ages of 18 and 84, though, Garbarino and Slonim (2009) find that women are trusted more than men, but do not necessarily behave in a more trustworthy manner (where behavioral patterns varied by age and amount received). Ert and Fleischer (2020) let participants rate AirBnB host photos and find that women are rated higher on trustworthiness, partly as a direct gender effect and partly channeled through higher attractiveness ratings. Our results align with these findings insofar as we observe that female avatars are more trusted, and consequently men are more likely to represent themselves with female avatars when this is feasible.

One of our main interests in this paper are environments where avatars may be chosen strategically. Based on observational data, interviews and survey responses from users of avatars in virtual worlds, Martey and Consalvo (2011) and Vasalou and Joinson (2009) conclude that many users choose their avatar not just as an accurate representation of themselves, but also condition their choice of avatar on their anticipated interaction partner and the type of interaction. Galanxhi and Nah (2007) let participants choose an avatar to represent themselves in an interaction where they were or were not instructed to deceive others, and find that subjects instructed to deceive chose avatars that looked more different than themselves. Tingley (2014) pre-generated avatar faces along the dimensions of trustworthiness, dominance, and threat, and finds that trustees in a trust game were more likely to choose avatar faces for themselves that rated higher on the trustworthiness dimension, and senders trusted more in the condition where the avatars were chosen rather than randomly assigned. In terms of strategic gender-bending, Charness et al. (2020) find evidence that agents strategically vary the gender of their avatar to be selected for a male-oriented task (though, in their experiment, the anticipated discrimination does not manifest in principal choices). Similarly, Alston (2022) observes that female mTurk workers are more likely to hide their gender when asked to send their CV for a male-oriented task.

The strategic choice of social information such as avatars is related to the experimental literature on cheap talk. While game-theoretically, costless communication should not have an effect on behavior in cooperation games with opposing player interests, laboratory experiments show robust evidence that cheap talk communication is helpful in sustaining cooperation (Palfrey and Rosenthal, 1991; Ben-Ner et al., 2011; Cooper and Kühn, 2014). Differently, in our experiment we find that allowing the free choice of avatars, which makes their use akin to cheap talk, nullifies the positive effects of introducing avatars into the market on the trustworthiness of sellers.

The remainder of this paper is organized as follows. In Section 2 we detail our experimental design and develop hypotheses. Section 3 presents and discusses our results, and Section 4 concludes.

2. Experimental design, hypotheses, and procedures

Our experiment was conducted at the WULABS at WU Vienna, and encompasses three treatments. In all treatments, participants interacted in a binary variant of the trust game, framed as a buyer-seller interaction, based on the experimental design of Bolton et al. (2004). In the stage game, both the buyer and seller receive an endowment of 5 ECU (experimental currency units). The seller offers an item for sale at a price of 5 ECU at a production cost of 3 ECU, with the buyer's value

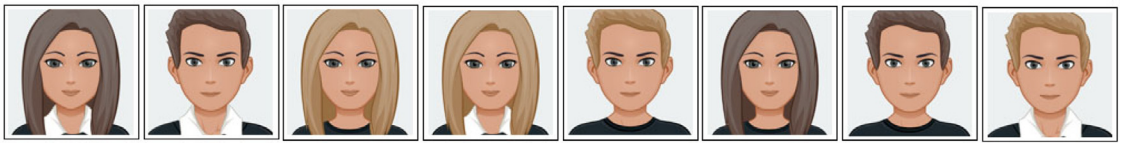

Fig. 1. Avatar choice set, varying by gender, hair color, and clothing.

for the item being 7 ECU. The buyer first decides to pay for the product, or not. The seller then decides to produce and ship the item, or not. Thus, if the buyer does not buy, both keep their endowment of 5 ECU. If the buyer pays but the seller does not ship, then the buyer earns 0 ECU and the seller receives 10 ECU. If the seller ships upon the buyer's payment, then both the seller and buyer make 7 ECU. In the unique Nash equilibrium of the game, the seller does not ship and the buyer does not buy.

To collect more information, we employed the strategy method to elicit the seller's choice, i.e., we asked sellers to state whether they would ship if the buyer buys, before telling them about the buyer's decision. In the laboratory, we repeat this game for 30 rounds, with randomly changing roles and a (role-contingent) complete stranger matching in order to approximate the typical one-time interaction nature in online market places. In particular, role and group assignment were random under the constraints that each participant received the role of buyer in 15 rounds and seller in the other 15 rounds, and that each participant would never meet the same other participant more than once in the same role. We used the algorithm proposed by Both et al. (2016) to create this matching in the experimental software.

For our experimental design, we decided to focus on human avatars (as opposed to profile photos, non-human avatars, or other kinds of social cues) to starkly reduce the dimensionality of the social communication in the experiment and be able to track a defined number of dimensions in terms of avatar variation. There are many possible dimensions in human avatars that can be varied, such as gender, ethnicity, hair color, skin-color, age, attire/clothing, or facial expressions. However, for a laboratory experiment with students in Vienna, not all of these dimensions are useful or available.[2] After thorough considerations, we decided to use gender, attire, and hair color as naturally occurring avatar dimensions for our subject pool, with less obvious interpretations of seller intentions.

Gender, as the most prominent among these avatar features, has received considerable attention in the academic literature on trust and trustworthiness (we discuss the related literature in Section 1). With respect to *hair color*, field experiments on stereotypes have observed that blond-haired women receive more solicitations in bars and higher tips in restaurants (Gueguen, 2012a; 2012b), while survey studies found that dark-haired (compared to blond- or red-haired) individuals are viewed as more capable (Kyle and Mahler, 1996) and are rated as more attractive, intelligent and trustworthy by both men and women (Song, 2020). Hinsz et al. (2013) find empirical support for stereotypical cross-gender preferences for "blond and beautiful" women and "dark-haired and handsome" men. A literature on *attire* perception confirms the common place that what we choose to wear changes how we perceive ourselves and how we are perceived by others. In a survey, Peluchette and Karl (2007) find that professionals who prefer formal attire feel more trustworthy and productive in that attire, while colleagues who prefer casual attire feel more friendly and creative when dressed as such. Formally attired professors are perceived by students as having more expertise but being less likable than those wearing casual attire (Sebastian and Bristow, 2008) while patients prefer therapists to wear formal rather than casual attire (Dacy and Brodsky, 1992). Oostrom et al. (2021) report that low-qualified job applicants are punished for dressing in an unprofessional way during an interview, while highly-qualified candidates face fewer negative consequences for violating the norm of professional workplace attire. In a field experiment, Gottschalk et al. (2020) find that dentists behave in a more trustworthy manner and are 17 percent less likely to overtreat a patient when the patient's higher socio-economic status is signaled by an expensive suit rather than casual wear. Thus, there is existing evidence that all three dimensions of seller avatars may matter for trusting decisions of buyers.

In all three treatments, before participants received the instructions for the game, they were asked to choose (out of a set of 8 avatars) the avatar that most closely resembled themselves.[3] We created a set of 8 relatively homogeneous avatars that differed only in the three dimensions: gender (male/female), hair color (light/dark), and attire (informal/formal). We pre-tested different sets of avatars in an online survey with 268 undergraduate students at WU, and selected the set that was found most representative of students. The set of avatars used in the main study is displayed in Fig. 1.

The three treatments differed in what was displayed to buyers before they made their decision. In the baseline treatment ("No Avatar"), the buyers did not see any avatars. In the "Genuine Avatar" treatment, buyers were shown the avatar which the seller had chosen to represent her/himself at the start of the experiment (before knowing about the game they were

[2] There is relatively little ethnic variation in the student body in Vienna (as a matter of fact, all participants in this experiment were White-Caucasian). There is little variation in age: in our experiment, average age of participants was 22.9 years (StdDev 2.9), with less than 8% younger than 20 and less than 8% older than 27. We considered facial expression as a too obvious variation in the avatar picture, with a clear interpretation in terms of a user's intentions and susceptible to experimenter demand effects.

[3] In the remainder of the paper, we will call this choice the 'genuine avatar'. Because it is chosen before experimental instructions were provided, it excludes strategic considerations like the potential effect of the selected avatar on buyer's trusting choices.

going to play). In the "Free Choice" treatment, the seller selected an avatar before every interaction with a new buyer (with the previous avatar being the default). In order to avoid interaction effects of avatar choice, buyers were not represented by an avatar.

Based on the existing experimental literature on the effects of social presence on trust and cooperation (see Section 1) we formed our first hypothesis. Pre-play communication has been found to affect trustworthiness and giving, through channels such as an increased feeling of closeness, the formation of normative expectations, or the invocation of guilt aversion. Communication/reduction in social distance has also been found to affect trust directly, not just by reputational effects such as reduced anonymity but also through social cues.

Hypothesis 1. Displaying avatars of sellers to buyers leads to higher trust and trustworthiness compared to when no social information about the seller is available to buyers.

The theoretical arguments on cheap talk communication motivate our second hypothesis. If there are indeed effects of social communication qua avatars on trust, then rational sellers have incentives to exploit those effects and choose their avatars strategically, making avatar choice cheap talk.

Hypothesis 2. Permitting sellers to freely choose their avatar nullifies the positive effects of avatars on cooperation in the market.

Finally, we form our third hypothesis based on the extensive and prominent literature on gender effects as well as accompanying theoretical strategic considerations.

Hypothesis 3. Sellers with female avatars are more trusted than sellers with male avatars when the genuine avatar of the seller is shown to the buyer. As a result, permitting sellers to freely choose their avatar leads to a gender bias in avatar selection.

We recruited 344 participants from the student subject pool of WULABS using the recruitment software ORSEE (Greiner, 2015).[4] The mean age of our subjects was 22.9 years, 63.5% were female, and almost all of them studied in a business, economics, or business law major. The experiment was implemented using the oTree software (Chen et al., 2016). Upon arrival, participants were randomly assigned to computers. Before being given any instructions, each participant was asked to choose one out of the set of 8 avatars that s/he believed resembled her/him most closely. Then the experiment instructions appeared on the screen. The buyer-seller interactions started after all participants had read the instructions and answered a few short comprehension questions. After completion of the 30 rounds of the experiment, participants answered a short demographic questionnaire, and were asked to evaluate the 8 avatars used in the experiment. Upon completing the survey, participants were privately paid in cash and dismissed. One round out of the 30 rounds was randomly selected for payment at an exchange rate of 1 ECU = 1 EUR. On average, sessions lasted about 45 minutes, and on average participants earned EUR 10.11 (StdDev 2.20) including a show-up fee of EUR 5.

3. Results

Fig. 2 displays the aggregate results for each of our three treatments. Even though the only Nash equilibrium of the buyer-seller trust game (for selfish and rational individuals) is not to ship and not to pay, consistent with previous results in the experimental economics literature we observe a significant amount of sellers being trustworthy (28-33%) and buyers trusting (22-25%). The resulting share of efficient trades is about 7–8% which is relatively low but not too different to other experiments with a stranger matching design (e.g., Bolton et al., 2004, upon which our experimental design is based).

In order to study the effects of displaying avatars in the market place, we regress the buy and ship decisions of our participants on the experimental treatments. We additionally include the *Round* to control for common time trends, and also run robustness models which include the decision-maker's age and gender.

Table 1 reports the results from our Probit models. With respect to sellers' shipping decisions, we find a positive effect of displaying seller avatars to buyers in the market place, compared to when no avatars are used. The effect is obliterated and not significantly different from zero when these avatars can be freely chosen. (The difference between the coefficients for Genuine Avatar and Free Choice, though, is statistically not significant due to noise in Free Choice, as the post-hoc tests and Fig. 2 show.) For buyers' purchase decisions we do not observe any treatment effects. These findings do not change when we include controls for participant demographics. Older participants are both more trusting and trustworthy, but this observation has to be interpreted with caution, since the age range across our student participants is very small.[5]

In order to investigate how seller avatars affect trader decisions, for each of our two avatar treatments we regress the choices of buyers and sellers on the characteristics of the seller's avatar, namely gender, clothing, and hair color.[6] In

[4] Due to some no-shows, we ran 6 sessions with 30 participants, 3 sessions with 28 participants, and 3 sessions with 26 participants, yielding 118, 112, and 114 participants in our three treatments "No Avatar", "Genuine Avatar", and "Free Choice", respectively.

[5] Similar to other trust game experiments such as Chaudhuri and Gangadharan (2007) or Schechter (2007), we find that trust and trustworthiness (average buy and average ship decisions per participant) are positively correlated, with coefficients of between 0.29 and 0.41 across treatments.

[6] Interaction effects in more extensive regression models are statistically not significant.

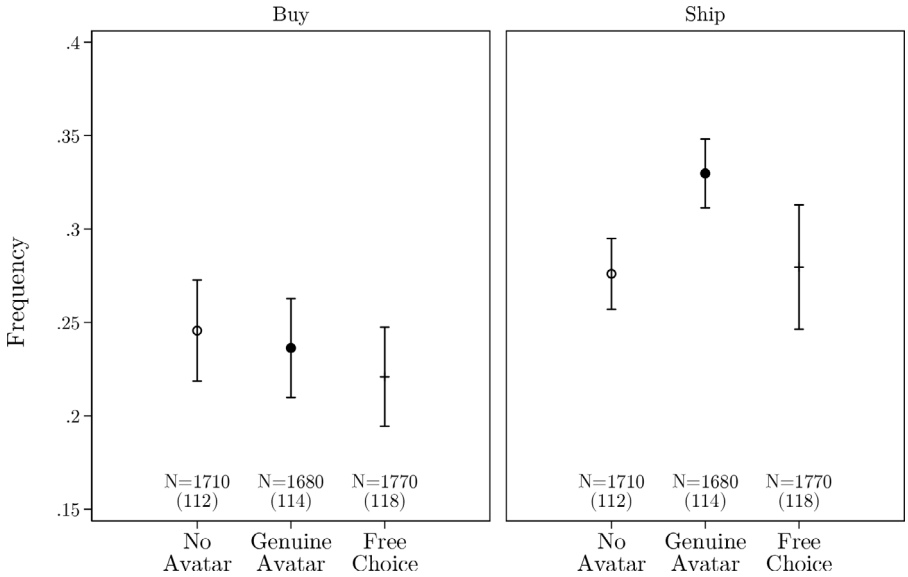

Fig. 2. Main effects of treatments on trust and trustworthiness. Notes: Error bars are standard errors from Probit regression models controlling for rounds, and clustered at the session level. N is the number of observed games, with number of participants in parentheses.

Table 1
Probit regressions of buy and ship decisions on treatments.

	Buy	Buy	Ship	Ship
Round	-0.011***	-0.011***	-0.004**	-0.004***
	(0.001)	(0.001)	(0.001)	(0.001)
Genuine Avatar	-0.008	-0.010	0.053**	0.053**
	(0.038)	(0.036)	(0.026)	(0.023)
Free Choice	-0.024	-0.022	0.003	0.008
	(0.038)	(0.035)	(0.039)	(0.037)
Male		-0.022		-0.004
		(0.022)		(0.042)
Age		0.009*		0.009**
		(0.005)		(0.004)
N choices	5160	5160	5160	5160
N subjects	344	344	344	344
Pseudo R^2	0.052	0.056	0.008	0.010
P-value for post-hoc test				
Genuine Avatar=Free Choice	0.670	0.750	0.196	0.235

Notes: We report marginal effects with standard errors clustered at session level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Table 2 we report the results of this analysis. We find that for both avatar treatments, female seller avatars (as compared to male seller avatars) are trusted more. In terms of actual trustworthiness, sellers with female avatars in the "Genuine avatar" treatment (where the gender of the seller's avatar mostly corresponds to the seller's own gender)[7] seem to be more likely to ship than male avatars, while in the Free Choice treatment (where avatar choice is presumably strategic) sellers with female avatars are less likely to ship. These effects, however, do not reach statistical significance. We do not observe effects of clothing style or hair color of the seller avatar, except that a light hair seller avatar in the Free Choice treatment is related to a lower likelihood of buying.[8]

Fig. 3 displays the sellers' avatar choices in the trading rounds in the Free Choice treatment conditional on the seller's initial choice of a genuine avatar (before they received the experiment instructions), and thus gives an overview of the extent of misrepresentation. Sellers in this treatment change their avatar quite often. The average frequency of a seller

[7] Genuine avatar choices, obtained at the beginning of a session before experiment rules were displayed, represent participants' (self-stated) real-world characteristics quite closely. For example, 98.2% (98.4%) of female (male) participants chose a female (male) genuine avatar. Table A.5 in Appendix A shows the distribution of genuine avatar choices relative to real-world characteristics.

[8] We did not have any expectation about this effect and cannot offer an interpretation. We note that this effect is driven by relatively few observations; see avatar choice frequencies reported below in Fig. 3.

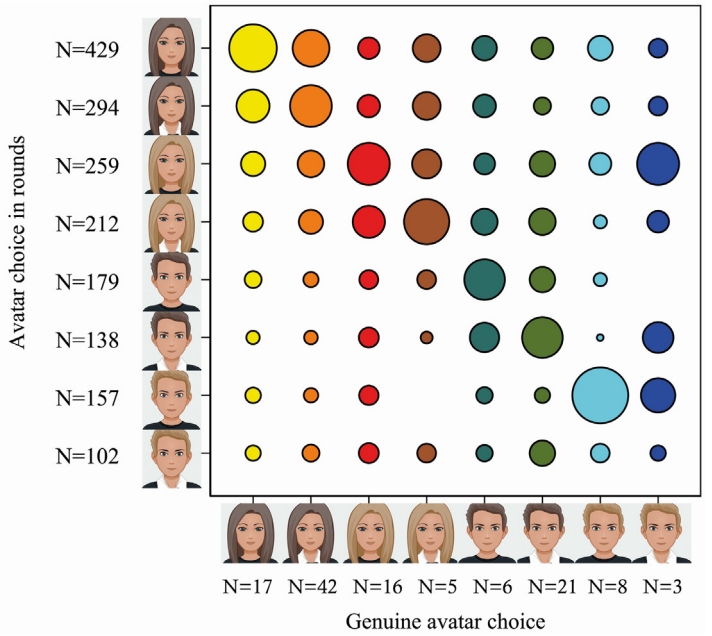

Fig. 3. Relative frequency of avatar choices in rounds conditional on initially chosen genuine avatar in Free Choice treatment Note: The bubble area reflects the relative frequency per column.

Table 2
Seller avatar characteristics and trader choices .

Treatment	Genuine Avatar		Free Choice	
	Buy	Ship	Buy	Ship
Round	-0.010***	-0.005**	-0.011***	-0.005***
	(0.003)	(0.002)	(0.002)	(0.001)
Female	0.033***	0.067	0.043***	-0.040
	(0.008)	(0.070)	(0.014)	(0.033)
Formal	0.005	-0.055	-0.004	0.020
	(0.009)	(0.094)	(0.015)	(0.030)
Light hair	0.002	0.029	-0.040*	0.044
	(0.022)	(0.065)	(0.022)	(0.055)
Pseudo R^2	0.045	0.012	0.057	0.012
N choices	1680	1680	1770	1770
N subjects	112	112	118	118

Notes: We report marginal effects with standard errors clustered at session level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

changing her avatar from one seller-round to her next seller-round is 54%, and the average likelihood that a seller would not be represented by her genuine avatar in a particular round is 63%.[9]

To analyze misrepresentation patterns, we regress the decision to be represented by a different gender, clothing, or hair color on the gender, clothing, and hair color of the initially chosen (genuine) avatar representation of the seller. We report results in Table 3. We find that men (more specifically: traders with a genuine male avatar) are more likely to represent themselves as females, than vice versa. Traders with genuine avatars with formal attire are more like to change the avatar clothing. Controlling for these effects, misrepresentations for gender and hair color additionally increase over rounds but not for clothing. We observe a correlation between genuine avatar attire and misrepresentation of hair color, but since we did not develop hypotheses for these, we do not attempt to interpret this.

These results are corroborated by an analysis of avatar choice dynamics.[10] In Table 4 we report results from Probit models that regress the choice to keep the same avatar from one seller round to the next seller round on experiences and behavior in the previous seller round as well as on the seller's previous avatar characteristics. We find that if a buyer did not buy from a seller, then the seller was 14% more likely to switch her avatar in the next round. When including the characteristics

[9] Fig. A.4 in Appendix A displays the frequency of avatar changes over rounds. We do not observe trends over time.
[10] We thank an anonymous reviewer for pointing these out to us.

Table 3
Probit regressions of choosing different avatar characteristic on original (genuine) avatar characteristics .

	Chooses different		
	Gender	Clothing	Hair color
Round	0.004***	0.001	0.002*
	(0.001)	(0.001)	(0.001)
Genuine Avatar: Female	-0.192***	0.009	-0.008
	(0.072)	(0.055)	(0.066)
Genuine Avatar: Formal	-0.008	0.074*	0.069*
	(0.048)	(0.044)	(0.039)
Genuine Avatar: Light Hair	0.041	-0.021	0.001
	(0.048)	(0.033)	(0.011)
Pseudo R^2	0.048	0.004	0.005
N choices	1770	1770	1770
N subjects	118	118	118

Notes: We report marginal effects with standard errors clustered at session level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Table 4
Probit regressions of keeping the same avatar in the next round conditional on previous round behavior/experience/avatar characteristics.

Model	(1)	(2)	(3)
Round	0.003	0.001	0.003
	(0.004)	(0.003)	(0.004)
Previous buyer bought	0.139***		0.127***
	(0.042)		(0.040)
Shipped to previous buyer	0.065		0.078**
	(0.040)		(0.039)
Previous avatar: Female		0.091**	0.090**
		(0.046)	(0.044)
Previous avatar: Formal		-0.117***	-0.119***
		(0.026)	(0.025)
Previous avatar: Light Hair		-0.120***	-0.117***
		(0.034)	(0.036)
Pseudo R^2	0.012	0.027	0.039
N choices	1652	1652	1652
N subjects	118	118	118

Notes: We report marginal effects with standard errors clustered at session level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

of the seller's avatar in the previous round, we observe that the seller was more likely to change when the avatar was male, with light hair, or with formal clothing. Consistent with our results reported above, this suggests convergence over rounds towards female, dark hair, informal clothing avatars.[11]

4. Discussion and conclusion

In our laboratory experiment employing anonymous buyer-seller interactions with always new transaction partners, we find that showing seller avatars that truthfully represent users before market transactions increases trustworthiness of sellers, but does not have a detectable effect on the overall extent of buyers' trusting behavior in the market. However, discrimination also increases in that female avatars are trusted more than male avatars. Seemingly anticipating that female avatars are more trusted, when allowing sellers to freely choose an avatar in each trading round, sellers with an initial (genuine) male avatar are more likely to (strategically) choose a female avatar than vice versa. Sellers whose buyers decide to buy as well as sellers with avatars that are female, dark-haired, and wear informal attire, are less likely to change their avatar in the next round than those that don't. Buyers, on the other hand, seem not to anticipate these strategic seller choices, and still trust female avatars more than male avatars. At the aggregate level, however, the positive effects of avatars truthfully representing sellers on trustworthiness in the market is undone when avatars can be freely chosen.

[11] In our post-experimental questionnaire we asked participants to rate "how trustworthy you think different avatars are". In general, female avatars were rated higher than male ones, dark-haired avatars higher than light-haired ones, and avatars with informal clothing higher than avatars in formal attire. However, while consistent with the results reported here, these differences in the ex-post ratings are statistically not significant.

As a result, we find partial support for our Hypothesis 1 that introducing avatars into the market place increases cooperation in the market, as well as for Hypothesis 2 that when these avatars can be chosen strategically, the positive effects disappear. Finally, our Hypothesis 3, stating that differently perceived trustworthiness of female avatars may result in a gender bias in avatar choice, also finds some support.

In general, both trustworthy as well as non-trustworthy, exploitative sellers may have an incentive to strategically choose their avatar in order to increase a buyer's trust. In our data, we do not find evidence that sellers who choose an avatar that is different to their genuine avatar choice (or who often change their avatar) would be more or less trustworthy than those who don't. This could indicate that both motivations are present in our sample.

Overall, our results allow us to draw the following conclusions for the use of avatars in internet C2C markets. Allowing sellers to upload profile pictures or choose avatars can increase their social presence and trustworthiness and thus benefit the market place, unless sellers learn about differences in avatar effects and begin using these social representations strategically. The latter however is hardly preventable in real-world markets, unless one restricts users to using validated profile photos.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

Appendix A

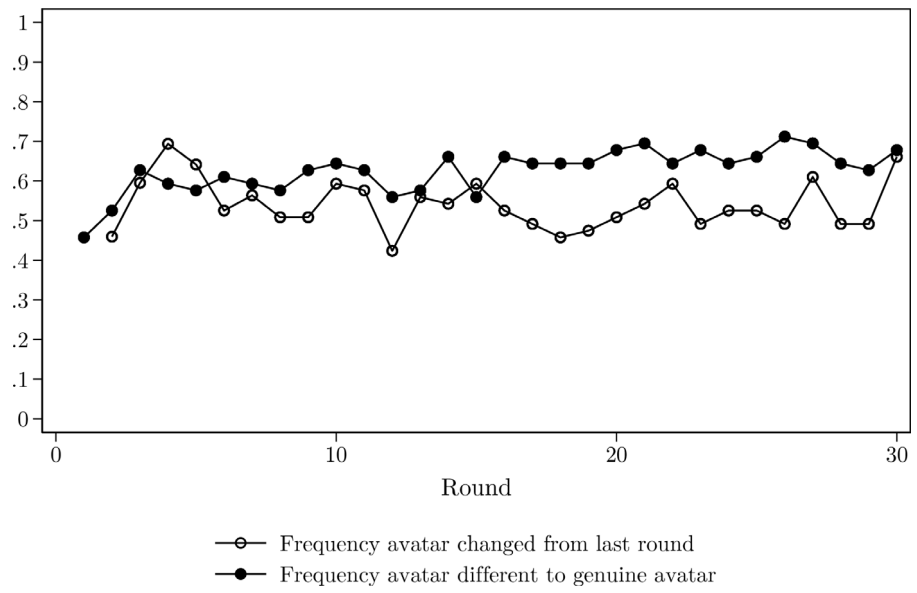

Fig. A1. Changes in avatar choice over rounds, treatment Free Choice.

Table A1
Genuine avatar choices conditional on demographics stated in post-experimental questionnaire.

Panel 1: Gender

Gender	Freq.	% Avatar female
Male	36%	1.60%
Female	63%	98.20%
Other	1%	75%

Panel 2: Clothing

Personal Attire	Freq.	% Avatar formal
More formal	29%	47%
More informal	71%	15%

Panel 3: Hair color

Hair color	Freq.	% Avatar light hair
Light blond	4%	100%
Blond	15%	100%
Light brown	30%	25%
Dark brown	36%	4%
Light red	0.6%	0%
Dark red	0.6%	50%
Black	12%	8%
Other	2%	60%

Notes: The table reports the percentage of choices of a 'genuine' avatar that is female, wears formal clothing, and has light hair conditional on participants' self-stated real-world gender, clothing preference, and hair color.

Supplementary material

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.jebo.2022.11.033

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