Intertemporal Decision-Making: ‘Smokers’ vs ‘Vapers’

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Abstract:

This paper conducts a survey experiment to examine the differences in time-discounting in intertemporal decision-making across three groups: traditional cigarette smokers, electronic cigarette users, and non-users. We provide two main findings. First, parallel to traditional cigarette users, electronic cigarette users have higher temporal discount rates than non-vapers. Second, when explicitly comparing individuals with exclusive smoking and vaping habits, those who only vape discount the future less heavily than those who only smoke and those who do both.

I. Introduction

The subject of cigarette smoking provides an interesting question for economists and health officials alike. Given the high costs of cigarette usage on the body, why do people continue to smoke? The success of policy in combatting cigarette usage in the United States provides some insight into this question. Since the federal government's first official acknowledgement of the negative health consequences associated with smoking in 1964, state and federal authorities incrementally adopted policy which expanded public awareness of the detrimental health effects in smoking (American Lung Association, 2018). Regulations requiring mandatory warning labels, limitations on tobacco advertising, and expanded smoking education in public schools were established over the past half-century and cigarette smoking has declined significantly.[1] Over this same period, the prevalence of cigarette usage in US adults declined from 42% in 1965 to just 14% in 2018 (Center for Disease Control and Prevention, 2018).

In this paper, we aim to examine cigarette smoking in relation to a relatively new phenomenon, namely the rise of electronic cigarettes. Electronic cigarettes ("e-cigarettes") are devices that vaporize liquid nicotine solutions for their users to inhale and simulate the experience of smoking a cigarette. The use of e-cigarettes is commonly known as "vaping" and correspondingly, the users are referred to as "vapers." Following innovations in both product design and marketing strategies, Rom et al. (2014) have found that the number of users worldwide has risen exponentially. This trend is especially prominent amongst teenagers and young adults. According to the 2018 National Youth Tobacco Survey administered by the FDA, both the popularity and frequency of e-cigarette use among middle-school and high-school

[1] The US Congress passed a number of bills regulating the production, sale and consumption of tobacco. Among others, the Federal Cigarette Labeling and Advertising Act of 1965, the Public Health Cigarette Smoking Act of 1969, and the Comprehensive Smoking Education Act of 1984 make up some of the most notable.

students increased significantly from the previous year. Usage among American high school students shot up from 11.7% to 20.8% between 2017 and 2018 (Simon, 2018).

Cigarettes and e-cigarettes are similar in nature for they both facilitate nicotine consumption. Since nicotine consumption mainly produces benefits in the present and costs in the future, the study of intertemporal decision-making in behavioral economics is particularly well suited to analyze the issue at hand. The goal of this paper is to examine such decision-making differs between vapers and cigarette smokers. In particular, we seek to determine if these two groups discount the future differently. To accomplish this, we conduct a survey experiment to gather temporal preference information from a sample of smokers, vapers, and non-users. Thus, we are able to compare discount rates among the groups and nuance our understanding of decision-making regarding consumption of the two products.

While there is a large literature on the health effects of cigarette smoking, there is significantly less accredited scientific research on the health consequences of e-cigarettes due to their novelty. After reviewing available research on the health effects of e-cigarettes, Hajek et al. (2014) found that, current knowledge suggests the long run consequences are ambiguous. This means it is possible that the future health costs of e-cigarettes are severely misjudged by the general public compared to that of traditional cigarettes. Moreover, given the plethora of subtle differences that exist between these two products (e.g. the presence of smoke, potential for indoor use, odor, social stigma, etc.), it is likely that consumers do not view them as perfect substitutes. Thus, it is important that research explore how smokers and vapers differ in their intertemporal decision-making processes. Therefore, this paper extends temporal preference research to the realm of e-cigarettes. We apply a time preferences research model, similar to that

used by Khwaja et al. (2007) to examine time discounting in smokers, to the domain of e-cigarettes.

This paper is structured as follows. The first section introduces the topic of time-discounting in decision-making, specifically in the area of nicotine consumption. The second section reviews the existing literature on time-discounting in the field of behavioral economics. The third section introduces the experimental design of the paper. The fourth section summarizes the data. The fifth section presents the results of our analysis. The sixth section discusses these results and concludes.

II. Literature Review

Within the existing research on tobacco consumption in behavioral economics, it seems that intertemporal choice is the most critical factor in the decision regarding cigarette usage, due to the non-simultaneity of related costs and benefits. Behavioral economists have suggested that the concept of time-discounting plays a large role in explaining not only the consumption of nicotine but also that of other substances.

Kirby et al. (1999) examined time-discounting preferences between heroin addicts and non-addicts by asking their participants a set of 27 questions concerning hypothetical monetary awards. The authors systematically derived the discount rates, k, of their subjects by inputting their responses to the monetary choice questions into the hyperbolic discounting model discussed by Mazur (1987), rather than the exponential discounting models. By utilizing the hyperbolic discounting model, the research takes into consideration potential dynamic inconsistencies in decision-making process of people. Kirby et al. (1999)'s method proved very influential in this field of research and has been adopted by many researchers following.

There exists a wealth of literature focused specifically on time-discounting in cigarette smokers as well. These studies aim to analyze the differences in intertemporal decision-making among smokers and non-smokers. Bickel et al. (1999) found higher discount rates in current smokers compared to ex- and never-smokers. In this study, the authors cite the hyperbolic discounting model as more accurate than the exponential discounting model. In a recent survey study on the role of time-discounting and smoking, Barlow et al. (2017) found that forty-four out of fifty-four relevant studies yielded results which indicated that smokers have a higher discount rate on the future compared to non-smokers. These findings suggest that cigarette smokers tend to weigh future costs, such as the negative health effects associated with smoking, less than those who do not smoke. In essence, smokers perceive the benefits of smoking a cigarette in the present to be greater than the time-discounted costs.

A variety of methods of assessing the time-discounting preferences of research subjects were employed of those studies surveyed by Barlow et al. (2017). Forty of the fifty-four studies the authors examined used hypothetical monetary rewards as a measurement of time-discounting rates, each following a template of Kirby et al. (1999)'s monetary choice questionnaire method to varying degrees.

A final important consideration in the literature within the realm of intertemporal decision-making is the role of mental impulsivity or intelligence. Frederick (2005) pioneered the use of the "Cognitive Reflection Test" (CRT) in behavioral economic research as a proxy for "a person's propensity to override an intuitive, but incorrect, response with a more analytical correct response" (Thomson and Oppenheimer 2016, 99). In Frederick's (2005) study, he found that those respondents who had higher scores on their CRT tests were more patient than those

with lower CRT scores. Therefore, Frederick's (2005) study suggests that cognitive ability plays a role in intertemporal decision-making.

III. Experimental Design

In order to tackle our research question, the main goals of our experiment were to capture the time-discounting preference of smokers, vapers, and non-users of nicotine. In addition to the main variables of interest, we take into consideration other plausible or known predictors of nicotine usage status by including CRT questions as well as demographic information. Our survey design includes the following components:

- 9 Monetary Choice Questions
- 3 CRT Questions
- Smoking and Vaping Status
- Demographic Information

9 Monetary Choice Questions

To precisely estimate discount rates, we designed the beginning of our survey closely following the questionnaire of Kirby et al. (1999) discussed in the above section. The 27 questions of Kirby et al. (1999) consisted of three sets of nine questions. The difference between these sets lied in the size of the delayed monetary reward asked in the questions: small ($25 to $35), medium ($50 to $60) and large ($75 to $85). The authors cited the magnitude effect, a decrease in people's discount rates with an increase in the reward size, observed in numerous past studies as their reasoning behind including this feature. However, we feared that given the resources available, the lengthiness of including 27 monetary choice questions in our survey

would severely disincentivize our potential participants to take it seriously, or even at all. Therefore, we only employed the set of nine questions with a medium reward size ($50 to $60) in our survey.

For each of the nine questions, formulated identically ("would you prefer $V today or $A in D days?"), participants had a choice between answering "smaller reward today" or "larger reward later". Using the function $V = \frac{A}{1 + kD}$ in Kirby et al. (1999), a *k* value can be computed, representing the discount rate with which a participant would be indifferent between the two answers. Table 1 shows the *k* values associated with each question, sorted from small (discounting the least) to large (discounting the most). We randomly ordered these nine questions in our survey to avoid trend recognition by our participants, which might confound their choices.

Table 1.

k								
0.00016	0.00040	0.0010	0.0025	0.0060	0.016	0.041	0.10	0.25

3 CRT Questions

Given that the literature indicates that cognitive ability may play a role in intertemporal preferences, we include a three question CRT test in our survey to control for this factor. We selected three lesser-known CRT questions from a study by Toplak et al. (2014) on expanding the traditionally-used CRT exam.[2]

[2] Toplak et al. (2014) introduced an expanded CRT that contains four new questions in addition to the traditional three questions used in nearly every CRT. The authors found that scores on the traditional and their new CRT were highly correlated. The motivation for this expansion on existing questions is increased exposure to the CRT among the general population. Thomson and Oppenheimer (2016) found that 72% of their respondents had prior exposure

Smoking and Vaping Status

We ask for our participants' current smoking and vaping status. Following the methodology of the Global Tobacco Surveillance System, we categorized smoking status into three groups, "Daily", "Less-than-daily" and "Never", and did the same for vaping status.

Demographic Information

It is well known that some demographic information can be highly predictive of smoking status, and we suspect the same for vaping status, especially given the rise in the popularity of e-cigarettes amongst the youth. Therefore, we ask five questions to determine our participants' gender, race, age, highest education level attained and household income to control for their potential effects.

Distribution

We used the Qualtrics software for the purposes of design, distribution and data collection. As an incentive, participants were entered into a raffle for two $40 Amazon Gift Cards. We distributed our survey through the Macalester Economics Department, the Macalester social network as well as our personal connections and collected responses over a period of ten days. A template of the actual survey can be found in Appendix 1.

IV. Data

to at least one question on the traditional CRT and those respondents with exposure achieved higher scores on the test.

We obtained 118 completed responses from a total of 142. The participants' genders were relatively evenly distributed, with a slightly higher proportion identifying as male. Almost all of the participants are under the age of 30, with most of them falling under the "18-21" age group. White and Asian together made up of the majority of the participants' race. The most common income category recorded was "$100,000 or above" and the most common education level was "some college but no degree". Detailed graphic summaries of the demographic data can be found in Appendix II. Based on the total number of correct answers to the three CRT questions, each participant was assigned a score of 0-3. 46 Participants had a total CRT score of 3, 41 had a score of 2, 19 had a score of 1 while 12 had a score of 0. The distribution of smoking and vaping status was highly uneven, as never-smokers vastly outnumbered smokers and Less-than-daily smokers. Table 2 shows the smoking and vaping status of the respondents.

Table 2.

	Daily	Less-than-daily	Never
Smoking Status	6	24	88
Vaping Status	7	16	96

Using their answers to the nine monetary choice questions, we estimated and assigned a *k* value to each participant, representing their discount rate. Following Kirby et al. (1999), we do so by taking the geometric mean of the indifference *k* value associated with each of the two questions at which a respondent switches her preference regarding the smaller reward now or the larger reward later. There were 16 participants who were inconsistent in their responses. For their

discount rate, we simply assigned the *k* value that yielded the highest proportion of correct predictions of their answers or the geometric mean of the two *k* values that did so equally. Summary statistics detailing each participant's *k* value generated through the computations described above can be found in Table 3. The most common *k* value estimated was 0.0098, the geometric mean of 0.0060 and 0.016, which means that the two questions associated with these two *k* values are the ones between which participants switched their preferences the most.

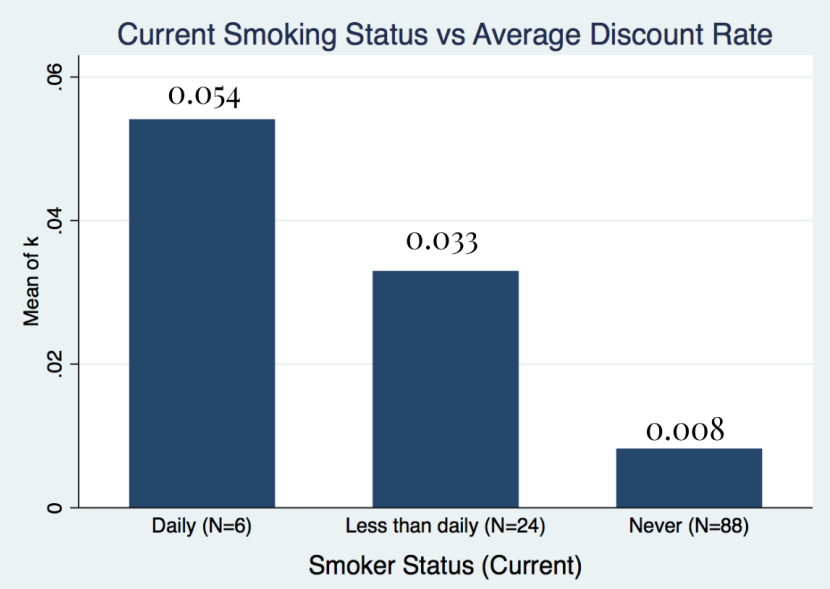
Table 3.

VARIABLES	(1) N	(2) mean	(3) sd	(4) min	(5) max
k	118	0.0156	0.0277	0.000160	0.158
.0001599	3	.00016	0	.00016	.00016
.0002529	2	.000253	0	.000253	.000253
.0006324	5	.0006325	0	.0006325	.0006325
.0015811	16	.0015811	0	.0015811	.0015811
.0038729	26	.003873	0	.003873	.003873
.0039359	5	.003936	0	.003936	.003936
.0097979	33	.009798	0	.009798	.009798
.0099597	1	.0099598	.	.0099598	.0099598
.0256124	17	.0256125	0	.0256125	.0256125
.0636371	1	.0636372	.	.0636372	.0636372
.0640312	6	.0640312	0	.0640312	.0640312
.1581138	3	.1581139	0	.1581139	.1581139

V. Results

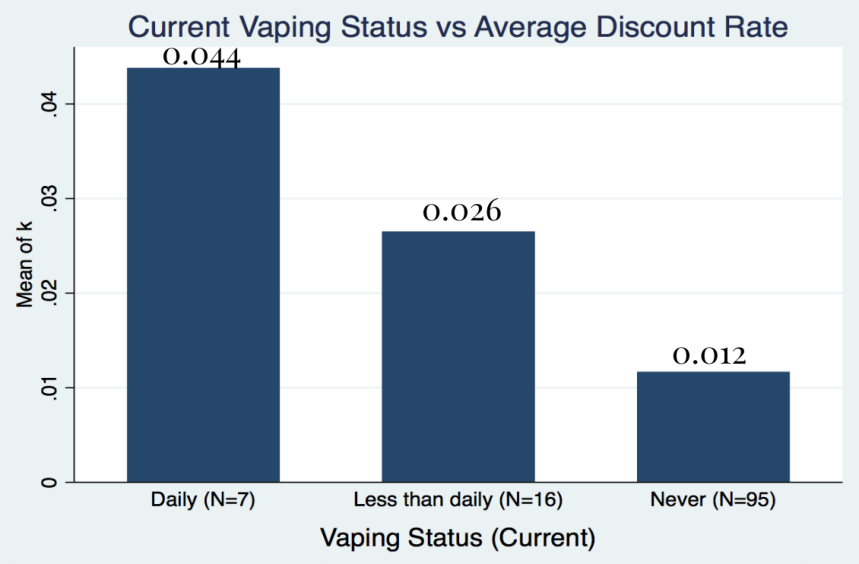
We begin our analysis by simply organizing responses by their smoking and vaping status and comparing the mean *k* values of each group. The results are visible on Figure 2 and Figure 3.

Figure 1.



First, we distinguish between responses of Daily, Less-than-daily, and Never in regard to cigarette usage. The results observed are clearly in line with the literature, as mean *k* value declines as the frequency of traditional cigarette consumption declines. While respondents who identify as Daily smokers have an average discount value of 0.054, Less-than-daily and Never respondents hold average *k* values which are substantially lower, 0.033 and 0.008 respectively. These results are mimicked in the e-cigarette domain. Daily vapers average a discount value of 0.044, while participants who identified as Less-than-daily and Never vapers hold mean *k* values of 0.026 and 0.012 respectively. This simple analysis confirms our hypothesis on positive relationship between *k* value and smoking and vaping frequency. These results are fruitful, in that they both confirm the findings of relevant literature on smoking status and time discounting behavior, as well as evidence a very similar correlation in the decision-making of e-cigarette users.

Figure 2.



Upon confirming that our data supports existing literature and extends these findings to the domain of e-cigarettes, we build two logistic regression models to compare relative differences in time-discounting behavior between traditional tobacco users and e-cigarette users. For the purpose of empirical analysis, we categorize both Daily and Less-than-daily smokers as smokers with the variable name *csmokers*. Similarly, we group Daily and Less-than-daily vapers as *cvapers*. Doing so also greatly improves the balance in the distribution of our uneven sample sizes of smoking and vaping status.

Our first model (1) examines the likelihood of an individual respondent being a smoker. Our variable of interest, *k*, is a measure of a respondent's time discounting coefficient, *k*. A series of controls are also included in the model. The variable, *crttotal*, is a measure of a respondent's CRT score, and thus controls for exogenous mental impulsivity in a subject. Additionally, we control for demographic information. The regression uses fixed effects to control for a participant's unique individual background, as measured by respondent's identification with

race, gender, age, household income, and education. These demographic controls are represented by the term, α_i. The stochastic error terms in included as the term, ε_i.

$$(1)\ Y_i = ß0 + ß1\ k + ß2\ crttotal + \alpha_i + \varepsilon_i$$

The results of the logistic regression our listed in Table 4. The dependent variable, Y_i, is binary. The value is equal to 1 if the individual is a smoker (Daily or Less-than-daily) and the value is equal to 0 if the individual stated that they never smoke. Column (1) reports the logistic coefficient and column (2) reports the coefficients in terms of odds ratio. The coefficient on the variable of interest, ß1, holds a value of 56.17. Though we cannot interpret much significance from the magnitude of this coefficient, the positive sign indicates that the likelihood that an individual is a smoker increases as their *k* value rises, all else held constant. Furthermore, term is statistically significant. Beyond this coefficient of interest, the control measures included in the model do not yield statistically significant results.[3]

[3] The Model 1 and Model 2 regression output tables with the controls listed are available in the Appendix II.

Table 4.

	(1)	(2)
VARIABLES	Logit coeff	Odds ratio
csmoker		
k	56.17***	2.482e+24***
	(3.007)	(3.007)
crttotal	-0.315	0.730
	(-0.969)	(-0.969)
	(-0.391)	(-0.391)
Constant	-0.703	0.495
	(-0.508)	(-0.508)
Observations	110	110
Demographic FE	YES	YES
chi2	35.37	35.37
ll	-44.72	-44.72

z-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

We then compare the results of our regression with model (1) to those with e-cigarette model (2). This model is identical to model (1) except for the dependent variable, which is *cvaper*.[4] Thus, model (2) examines the relationship between the rate at which an individual discounts the future, proxied through the variable, *k*, and the probability that individual vapes.

$$(2)\ Y_i = ß0 + ß1\ k + ß2\ crttotal + \alpha_i + \varepsilon_i$$

The results of the logistic regression using model (2) are listed on Table 5. The dependent variable, Y_i, is binary. The value is equal to 1 if the individual is a vaper (Daily or Less-than-

[4] The *cvaper* variable, like the *csmoker* variable, groups Daily and Less-than-daily users of electronic cigarettes into a single group.

daily) and the value is equal to 0 if the individual stated that they never vape. Column (1) reports the logistic coefficient and column (2) reports the coefficients in terms of odds ratio. The primary variable of interest, *k*, holds a coefficient value of 28.29. Again, the positive sign on this coefficient indicates that the probability of an individual being a vaper rises with an increase in *k*, all else held constant. Much like the result for the model (1), nearly every control variable included holds no statistical significance.[5]

Table 5.

VARIABLES	(1) Logit coeff	(2) Odds ratio
cvaper		
k	28.29**	1.924e+12**
	(2.392)	(2.392)
crttotal	0.256	1.292
	(0.744)	(0.744)
Constant	-2.007	0.134
	(-1.308)	(-1.308)
Observations	108	108
Demographic FE	YES	YES
chi2	25.23	25.23
ll	-41.98	-41.98

z-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

By comparing the odds ratios, which are derived from the ß1 logistic coefficient values in each regression, we see that, given a one unit increase in *k*, the odds ratio on a individual being a smoker increases by 2.482×10^{24} in model (1). In the e-cigarette model, however, a one unit increase in *k* corresponds to only a 1.924×10^{12} increase in the odds ratio of being a vaper.

[5] The only control variable with significance is the fixed effects control for the education level of 'Bachelors.'

Though the actual magnitude of these numbers cannot be practically interpreted,[6] the relative difference the magnitude indicates that at a given value of *k,* the odds ratio of an individual being a cigarette smoker is higher than the odds ratio of an individual being a vaper. To further highlight this difference, we conducted a margins analyses of models (1) and (2).[7] When holding all variables fixed at their mean values, we find that, at the mean value of *k*, the predicted probability that an individual is a cigarette smoker is 21.56%. For the same margins analysis, we find that the predicted probability of an individual identifying as a vaper is only 12.79%. At the same level of *k*, a respondent is more likely to be smoker than a vaper. Thus, we find evidence to support the hypothesis that vapers discount the future at a lower rate than traditional cigarette smokers.

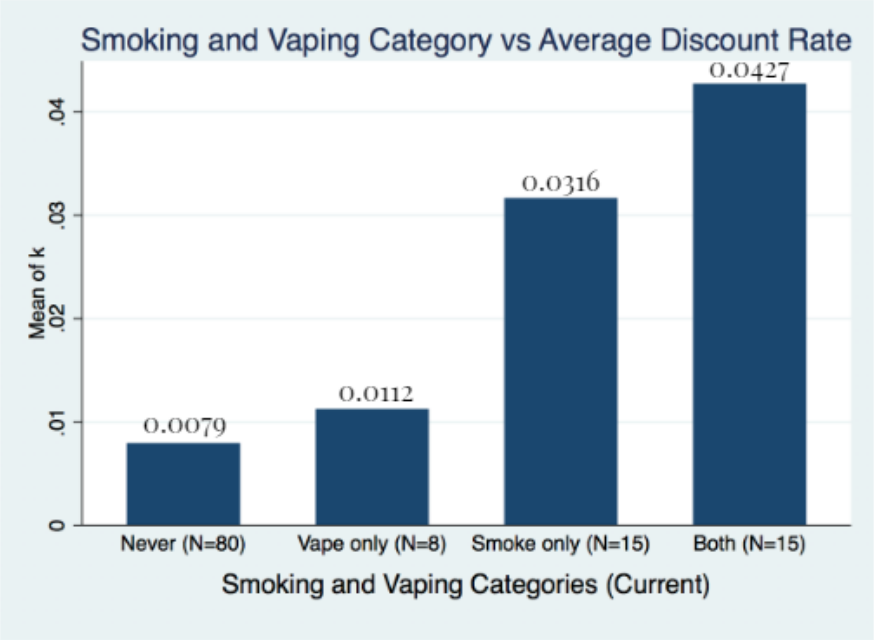
In order to examine the robustness of our results, we further divide our sample into four groups: 1) those who never smoke or vape (*Never*), 2) those who only vape (*Vapeonly*), 3) those who only smoke (*Smokeonly*), and 4) those who both smoke and vape (*Both*). We do this to better distinguish between the preferences of those who solely smoke and those who solely vape. A potential source of bias in models (1) and (2) is that some individual in our sample both smoke and vape. Thus, the time preferences so those individuals were factored into both models. By further categorizing our data, we are able to analyze differences between the four categories listed above and explicitly examine differences in time preferences between smokers and vapers.

The comparisons among the average *k* values of each group are displayed in Figure 4. By examining the relative mean *k* values of each group, we find support for the hypothesis that there is systematic difference between the intertemporal preferences of smokers and vapers. The mean *k* value for those participants that only use e-cigarettes is 0.0112, while the mean *k* value for

[6] Given that values of *k* are contained 0 and 1, the concept of a one unit increase in *k* is purely hypothetical.
[7] Margins analysis output can be found in the Appendix II.

solely smokers is 0.0316. Additionally, an interesting finding from this analysis is that those individuals that both smoke and vape have the highest average *k* value at 0.0427.

Figure 3.



In an effort to further understand the relationship between these categories and time discounting preference, we run an ordinal logistic regression (OLR) to examine how a change in *k* corresponds to compare the likelihood of being in each category. Due to the static nature of our controls, we refrained from adding control variables in order to conduct this OLR.[8] Upon running the regression and conducting a marginal effect analysis on the results, we see that a one unit increase in *k* results in significantly different effects on the probability of an individual being in a specific category. For the None category, a one unit increase in *k* decreases the probability of

[8] Given the lack of significance the controls held in models (1) and (2), the omission of demographic and CRT controls should not bias the results of the OLR. To ensure this was the case, we ran the OLR regression on both a model that included controls and one that did not. The difference in the value of coefficients of interest was less than 0.3 % and the difference was deemed negligible.

an individual being in this category by 739.67%, all else held constant. For the same marginal increases, the probability of being a *Vapeonly* go up by 120.1%. For the *Smokeonly* category, the probability rises by 313.35%. And for the *Both* category, probability rises by 306.22%. These results are listed on Table 6.

Table 6.

	dy/dx	z
None	-7.3967***	-3.45
Vapeonly	1.2010**	2.08
Smokeonly	3.1335***	2.63
Both	3.0621***	2.95

VI. Discussion

Summarizing our comprehensive analysis of the data, we conclude with three main findings. First, we successfully replicated the result widely cited in the relevant literatures that cigarette smokers have a higher discount rate than non-smokers. Second, we found that this result is transferable to the realm of electronic cigarettes, where vapers have higher discount rates than non-vapers. Lastly, however, when explicitly comparing individuals with exclusive smoking and vaping habits, those who vape only discount the future less heavily than those who smoke only and those who do both.

Our findings satisfy the research questions we sought out to answer. Smokers and vapers differ from each other in terms of their intertemporal decision-making processes in the magnitude that they discount the future. We hypothesize this is mainly caused by the perceived differences between traditional cigarettes and e-cigarettes in their future costs. Particularly, the future costs of e-cigarettes are likely to be perceived as lower than that of traditional cigarettes. Due to the perceived lower future costs, e-cigarettes successfully capture those individuals with an above average level of k who discount the future not heavily enough to smoke, but just heavily enough to vape.

We suggest a few plausible causes behind this perception. First, despite a relatively recent shift by e-cigarette companies to focus on capturing more youths, e-cigarettes had, since their conception, been marketed as a healthier alternative to traditional cigarettes, helping smokers quit. On the other hand, a lack of scientific research on e-cigarettes mentioned in the introduction means that there is nothing standing in the way of the marketing effects. The miniature body size of relevant research simultaneously implies a decreased saliency in the future costs of e-cigarettes. Relatedly, the long-run dangers of smoking traditional cigarettes are not only well-established, but also constantly exhibited throughout society, be it through campaigns, public policies, cultures or simply personal experiences from every day-life, none of which that is applicable to e-cigarettes come close to the same degree or scale. It is highly likely that the true future costs of e-cigarettes have not even had enough time to fully manifest themselves yet in the less than two decades of time in which e-cigarettes have existed.

However, our findings are not without limitations. Our primary concern relates to our sample and thus the external validity of our findings. Due to our distribution channels (via Macalester social media pages and networks), nearly all respondents to our survey were

Macalester students. As we noted in our demographic information, Macalester students represent a particular cross-section of society. Our subjects were primarily WEIRD, meaning that much of our sample had similar backgrounds in regard to education, income, and race. Furthermore, the number of Macalester students who smoke or vape regularly is small, and thus, the portion of our sample with a smoking or vaping status of Daily was limited.

In conclusion, this project examined the time preferences of smokers, vapers and those who do not consume nicotine and found significant results indicating that smokers discount the future more than vapers, who in turn discount the future more than the rest. Based on theoretical frameworks in Behavioral Economics, we suspect the main reason behind these findings is the lower perceived future costs of e-cigarettes. The fact that cigarettes have existed much longer than e-cigarettes naturally implies that people are much more conscious about the harmful effects of cigarettes. Whether or not this differed perception is warranted, however, remains to be explored by future health research.

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Appendix I

For each of the next 9 questions, please indicate which reward you would prefer: the smaller reward today, or the larger reward in the later date specified.

Would you prefer $25 today, or $60 in 14 days?

- Smaller reward today
- Larger reward later

Would you prefer $54 today, or $60 in 111 days?

- Smaller reward today
- Larger reward later

Would you prefer $34 today, or $50 in 30 days?

- Smaller reward today
- Larger reward later

Would you prefer $54 today, or $55 in 117 days?

- Smaller reward today
- Larger reward later

Would you prefer $47 today, or $50 in 160 days?

- Smaller reward today
- Larger reward later

Would you prefer $20 today, or $55 in 7 days?

- Smaller reward today
- Larger reward later

Would you prefer $27 today, or $50 in 21 days?

- Smaller reward today
- Larger reward later

Would you prefer $49 today, $60 in 89 days?

- Smaller reward today

- Larger reward later

Would you prefer $40 today, or $55 in 62 days?

Answer the following 3 questions carefully.

A man buys a pig for $60, sells it for $70, buys it back for $80, and sells it finally for $90. How much has he made?

If John can drink one barrel of water in 6 days, and Mary can drink one barrel of water in 12 days, how long would it take them to drink one barrel of water together?

Simon decided to invest $8,000 in the stock market one day early in 2008. Six months after he invested, on July 17, the stocks he had purchased were down 50%. Fortunately for Simon, from July 17 to October 17, the stocks he had purchased went up 75%. At this point, Simon:

- has broke even in the stock market
- is ahead of where he began.
- has lost money.

Almost done! We just need some information about you now.

How frequently do you currently smoke cigarettes?

- Daily
- Less than daily
- Not at all

How frequently do you currently use electronic cigarettes?

- Daily
- Less than daily
- Not at all

What is your gender?

- Male
- Female
- Other

What is your race?

- White
- Black or African-American
- American Indian or Alaska Native
- Asian
- Native Hawaiian or Pacific Islander
- Multiple races

What is your age?

- 17 or younger
- 18-21
- 22-29
- 30-39
- 40-49
- 50-59
- 60 or older

What is the highest level of school you have completed or the highest degree you have received?

- Less than high school degree
- High school degree or equivalent (e.g., GED)
- Some college but no degree
- Associate degree
- Bachelor degree
- Graduate degree

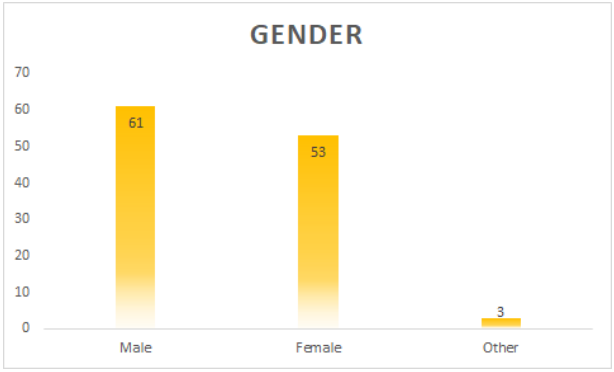
How much total combined money did all members of your household earn in 2018?

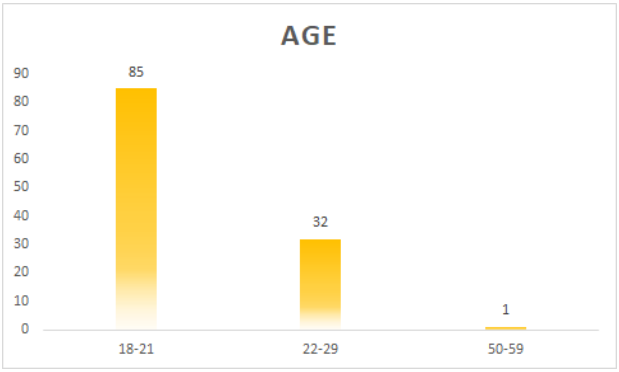
- $0 - $29,999
- $30,000 - $49,999
- $50,000 - $69,999
- $70,000 - $99,999
- $100,000 or above

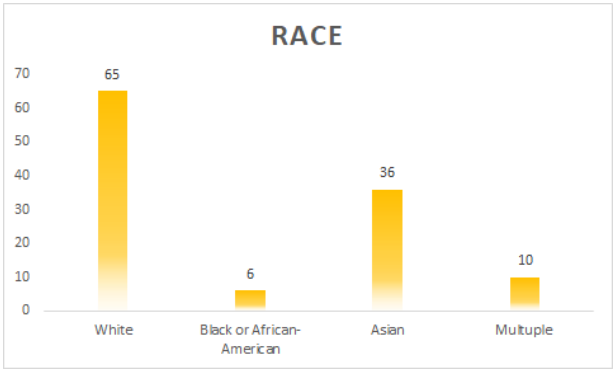
Thank you very much for your participation!

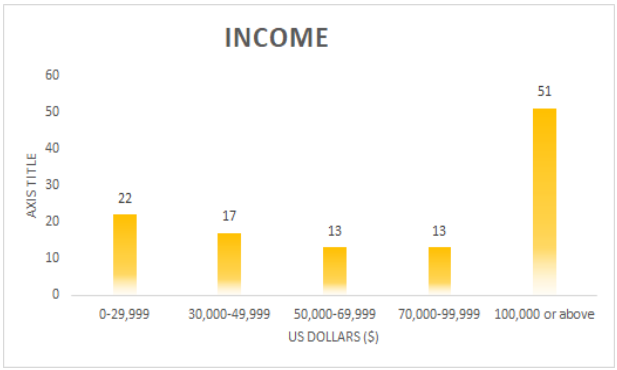
Appendix II

Graphic Summaries of Demographic Information









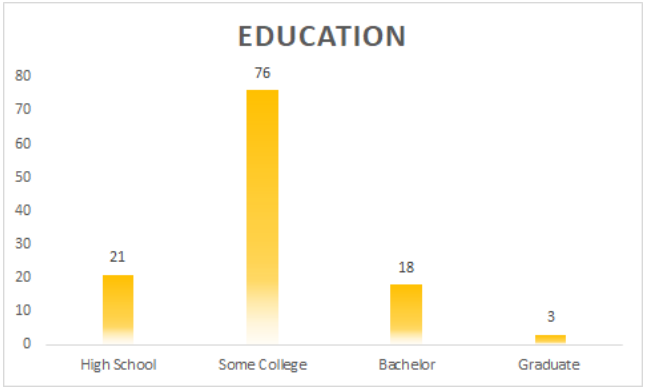


Table 4.1 Including Listed Controls

VARIABLES	(1) Logit coeff	(2) Odds ratio
csmoker		
k	56.17***	2.482e+24***
	(3.007)	(3.007)
crttotal	-0.315	0.730
	(-0.969)	(-0.969)
2.gender	-0.892	0.410
	(-1.410)	(-1.410)
3o.gender	-	-
2.race	0.275	1.317
	(0.199)	(0.199)
4.race	1.004	2.730
	(1.364)	(1.364)
6.race	0.807	2.241
	(0.826)	(0.826)
3.age	-0.320	0.726
	(-0.467)	(-0.467)
6o.age	-	-
3.edu	-0.114	0.892
	(-0.151)	(-0.151)
5.edu	-1.136	0.321
	(-1.103)	(-1.103)
6.edu	-0.963	0.382
	(-0.413)	(-0.413)
2.income	-0.244	0.783
	(-0.241)	(-0.241)
3.income	0.0162	1.016
	(0.0140)	(0.0140)
4.income	-2.058	0.128
	(-1.393)	(-1.393)
5.income	-0.335	0.715
	(-0.391)	(-0.391)
Constant	-0.703	0.495
	(-0.508)	(-0.508)
Observations	110	110

chi2	35.37	35.37
ll	-44.72	-44.72

z-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5. 1 Including Listed Controls

VARIABLES	(1) Logit coeff	(2) Odds ratio
cvaper		
k	28.29**	1.924e+12**
	(2.392)	(2.392)
crttotal	0.256	1.292
	(0.744)	(0.744)
2.gender	-1.788**	0.167**
	(-2.552)	(-2.552)
3o.gender	-	-
2.race	0.225	1.253
	(0.137)	(0.137)
4.race	0.332	1.394
	(0.443)	(0.443)
6.race	0.186	1.205
	(0.142)	(0.142)
3.age	0.168	1.183
	(0.239)	(0.239)
6o.age	-	-
3.edu	-0.658	0.518
	(-0.871)	(-0.871)
5.edu	-3.082**	0.0459**
	(-2.032)	(-2.032)
6o.edu	-	-
2.income	0.491	1.634
	(0.374)	(0.374)
3.income	0.946	2.576
	(0.754)	(0.754)
4.income	0.957	2.605
	(0.754)	(0.754)
5.income	0.928	2.529
	(0.855)	(0.855)
Constant	-2.007	0.134
	(-1.308)	(-1.308)

Observations	108	108
chi2	25.23	25.23
ll	-41.98	-41.98

z-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Marginal Analysis. Vapers

```
. margins, at(kmissing=(.0156)) atmeans vsquish post

Adjusted predictions                            Number of obs     =        108
Model VCE    : OIM

Expression   : Pr(cvaper), predict()
at           : kmissing        =       .0156
               crttotal        =    2.046296 (mean)
               1.gender        =     .537037 (mean)
               2.gender        =     .462963 (mean)
               1.race          =    .5740741 (mean)
               2.race          =    .0555556 (mean)
               4.race          =     .287037 (mean)
               6.race          =    .0833333 (mean)
               2.age           =    .7314815 (mean)
               3.age           =    .2685185 (mean)
               2.edu           =    .1851852 (mean)
               3.edu           =    .6481481 (mean)
               5.edu           =    .1666667 (mean)
               1.income        =    .1574074 (mean)
               2.income        =    .1481481 (mean)
               3.income        =    .1203704 (mean)
               4.income        =    .1203704 (mean)
               5.income        =    .4537037 (mean)
```

	Delta-method Margin	Std. Err.	z	P>|z|	[95% Conf.	Interval]
_cons	.1279973	.0424621	3.01	0.003	.0447732	.2112214

Marginal Analysis. Smokers

```
. margins, at(kmissing=(.0156)) atmeans vsquish post

Adjusted predictions                            Number of obs     =        110
Model VCE    : OIM

Expression   : Pr(csmoker), predict()
at           : kmissing        =       .0156
               crttotal        =    2.036364 (mean)
               1.gender        =    .5363636 (mean)
               2.gender        =    .4636364 (mean)
               1.race          =    .5636364 (mean)
               2.race          =    .0545455 (mean)
               4.race          =          .3 (mean)
               6.race          =    .0818182 (mean)
               2.age           =    .7272727 (mean)
               3.age           =    .2727273 (mean)
               2.edu           =    .1818182 (mean)
               3.edu           =    .6363636 (mean)
               5.edu           =    .1636364 (mean)
               6.edu           =    .0181818 (mean)
               1.income        =    .1636364 (mean)
               2.income        =    .1454545 (mean)
               3.income        =    .1181818 (mean)
               4.income        =    .1181818 (mean)
               5.income        =    .4545455 (mean)
```

	Delta-method Margin	Std. Err.	z	P>|z|	[95% Conf.	Interval]
_cons	.2156572	.0498249	4.33	0.000	.1180021	.3133123