Replication: Assortative Mating on Ideology Could Operate Through Olfactory Cues

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1 Abstract

Tingley, McDermott, and Hatemi (2014) find that olfactory senses could explain assortative mating by ideology. My replication of this paper succeeded except for minor discrepancies which do not affect his conclusions. Through my extension, I further evaluate the three models Tingley, McDermott, and Hatemi use by applying a Bayesian framework instead of a regular linear model. I further use the sampled iterations created by `stan_lm` to graph density plots of the main coefficient being evaluated in the respective models. Through this framework, I confirm that Tingley's model illustrates little variability in their coefficients. The data and code used in this analysis replication is available on my github.[1]

2 Introduction

Have you ever wondered why dogs smell each other upon meeting each other? They use smell in deciding whether or not they like each other, and many more animals do this as well. Tingley, McDermott, and Hatemi take this knowledge to study whether smell affects who we like based on our political ideologies. According to Iyengar, Konitzer, and Tedin (2018), in 2015, there was a spousal [political] agreement level of 81.5%. There are numerous factors that can attribute to such a high percentage like this, but Tingley, McDermott, and Hatemi explore the connection to our sense of smell. In order to do so, they surveyed 146 participants asking them to rate the odor of anonymous targets who were either strong liberals or strong conservatives. With this data, they create three separate models. The models all regress the reported attractive rating on numerous variables. In the first model, they primarily focus on the coefficient explaining when the evaluator and the target shared ideologies. The second two models focus on the coefficient that measures the distance between ideology on a 7 point scale. This coefficient explains how a smaller or larger distance apart in ideology between the evaluator and target leads to different attractive ratings. The constant, or the intercept, in these models explain the predicted shift in attractiveness rating of the targets. Through these models, Tingley, McDermott, and Hatemi observe that their hypotheses hold true even though there were small reported coefficient values.

For my replication, I use R software[2] to translate Tingley's, McDermott's, and Hatemi's Stata code. Their code is available in the Harvard Dataverse here ("Replication Data for: Assortative Mating on Ideology Could Operate Through Olfactory Cues," n.d.). As mentioned, the data and code used in this replication is available on my github[3]. My replication of this paper was successful except for a few minor differences. I successfully recreated the first two models, but had troubles including target and evaluator fixed effects in the third model. Not including the fixed effects left my model three looking slightly different than the original model. I was also unable to successfully cluster my standard errors on a specific evaluator variable, leaving small discrepancies in the standard errors for the entire table. Regardless of these minor details, my overall replication was a success.

My extension of the paper focused on further solidifying the significance on Tingley's, McDermott's, and Hatemi's models. In order to do this, I applied a Bayesian framework to the linear models produced. This allowed me to use the sampled iterations that Bayesian models produce in order to evaluate the distributions of the main coefficients being explained. Interpreting these distributions gives a further understanding of the variability in these predicted values, which helps to explain the significance of the model. If there is little variability, then the model correctly explains the data and holds significance. Through my extension, I found that there was a very tight spread of all three main coefficients being evaluated, which proves that the models are significant.

[1] ("Mike Silva Replication Project Github," n.d.)
[2] ("The R Project for Statistical Computing," n.d.)
[3] ("Mike Silva Replication Project Github," n.d.)

3 Literature Review

Research on the connection between smell and attraction lead Tingley, McDermott, and Hatemi to their hypothesis on ideology pairings. The science behind our sense of smell differs from our other senses like hearing and seeing. Our olfactory bulb has connections with our emotional responses in the amygdala and our center of memory in the hippocampus[4]. Tingley, McDermott, and Hatemi explain how physically experienced predilections through the sense of smell shape an individual's opinion on cases such as abortion or homosexuality[5]. If the sense of smell can orient an individual's opinions on such topics, then there may be a connection to ideological similarities between one another as well. Previous literature on this topic have not involved politics in their research. Mandairon et al.(2009) find how our sense of smell triggers attraction and repulsion responses in our brain, which is a response that we share with mice[6]. Since the release of this paper, there have not been any papers focused on this topic as well.

4 Paper Review

Tingley, McDermott, and Hatemi create this theoretical piece to explore the many ways that lead to ideological pairings in couples in the United States. Besides religion, human relationships coincide on social and political attitudes more than any other trait. This is not because of increased time spent with one another, rather it happens before the pair even knows each other. Many animals use their sense of smell to base their opinions on others. Have you ever seen two dogs interact for the first time and immediately sniff each other? The basis that smell triggers emotional responses creates Tingley, McDermott, and Hatemi's work. They hypothesize that people with the same ideology are more likely to give high ratings of attractiveness to each other. In order to do this, they have 21 participants wear pads on their armpits for a specific amount of time. These participants are instructed to follow strict living guidelines to ensure there was control in the experiment. After the allotted time, the participants turn in their armpit pads, which are locked away in freezers. The 119 evaluators then come in, and rate the attractiveness of odor for each pad. Through this experiment, the evaluators are unaware of the political ideology of the person who's armpit pad they are rating. In one model, binary versions of ideology are created by grouping all respondents who rated themselves as 4 or higher on the ideology scale as Conservative and the rest as Liberal. The other two models take the negative absolute value between the evaluator and the target to show how larger and smaller gaps in ideology effect the attractiveness ratings. Through these results, Tingley, McDermott, and Hatemi find that evaluators gave higher attractiveness ratings to targets with the same or close to same ideology of themselves, which successfully proved their hypothesis. Through the discussion, it is noted that olfactory mechanisms are not the only way nor the most dominant way in which ideologically similar couples come about. Instead, this paper suggests that olfactory mechanisms are one of the many ways that humans find compatible spouses.

5 Replication

I was able to replicate nearly every aspect of the paper, but there were several subtleties. The largest difference appears in the table. I was unable to cluster stanard errors around the evaluator ids. This would help show the standard error for each individual evaluator, which gives a better understanding of the evaluator's behavior. Regardless, the values themselves are only slightly off from the clustered values in the original paper. I also was unable to add fixed effects to the third model as the original paper does. The fixed effects help cancel out some effects that may effect the model itself. Without these fixed effects, my values differ especially in the coefficient explaining absolute ideology difference. Despite these two subtleties, I was able to accurately recreate the table in the original paper.

[4] McDermott, Tingley, and Hatemi (2014)
[5] McDermott, Tingley, and Hatemi (2014)
[6] Mandairon et al. (2009)

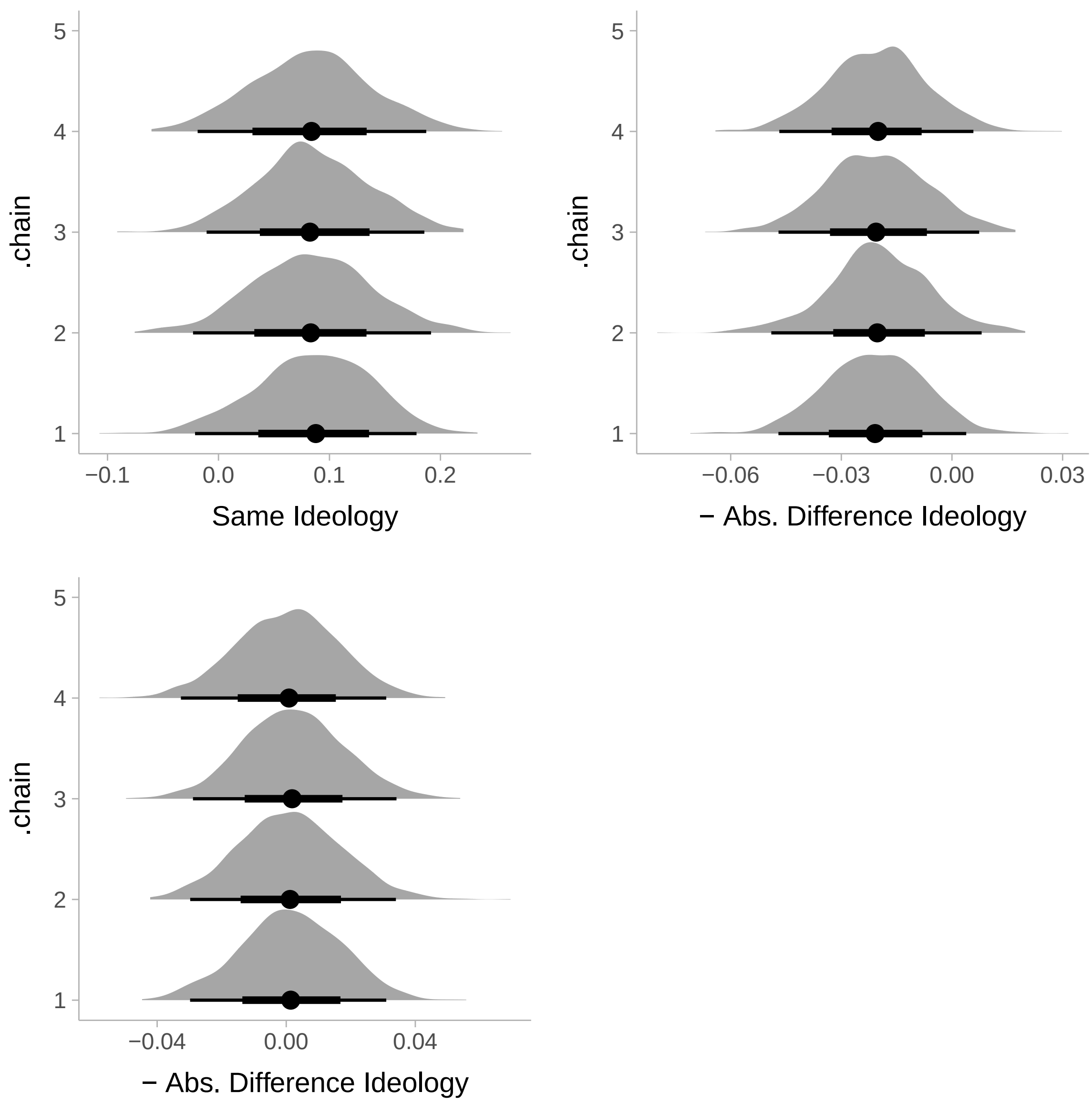
Table 1: Odor Attraction as a Function of Ideological Similarity

	Model 1	**Model 2**	**Model 3**
Same Ideology	0.0853		
	(0.0522)		
- Abs Ideology Diff.		-0.0206	0.0008
		(0.0142)	(0.0163)
Same Sex	-0.1436^{***}	-0.1430^{***}	-0.1877^{***}
	(0.0507)	(0.0508)	(0.0618)
Conservative Eval.	-0.0056		
	(0.0540)		
Conservative Target	0.0196		
	(0.0522)		
Ideology of Eval.		-0.0009	
		(0.0136)	
Ideology of Target		0.0056	
		(0.0121)	
Male Evaluator	-0.00003	0.0004	
	(0.0523)	(0.0522)	
Male Target	-0.0174	-0.0141	
	(0.0526)	(0.0533)	
Avg. Target Attract	0.9990^{***}	1.0012^{***}	
	(0.0404)	(0.0406)	
Avg. Eval. Attract	0.9988^{***}	0.9988^{***}	
	(0.0463)	(0.0463)	
Constant	-3.5759^{***}	-3.5058^{***}	3.7053^{***}
	(0.2254)	(0.2267)	(0.0580)
N	2195	2195	2195

$^{***}p < .01$; $^{**}p < .05$; $^{*}p < .1$

6 Extension

to further investigate this paper, I decided to apply a Bayesian framework to models created by Tingley, McDermott, and Hatemi, and explore the variability behind the most important parameters each model looks at. Using `stan_lm` for a Bayesian framework, I recreate the three models from the original paper. With these models, I pull the distributions created from `stan_lm` and create graphs displaying the distributions of each focused parameter. The `stan_lm` function takes the original data and model, and creates four different distributions of the data referred to as chains. With these chains, it then runs 1,000 iterations of the model for each chain. I pull the 4000 iterations of the focused parameters to explore how much variability there is around those parameters, which speaks to the accuracy and significance of the models that Tingley, McDermott, and Hatemi use in the paper.



For the first model, I observed a tight spread for the same ideology variable. The boxplot solid line on the bottom displays the quartiles and median value of the variable. One interesting trait of this graph is that the tail end of the density graphs show values that slipped into the negatives. This speaks to the overall effectiveness of the model. Having a coeficient value so close to zero illustrates little to no correlation between the dependent variable and its parameters. The second model displays a tighter spread of the absolute difference in ideology variable. Once again, the coefficient value is so close to zero that the model itself is questioned. Regardless, the tight spread illustrates the little variability in this observed parameter. Lastly, the third model also displays a tight spread of the absolute difference in ideology variable. This spread is slightly larger than the spread in model 2, and this is most likely because the fixed effects that the authors use in their model are not included. Altogether, these three graphs prove that the model created holds significance despite having small values in the focused parameters.

7 Conclusion

Tingley, McDermott, and Hatemi use this paper to explore one of the many ways in which ideological pairings come about in the U.S. Previously published papers have established that our sense of smell can generate specific feelings or attitudes towards the odor, which Tingley, McDermott, and Hatemi further explore in attempt to connect assortative mating by ideology. Our sense of smell works uneiquely in everyone, the authors explain, as two respondents in their experiment demonstrated polar opposite experiences after smelling the same odor. One person, whos ideology matched that of the person's odor being smelt, loved the smell of the odor. Meanwhile the second person, who had different ideological beliefs than the target, believed the odor had gone bad and needed to be exchanged[7]. In order to study the effect of smell on attraction, the authors surveyed 146 participants asking them to rate the odor of anonymous targets who were either strong liberals or strong conservatives. With this data, they create three separate models. The models all regress the reported attractive rating on numerous variables. In the first model, they primarily focus on the coefficient explaining when the evaluator and the target shared ideologies. The second two models focus on the coefficient that measures the distance between ideology on a 7 point scale. This coefficient explains how a smaller or larger distance apart in ideology between the evaluator and target leads to different attractive ratings. The constant, or the intercept, in these models explain the predicted shift in attractiveness rating of the targets. Through these models, Tingley, McDermott, and Hatemi observe that their hypotheses hold true even though there were small reported coefficient values.

As noted, my replication was successful despite some minor discrepancies. The coeficient values are almost identical across the entire table, excpept for model 3. This model used fixed effects in their model in attempt to account for similar effects in the other models. I was unable to add these fixed effects into my own model. Also, the original table clusters their standard errors around the evaluators in order to account for the difference in evaluation styles. I was unable to cluster my models, which only leaves minor differences in the standard errors across the entire table. Overall, my replication was a success.

My extension of this paper focused on further solidifying the significance of the models that Tingley, McDermott, and Hatemi create. I apply a Bayesian framework to their linear models, which allows me to pull sampled distributions and examine the data in my own way. I display graphs that illustrate the variability around the focused parameters for each respective model. This allows me to visualize how much variability there is within the models, and assess whether the models hold significance. I find that there are tight spreads of data for the focused parameters in their respective models, and I finally confirm that the models all hold significance.

Through this paper, we see the implications of our sense of smell. Just like when we smell food and formulate opinions on the food without eating it, we evaluate one another in the same manner. In this case, our brains make these opinions subconcsiously, and we are left to decide the rest on our own. A further exploration of this topic would demonstrate the other ways in which ideological pairings come about. Our sense of smell gives us a pre-determined opinion of the target, but what happens beyond that first smell?

8 Appendix

[7] McDermott, Tingley, and Hatemi (2014)

Selected Bibliography + References:

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