

Prospective Marketing Meta-Analysis: The Effect of TV vs New Media Car Ads on Consumer Car Consideration Probabilities in China and USA

by

Yasemin Gokce

Submitted to the Department of Electrical Engineering and Computer Science

in partial fulfillment of the requirements for the degree of

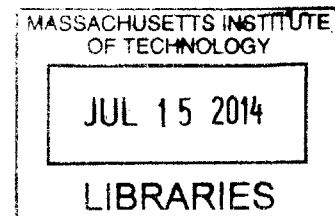
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Author
Department of Electrical Engineering and Computer Science

May 23, 2014

Signature redacted

Certified by...
Glen L. Urban

David Austin Professor in Management, Emeritus
Professor of Marketing, Emeritus

Dean Emeritus; Chairman, MIT Center for Digital Business
Thesis Supervisor

Signature redacted

Accepted by
Albert R. Meyer

Chairman, Department Committee on Graduate Theses



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Abstract

This thesis addresses a major marketing challenge faced by global companies: how to spend online marketing budgets with maximum effect on end user behavior. Specifically, we examine the effectiveness of strategically placed online car ads on end users' new car considerations. The research in this paper is the final piece of a 3-year investigative collaboration between General Motors and MIT and spans the USA, China, and Netherlands. In this thesis, I show how the Chrome extension used for injecting ads on webpages in the USA marketing study of last year was adapted to the Chinese and Netherlands markets. I discuss the data collection and analysis of 2550 Chinese participants and the improvements we have made for Netherlands where the study is currently in the data collection stage. I also analyze the best ad strategies from pooling of USA and China data. My research shows that in China, TV, social media, TV+social media, and imminence of purchase had the highest statistically significant positive effect on advertised car considerations. In USA, TV, social media, age, and education had the highest statistically significant effects on advertised car considerations. When pooled together, TV, social media, TV+search, banner+search, banner+TV+social media / search combinations, age, education, all had statistically significant effects on car consideration probabilities.

Thesis Supervisor: Glen L. Urban

Title:

David Austin Professor in Management, Emeritus
Professor of Marketing, Emeritus
Dean Emeritus; Chairman, MIT Center for Digital Business

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Chapter 1

Introduction and Background

This chapter will introduce the motivation for the thesis, describe past work in this area, and outline the main contributions.

1.1 Motivation

All companies need to make decisions on the size of their marketing budgets and how to allocate it to have maximum response from end users. The smaller and localized the user segment is, the easier marketing results can be measured. For example, a service catering to elderly people in downtown San Francisco would have a much easier time devising a strategy than a global company selling products to adults of all ages in vastly different cultures, such as a car manufacturer.

This thesis builds on past collaboration between MIT and General Motors to investigate the effectiveness of car ads between TV clips, in social media news feeds, on search engine results, and as banners on webpages on car brand and model considerations for the consumer's next car purchase.

1.2 Current solutions

Current solutions in assisting companies with their marketing decisions are very fragmented. There are companies that report gender, age and past websites of incoming users to the company websites. There are companies that focus on user tracking on the website and, for example, giving feedback that a red "Buy" button is, say, 4% more effective than a blue "Buy" button. There are companies that do small-scale user focus groups, gathering 10-20 people from a specific background to go through an end-to-end experience with company sales and giving detailed feedback.

Each of these companies addresses a specific need, but the sum of these parts doesn't add up to the main question: what is the most effective marketing strategy for a diverse user segment in multinational companies? This thesis attempts to answer this question in the car manufacturing domain.

Our investigation involves a large and carefully selected user population in multiple countries and collecting data on user car considerations before and after exposure to specific car ad combinations.

1.3 Past Work

In 2011, Ryan Ko [2] and colleagues designed a flexible Chrome extension and a database in preparation for large scale marketing studies. A car consideration survey was administered before and after downloading the extension and viewing car ads on several websites including Facebook, Google, Twitter, and Youtube. A preliminary survey was conducted with 50 people and significant results were observed, prompting a more wide-scale pursuit of this study.

In 2012, Brandon Baker [1] and colleagues extended and adapted technical infrastructure, including the Chrome extension, database, and the survey, and administered the car consideration probabilities survey to over 14,000 people in the United States.

1.4 Contributions in this Thesis

In this thesis, I show how the technical infrastructure was adapted for marketing studies in China and Netherlands and I show what the US, China, and pooled US&China data shows about the most effective car marketing strategies.

Chapter 2

Marketing Study

This chapter details the various elements and technologies behind the marketing study. The relevant code can be found in the appendix.

2.1 Overview

We partnered with the global marketing research company Gongos to recruit users in China and Netherlands. This process mirrored the USA user acquisition process. Users were directed to an online survey, each with their individual links. They answered questions about themselves (age, gender, ...) and about their views on cars. If users navigated through these without raising red-flags, they could download a Chrome extension and hit our MIT media server. After visiting one or more websites with artificially injected car advertisements, they would return to the survey. This post-media portion of the survey mirrored the car consideration questions of the first portion and also included standardized personality classification questions. Finally, the user was instructed to remove the Chrome extension and the survey status would be updated as complete. The entire process, from a user's perspective took approximately 20-25 minutes.

2.2 Survey

The survey is comprised of over 50 multiple choice questions with two goals: 1) eliminate users that display disqualifying behavior or are outside of the intended audience and 2) record the car consideration preferences and details of the users' life.

The first goal, eliminating disqualifying behavior, is achieved through various mechanisms. For example, in questions where the user is asked to rate various qualities from 1 to 7, if the user rates everything with the same value, the user is considered to be "straight-lining" the answer and we disqualify the user. Double checking is another method; the user is asked to make a ranking of the cars, then, in the next question, is asked to distribute 100 points among the cars. If the user doesn't allocate the highest number of points to the highest ranked car, the user is assumed to have hastily and randomly selected the cars and is eliminated. Users who don't consider buying a new car in the next 4 years or want to buy exclusively cars that General Motors is not concerned with in this study (sports cars, for example) are also eliminated. All these mechanisms and many that haven't been mentioned entail survey question programming that ensures a high fidelity user data.

Q116. For each of the following occupations, please indicate if you, or anyone in your household, is currently employed or used to work in any of them. (Select all that apply)

[ACCEPT MULTIPLE ANSWERS]

- 1 Advertising **[SOFT TERMINATE]**
- 2 Airlines
- 3 Automotive Dealership **[SOFT TERMINATE]**
- 4 Automotive Manufacturer **[SOFT TERMINATE]**
- 5 Banking
- 6 Hotel Trade
- 7 Insurance
- 8 Market Research **[SOFT TERMINATE]**
- 9 Press, Radio, TV, Journalism **[SOFT TERMINATE]**
- 10 Supplier to the Automotive Industry **[SOFT TERMINATE]**
- 11 None of the above **[HOLD][DO NOT ALLOW CONFLICTING ANSWERS]**

Figure 2-1: Sample Question from the Survey

Q120. When do you plan to purchase/lease your next new (not used) vehicle?

- 1 within the next 1-6 months
- 2 within the next 7-12 months
- 3 within the next 1 to 2 years
- 4 within the next 2 to 3 years
- 5 within the next 3 to 4 years
- 6 in more than 4 years **[SOFT TERMINATE AND SKIP TO Q132]**
- 7 I do not plan to purchase/lease a new vehicle **[SOFT TERMINATE AND SKIP TO Q132]**

Figure 2-2: Sample Question from the Survey

Q230. To ensure your settings are allowing you to appropriately view the video clips, can you please tell us what you saw in the clip you just viewed?

- 1 Ball bouncing **[TERMINATE]**
- 2 Lions walking towards hyenas
- 3 Car driving down curved road **[TERMINATE]**
- 4 Dog chasing a cat **[TERMINATE]**

Figure 2-3: Sample Question from the Survey

The second goal is to record the car consideration preferences of users. Users are given over 100 different car and model consideration choices available in their countries. Unbeknownst to them, each car make and model falls into one of 3 segments, small, medium, and large. The user's preferred car segments inform the media site about which General Motors make and model car should be advertised. In addition to matching user's taste in car sizes, the car consideration probabilities are the dependent variable in our study as shown below.

2.2.1 Dependent Variable

The dependent variable in the analysis is the change in points allocated to the GM car in the user's segment. It was derived from the pre- and post-stimuli survey results.

Q325. If you had to replace your vehicle tomorrow (or purchase a vehicle if you do not currently have one), please tell us which new hatchback sedan(s) and/or sedan car(s) you would consider. Use the drop down list(s) to select the car(s) you would consider (up to 5 cars) starting with the vehicle you would consider most. Please list all the new hatchback sedan(s) and/or sedan car(s) you would possibly consider (up to 5), even if you would only be somewhat likely to consider them.

_1 Car 1 (Highest Preference) [DROPDOWN BOX OF VEHICLES FROM MAKE MODEL LIST - ONLY THOSE WITH A 1 IN COLUMN L][FORCE]
_2 Car 2 [DROPDOWN BOX OF VEHICLES FROM MAKE MODEL LIST - ONLY THOSE WITH A 1 IN COLUMN L][DO NOT FORCE]
_3 Car 3 [DROPDOWN BOX OF VEHICLES FROM MAKE MODEL LIST - ONLY THOSE WITH A 1 IN COLUMN L][DO NOT FORCE]
_4 Car 4 [DROPDOWN BOX OF VEHICLES FROM MAKE MODEL LIST - ONLY THOSE WITH A 1 IN COLUMN L][DO NOT FORCE]
_5 Car 5 [DROPDOWN BOX OF VEHICLES FROM MAKE MODEL LIST - ONLY THOSE WITH A 1 IN COLUMN L][DO NOT FORCE]

[VEHICLE CAN ONLY BE SELECTED ONCE: _1<>_2<>_3<>_4<>_5]

[IF RESPONDENT SELECTED ONLY "OTHER" - THEN TERM.
IF RESPONDENT SELECTS "OTHER and Vehicle(s) - then determine segment on the highest ranked of the actual vehicle(s). Based on Q329]

[PULL IN VEHICLES FROM Q325]

Q329. Thinking about the cars that you would consider for your next new vehicle (listed below), what is the likelihood that you would consider each?

[10 POINT SCALE WHERE 1="10% or less" 2="20%", 3="30%", 4="40%", 5="50%", 6="60%", 7="70%", 8="80%", 9="90%", 10="100%"]

_1 [INSERT Q325_1]
_2 [INSERT Q325_2]
_3 [INSERT Q325_3]
_4 [INSERT Q325_4]
_5 [INSERT Q325_5]

[DETERMINE WHICH OF _1_5 IS RATED HIGHEST. ASSIGN SEGMENT (QUOTA 2) BASED ON HIGHEST _1_5 USING COLUMN I OF MAKE MODEL LIST. IF TIE, RANDOMLY ASSIGN TO ONE OF THE TIED SEGMENTS.]

[FLAG AS STIMULI 1, 2, or 3 USING COLUMN P OF MAKE MODEL LIST]

IF HIGHEST 1-5 FLAGGED HERE (CAN BE MULTIPLE) <>Q325_1, FLAG AS BAD DATA.

Figure 2-4: Pre-stimuli consideration questions: User is asked to select top 5 cars for next purchase from hundreds of make and model combinations available in his/her country. Next, user is asked to rate these cars on a scale of 1-10. The post-stimuli consideration questions mirror the pre-stimuli consideration questions exactly. The difference in points allocated to the segment appropriate GM/Chevrolet car is the Dependent variable in our study.

For example, if the user's segment corresponds to the Chevrolet Malibu, and the

user did not have the Malibu in their pre-consideration, but rated it 6/10 in their post-consideration, the dependent variable points-change would be $6-0 = 6$.

2.3 Chrome Extension

The purpose of the Chrome extension is to keep track of the user as they progress from the survey to the media site and back to the survey. The extension captures user clicks, keyboard strokes, time spent on various activities, and enforces minimum engagement rules for the user. The engagement rules are another form of ensuring high-fidelity data and have been refined in each administration of the survey.

2.4 Media Site

The media site presents the user their randomly selected sequence of stimuli in succession. Each stimuli is presented in a new tab and the original tab is updated when the extension detects that the user has complied with the minimum engagement rules in the presented page.

2.4.1 TV

The TV stimuli are 90-second clips consisting of 3 parts: 1) 30-seconds of a famous TV show 2) 30-seconds of GM/Chevrolet car ad appropriate for the user's segment 3) 30-seconds of the TV show continued. This mirrors a usual TV ad experience in real life.

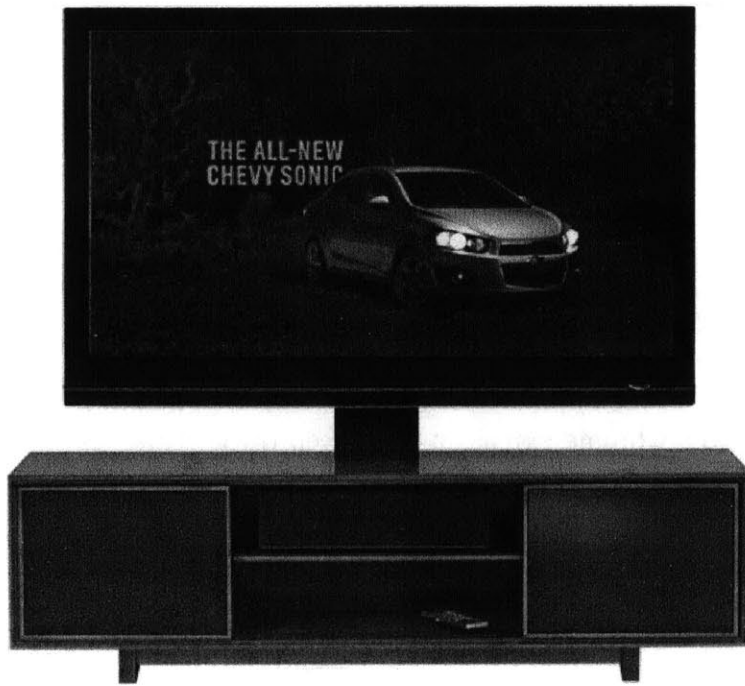


Figure 2-5: TV Stimuli: 30-second ads between 30-second TV clips

2.4.2 Social

The Social cell directs the user to Facebook.com in USA and Netherlands and Weibo.com in China, the most popular social media sites in the respective countries. Both websites feature a newsfeed where users can view images, videos, and updates from their friends and acquaintances. The Chrome extension inserts a segment-appropriate GM/Chevrolet ad at the top of this newsfeed. The ad looks organic in the newsfeed of the website and we measure how much if at all the users engage with the ad. Do they click on the image? Do they "like" or "share" the ad?

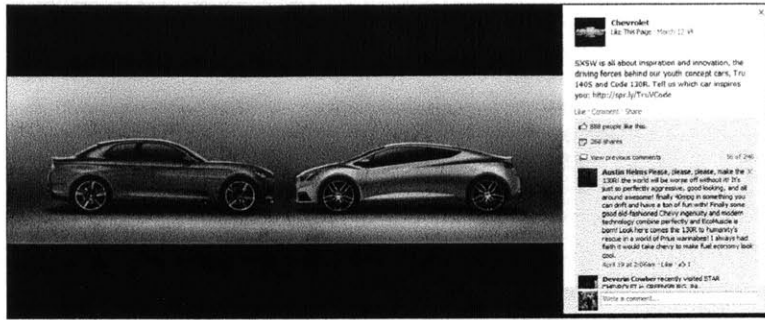


Figure 2-6: Sample Facebook Ad



Figure 2-7: Sample Weibo Ad

2.4.3 Search

The Search cell directs the user to Google.com in USA and Baidu.com in China (Netherlands does not have the Search cell in the study). Segment-appropriate car ads mimicing search engine ads are placed at the top of the search result pages. The extension monitors which part of the ad, if any, the user clicks, and how many GM/Chevrolet related pages the user views originating from the search results page.

<p>迈锐宝 1.6T 20.99 万上市 享2万起钜惠! Malibu.chevrolet.com.cn</p> <p>迈锐宝官网报名试驾,抢先感受迈锐宝 1.6T 20.99 万,火热开售2万起钜惠!</p> <p>试驾体验 价格配置 车型介绍 查询经销商</p>	<p>推广链接</p>
<p>科鲁兹引爆改装风潮,申请试驾获取三重潮礼! Cruze.chevrolet.com.cn/2012</p> <p>科鲁兹预约试驾即可获享试驾潮礼,活动期间购科鲁兹更有超值礼品赠送!</p> <p>试驾体验 价格配置 车型介绍 查询经销商</p>	<p>推广链接</p>
<p>雪佛兰新一代 爱唯欧蓄势待发! Aveo.chevrolet.com.cn</p> <p>新生代越级性能小车 爱唯欧率性登场!</p> <p>试驾体验 价格配置 车型介绍 查询经销商</p>	<p>推广链接</p>

Figure 2-8: Baidu.com ads for Chevrolet Malibu, Cruze, and Aveo

Chevrolet Cruze Eco Site – Fun & Est 42 MPG Hwy.
www.chevrolet.com/Cruze

Current Offers	Locate a Vehicle
Locate a Dealer	Chevy Superbowl Commercials

Figure 2-9: Sample Google Ad

2.4.4 Control

The control stimulus is an article about aluminium production. An excerpt is provided below.

雪佛兰带给您的



铝在运输

大会背景

交通运输行业是我国铝消费的第二大行业。随着该行业逐步进入高速发展阶段，用铝量也开始显著提高。2010年，我国交通运输领域铝需求量合计348万吨，占中国总体铝消费量17%-18%。“十二五”期间，我国交通运输业铝消费前景将更加值得期待！

陆地交通

“十一五”期间，国内汽车制造业铝消费年复合增长率20.8%。预计，2011-2015年中国交通运输领域对铝合金属材料的需求年复合增长率为10%。其中汽车的铝消费量占比最大。在汽车轻量化的大趋势之下，铝合金型材、板带、铸件、锻件在车辆各个部件上的应用是目前主要的

Figure 2-10: Sample Control Article

2.4.5 Engagement Enforcement Rules

The engagement rules ensure that all users have a minimum depth of interaction with each of the stimuli. Some engagement rules are time-related (minimum number of seconds spent on the page), some are event-related (minimum number of clicks), and some are a combination of the two. The engagement rules have been continuously honed with each administration of the survey in the different countries, based on the data from them. Relevant enforcement code can be found in the appendix.

	USA	China	Netherlands
Control	10 seconds	10 seconds	10 seconds
TV	10 & 50 seconds	75 seconds	75 seconds
Social	10 & 50 seconds	3 clicks after login	60 seconds + 1 click
Search	10 & 50 seconds	3 clicks anywhere	n/a
Banners	10 & 50seconds	n/a	n/a

Table 2.1: Stimuli Enforcement Rules Per Country. In USA, a 2-tiered approach was used, where users who spent <10 seconds would be forced to remain on the site. Those who spent 10-50 seconds would be encouraged, but not forced to remain on the website.

2.5 Database

The database is relational MySQL database with 8 tables connected through the unique userID assigned to each participant at the beginning of the study. These 8 tables together capture all data that the extension collects.

2.5.1 Errors table

This table records any errors that the user experienced. For example if a userID with status "Completed" hits the servers, an "old userID" error would be raised and a double-take would be prevented.

2.5.2 Stimuli table

This table records the stimuli presented to the users with the unique stimuli IDs.

2.5.3 Users table

This table records the general user information, the first and last times the user accesses the website, and the userID status.

2.5.4 User Stimuli Actions Table

This table records the user event actions such as clicking.

2.5.5 User Stimuli Browsing History Table

This table is particularly useful for Search stimuli data and records the browsing history of the participants.

2.5.6 User Stimuli Enforcement Table

This table records every time a user was prevented from progressing to the next stimuli because they didn't meet the minimum engagement rules of the current stimuli. For example, if a user tried to close a control article immediately after opening it, the media site would instruct the user to spend more time on the stimulus and record an enforcement entry in this table.

2.5.7 User Stimuli Order Table

If a user is assigned a combination of stimuli, the order is randomized to prevent systemic bias. This table records the order in which the users viewed the stimuli.

2.6 Adapting the existing USA study to China and Netherlands

Several issues need to be addressed when expanding this study to other countries.

- Finding equivalent websites: The #1 social media site and search engine vary depending on country. While Netherlands is consistent with the US in Facebook, we had to customize our code for Baidu and Sina Weibo in China.
- Translation consistency: To keep the survey meaning exactly the same, we went through the process of independently translating to local language and then back to English. We checked for consistent meaning and
- User behavior monitoring: Since market study participants get paid for completed studies, the local marketing research company's incentive is to have their users complete as many studies as possible. Occasionally this led to odd behavior. For example, tens of users in close succession of each other answered every question exactly the same. In another case, the Chevrolet brand consideration was unnaturally high, because the brand name was leaked. Daily user monitoring is important to quickly identify and correct aberrant behavior.
- Soft launch: At the very beginning of the study, it is important to open the survey to only a few hundred participants and observe each closely. This way, all aspects of the study are seen and tested by fresh eyes and any remaining systemic problems (such as unclear download instructions) can be eliminated.
- Suspending study for unexpected situations: The main benefit of our extension setup was that users could experience popular websites while we maintained control of the stimuli on the page. This left us vulnerable to site updates and in such cases, it is important to be able to suspend and restart the study quickly. In our case, Facebook performed a mid-study Newsfeed update and changed the color scheme such that our stimuli were unnaturally conspicuous. We suspended the survey, reprogrammed the extension, and restarted, all within a few days.

Similar issues came up for Baidu and Google. A flexible way to shut down and restart the study is essential for large-scale projects.

Chapter 3

Data Analysis

An overview of the data analysis process is provided in this chapter. Relevant code can be found in the appendix.

3.1 Database Cleanup

This marketing study is unusually complex, with an intricate survey logic, Chrome extension download, and redirects to the MIT media server and back to the survey servers. Because we enforced strict study progression rules, the database cleanup included eliminating all users whose status was determined not "Complete" and whose timing data did not make sense in our context. The "Complete"ness of a user was determined daily in collaboration with our local marketing research partners.

If the userID was shown to have completed all survey questions and successfully passed all stimuli on the MIT media server, the user was flagged "Complete".

For timing, we eliminated users where the timing data was not registered properly (timestamps of "00-00-00") or the survey took unusually long (hours, days) to complete.

For the purposes of this analysis, we also eliminated users, who did not interact at all with the social media and search engine ads. In other words, we dropped the low-involvement participants.

3.2 Variable Generation

Our dependent variable was the difference in consideration points allocated to the advertised car. Our independent variable was a binary value for which cell and which combination of cells the user was placed in (and met enforcement and high involvement criteria). Other user attributes such as age, income, education, employment were also included in the regression.

3.3 Regression

We performed linear regressions in Stata for USA, China, and pooled USA & China data.

Chapter 4

Results

The results for regressions by country and country combinations are shown below.

4.1 US Results

The statistically significant regression results from the US dataset are shown below.

	Coefficient	P> t
Age	0.0045	<0.10
Education	-0.0777	<0.01
TV	0.6654	<0.01
Social	0.6596	<0.10
Banner & TV	0.1891	<0.10

Table 4.1: Statistically Significant US Results

The results show that TV and social media had the highest effect on the consideration probability changes, while the coefficients of age and education are small and therefore didn't influence the end result in the same degree.

4.2 China Results

The statistically significant regression results from the China dataset are shown below.

	Coefficient	P> t
TV	0.9783	<0.01
Social	2.0412	<0.05
TV + Social	1.2715	<0.01
Imminence of Purchase	0.2787	<0.05

Table 4.2: Statistically Significant China Results

The results show that TV, social media, and TV+social media had a very high impact on the car consideration probabilities of the consumers. To a lesser degree, the imminence of purchase, measured by reversing the estimated number of months until next car purchase, also had a positive correlation, indicating that car considerations were more reliable in the near future.

4.3 Pooled Results

The statistically significant regression results from the pooled US & China dataset are shown below.

	Coefficient	P> t
TV	0.6671	<0.01
Social	1.2789	<0.01
TV + Search	0.3128	<0.10
Banner + Search	0.3297	<0.10
Banner + Social	0.0687	<0.05
Banner + TV	0.0316	<0.05
Banner + Social + Search	2.5556	<0.10
Banner + TV + Search	2.6807	<0.05
Age	0.0042	<0.10
Education	-0.0478	<0.10

Table 4.3: Statistically Significant Pooled Us & China Results

The results show that tertiary stimuli combinations that include banners are most effective in influencing car consideration probabilities of consumers. TV and Social also remain consistently highly effective. Age and education, while significant, influence consideration probabilities very little. TV+Search and Banner+Search have the next most significant effects on the results.

Chapter 5

Next Steps

Several possibilities could be pursued with the data collected in this study. I will highlight some of them below.

5.1 Analyze NL Data

As of this writing, the marketing study is being replicated in the Netherlands. Regression analysis of that data and pooled results from US, China, and Netherlands, will elucidate what marketing strategies are most effective for a global audience.

5.2 Clustering Studies

In the survey, we asked users standardized marketing personality and trust trait questions. It would be interesting to cluster the users based on their answers to the 32 parameters recorded in this area and observe whether the marketing strategies vary significantly between clusters. Do people who have a more social personality, for example, rely heavier on social media for marketing?

5.3 More Countries, More Websites

Finally, the study could also benefit from being replicated further, particularly in South America, Russia / Balkans, and Africa; regions which show significant culture differences between the presently studied regions.

Chapter 6

Conclusion

In this thesis, I have shown how a complex marketing study measuring car consideration probabilities based on stimuli exposed was adapted for replication in two different countries. My analysis showed that TV and social media was consistently significant marketing influence in very diverse cultures. Pooling of the results showed that while single stimuli were still effective, particular combinations of stimuli involving search engines, banners, and TV, had the potential to influence car considerations far beyond any single stimulus.

In addition to much specific domain knowledge, including Javascript, Stata, and SAS, I have gained a new appreciation for the complexities of multi-year multi-national research projects. I take away writing good documentation, maintainable and decoupled code, and frequent meetings to establish common ground as essential elements of successful long-term projects.

Appendix A

Chrome Extension Code

Sample extension code for Baidu, the main search engine of China. The code shows click captures and stimuli presentation. All other stimuli mirror this code for their specific webpages.

```
//-----Record the search query-----  
  
var searchForm = $('form[name="f"]');  
var searchBox = $("#kw");  
searchForm.submit(function(event) {  
    processSearch(event);  
});  
  
//ensures that if the user submits the query by pressing enter in the  
//text box, our listener is still called  
searchBox.keyup(function(event) {  
    if (event.keyCode == 13) {  
        event.preventDefault();  
        searchForm.submit();  
    }  
}
```

```

});

function processSearch(event) {
    var query = searchBox.val();
    // console.log(query);
    // console.log(unescape(encodeURIComponent(query)));
    chrome.extension.sendRequest({type: "writeSearch", stimID: "1", ta:
}

//-----Create stimuli based on segment-----

//Default values
var seg = -1;
var adMainRowTitle = "";
var adMainRowLink = "";
var adLinkName = "";
var adSecondRowText = "";
var adThirdRowLinks = "";

//Record any clicks made for enforcement
$(document).mousedown(function(event) {chrome.extension.sendRequest({type:

//Get segment from extension and use to set values
chrome.extension.sendRequest({type: "getUserSegment"},
    function(response){
        seg = response.segment;
        //seg = 1;
        if (seg == 3) {
            adMainRowTitle = "&#36808;&#38160;&#23453; 1.6T 20
            adMainRowLink = 'http://malibu.chevrolet.com.cn/?u

```



```

        adLinkName = "Malibu.chevrolet.com.cn";
        adSecondRowText = "迈锐宝官";
        adThirdRowLinks = '<span class="ec_xj_icon"></span>';
        clicktext="test_drive" href="http://www.chevrolet.com.cn/brandsite/try/1601?utm_source=Baidu&utm_medium=SEM" style="display:inline-block; vertical-align:middle;">
        href="http://malibu.chevrolet.com.cn/feature.html" style="display:inline-block; vertical-align:middle;">
        href="http://www.chevrolet.com.cn/brandsite/try_speci/1601?utm_source=Baidu&utm_medium=SEM" style="display:inline-block; vertical-align:middle;">
    }
    else if (seg == 2) {
        adMainRowTitle = "科鲁兹引";
        adMainRowLink = 'http://cruze.chevrolet.com.cn/2012/';
        adLinkName = "Cruze.chevrolet.com.cn/2012";
        adSecondRowText = '&#31185;&#40065;&#20857;&#39044';
        adThirdRowLinks = '<span class="ec_xj_icon"></span>';
        href="http://www.chevrolet.com.cn/brandsite/try/1601?utm_source=Baidu&utm_medium=SEM" style="display:inline-block; vertical-align:middle;">
        href="http://www.chevrolet.com.cn/models_cruze_features.htm" style="display:inline-block; vertical-align:middle;">
        href="http://www.chevrolet.com.cn/brandsite/try_speci/1601?utm_source=Baidu&utm_medium=SEM" style="display:inline-block; vertical-align:middle;">
    }
    else if (seg == 1) {
        adMainRowTitle = "雪佛兰新";
        adMainRowLink = "http://aveo.chevrolet.com.cn/#/home";
        adLinkName = "Aveo.chevrolet.com.cn";
        adSecondRowText = "新生代越";
        adThirdRowLinks = '<span class="ec_xj_icon"></span>';
        href="http://www.chevrolet.com.cn/brandsite/try/1601?utm_source=Baidu&utm_medium=SEM" style="display:inline-block; vertical-align:middle;">
        href="http://aveo.chevrolet.com.cn/models_aveo_HB.html" style="display:inline-block; vertical-align:middle;">
        href="http://www.chevrolet.com.cn/brandsite/try_speci/1601?utm_source=Baidu&utm_medium=SEM" style="display:inline-block; vertical-align:middle;">
    }
    //Create ad with values
    var newAd = "";
    newAd = newAd.concat('<table id="4001" width="635" cellspacing="0"

```

```

newAd = newAd.concat(adMainRowLink);
newAd = newAd.concat(' " id="aw0"><font clicktext="title_link" size:
newAd = newAd.concat(adMainRowTitle);
newAd = newAd.concat('</font><font clicktext="model_link" size="-1
newAd = newAd.concat(adLinkName);
newAd = newAd.concat(' </font></a></td><td width="10%" align="right
newAd = newAd.concat(adSecondRowText);
newAd = newAd.concat('</font></a></td></tr><tr><td colspan="2">');
newAd = newAd.concat(adThirdRowLinks);
newAd = newAd.concat('</td></tr></tbody></table >');

//-----Insert stimuli and add click listener-----
var container = $("#container");
var topTextAd = container.find("#4001"); //Top text ad always has id 4001
var firstResultsTable = container.find("#content_left").find("table").filter

if (topTextAd.length == 0) { //No text ads occur naturally for this query,
//so insert stimuli
    newAd = newAd.concat("<br>");
    var newNode = $(newAd);
    newNode.mousedown(function(event) {chrome.extension.sendRequest({type:
//
    newNode.mousedown(function(event) {console.log(event.target.getAttribute
    newNode.insertBefore(firstResultsTable);
}
else { //Change top text ad to our stimuli
    topTextAd.html(newAd);
    newNode.mousedown(function(event) {chrome.extension.sendRequest({type:
}
});

```

Appendix B

Stata Code

```
*****:
*
*                               PMM China
*   May 23, 2014 - Integrated across all 3 countries.
*   Do not change as all 3 scripts have common pieces of code
*
*   Notes:
*   - length trimmed in 10% at the top. The +_2sd makes no sense in this d
*     Trimming is defensible as long as explicitly reported and data made
*   - involvement in terms of clicks on search and social
*
*****:

clear

cd "/Users/yasho/Dropbox/PMMA-team/Data/Archive/China"

use "gongos_china_merge.dta"
quietly destring, replace
```

```

*****:
*          DATA QUALITY – CONTROL OF COMPLETES AND INVOLVEMENT
*****:
keep if status==5 /* Completes */

* drop low-involvement search
drop if ( (cell==5|cell==6|cell==7|cell==8) & chevy_viewed== 0
)

* drop low-involvement social
drop if ( (cell==3|cell==4|cell==7|cell==8) & !( brand_click==1
| image_click==1 | video_click==1 | like==1 | forward==1 | favorite==1 | cc

*****:
*          DATA QUALITY – TIME CONTROL
*****:

* Drop cases that answered for more than one hour
display real(substr("1:56:00", -7,1))
display real(substr("21:56:00", -8,2))
display real(substr("311:56:00", -9,3))

gen hour_has_three_digits = substr(length, -9,1)
gen hour_has_two_digits   = substr(length, -8,1)
gen hour_has_one_digit    = substr(length, -7,1)

gen hour_digits = -99
replace hour_digits = 3 if (!(hour_has_three_digits == "") & !(hour_has_two
& !(hour_has_one_digit=="") )

```

```

replace hour_digits = 2 if ((hour_has_three_digits == "") & !(hour_has_two_
& !(hour_has_one_digit==""))
replace hour_digits = 1 if ((hour_has_three_digits == "") & (hour_has_two_
& !(hour_has_one_digit=="") )
replace hour_digits = 0 if ((hour_has_three_digits == "") & (hour_has_two_
& (hour_has_one_digit=="") )

```

```
gen hours = 0
```

```
gen minutes = 0
```

```
gen seconds = 0
```

```
quietly replace hours = real(substr(length, -7,1)) if (hour_digits ==1)
```

```
quietly replace hours = real(substr(length, -8,2)) if (hour_digits ==2)
```

```
quietly replace hours = real(substr(length, -9,3)) if (hour_digits ==3)
```

```
quietly replace minutes = real(substr(length, -5,2))
```

```
quietly replace seconds = real(substr(length, -2,2))
```

```
* why this works:
```

```
display real(substr("1:56:00", -5,2))
```

```
display real(substr("21:56:00", -5,2))
```

```
display real(substr("311:56:10", -2,2))
```

```
quietly gen tot_time_secs = hours * 3600 + minutes*60+seconds
```

```
quietly egen sd_tot_time_secs = sd(tot_time_secs)
```

```
* trim i.e., remove top 10%
```

```
*hist tot_time_secs
```

```
_pctile tot_time_secs, nq(100)
```

```
drop if tot_time_secs>r(r90) /* top 10 percent */
```

```
*hist tot_time_secs
```

```

/*****
*
*
*****

```

CODEBOOK

Segment 1 received Aveo stimuli for TV and BA (Baidu), and Chevy stimuli for
Segment 2 received Cruze stimuli for TV and BA (Baidu), and Chevy stimuli for
Segment 3 received Malibu stimuli for TV and BA (Baidu), and Chevy stimuli for

Codes: Aveo=211, Cruze=212, Malibu=214, Chevy=208–214

Model_Consider_Bin = Whether the model is included in consideration
Model_Consider_Prob = Likelihood of model consideration (1(=10%) to 10
Model_Purchase = Preference to Purchase considered model (1–10)

Chevy_Consider_Bin = Whether one of Chevy models is included in consideration
Chevy_Consider_Prob_Total = Sum of consideration likelihoods for all considered models
Chevy_Purchase = Sum of Preferences to Purchase for all considered models

Chevy_Familiarity = How familiar are you with each of the following brands
(Chevy is one of ten brands (#2), 1–7 scale)

Chevy_Consider_Prob_Only = Thinking about your next new vehicle, what is the probability
*/

```

/*****
*
*
*****

```

Initialize Variables

* Initialize treatments

gen TV = 0

gen Social = 0

```

gen Search = 0
gen Banner = 0
gen Twitter = 0

* initialize 2-way interactions
gen WeeklyUsage_TV = 0
gen WeeklyUsage_Social = 0
gen WeeklyUsage_Search = 0
gen TVSocial = 0
gen TVSearch = 0
gen SocialSearch = 0
gen BannerSearch = 0
gen BannerSocial = 0
gen BannerTV = 0
gen Interact_TV_Imminence_Buy = 0
gen Interact_Social_Imminence_Buy = 0
gen Interact_Search_Imminence_Buy = 0
gen Interact_Banner_Imminence_Buy = 0

* initialize 3,4-way interactions
gen TVSocialSearch = 0
gen SocialBannerSearch = 0
gen BannerTVSearch = 0
gen BannerTVSocial = 0
gen BannerSocialTVSearch = 0

* initialize controls ,covariates
gen Distance_to_Purchase = 0
gen Imminence_of_Purchase = 0
gen Clicks_Social = 0

```

```

gen Two_or_More_Treats          = 0
gen Lift_PL                     = 0
gen Lift_CSP                    = 0
gen Lift_Consider_Prob         = 0
gen Lift_Consider_Bin          = 0
gen Age                         = 0
gen Gender                      = 0
gen Education                   = 0
gen Employed                    = 0
gen Income                      = 0

* initialize DV
gen lift_consider_prob_car_model = 0
gen pre_consider_prob_car_model  = 0
gen post_consider_prob_car_model = 0

* CN-specific initializations
gen next_buy                    = 0
gen pre_model_consider_bin      = 0
gen pre_model_purchase          = 0
gen post_model_consider_bin     = 0
gen post_model_purchase         = 0
gen lift_model_consider_bin     = 0
gen lift_model_purchase         = 0
gen pre_chevy_consider_bin      = 0
gen pre_chevy_consider_prob_total = 0
gen pre_chevy_purchase          = 0
gen post_chevy_consider_bin     = 0
gen post_chevy_consider_prob_total = 0
gen post_chevy_purchase         = 0

```



```

gen lift_chevy_consider_bin          = 0
gen lift_chevy_consider_prob_total  = 0
gen lift_chevy_purchase              = 0
gen pre_chevy_familiarity           = 0
gen pre_chevy_consider_prob_only    = 0
gen post_chevy_familiarity          = 0
gen post_chevy_consider_prob_only   = 0
gen lift_chevy_familiarity          = 0
gen lift_chevy_consider_prob_only   = 0

```

```

/*****

```

```

*                               Code IVs, Interactions and Covariates

```

```

*****

```

```

quietly replace TV                = 1 if (cell == 2 | cell == 4 | cell == 6)
quietly replace Social            = 1 if (cell == 3 | cell == 4 | cell == 7)
quietly replace Search            = 1 if (cell == 5 | cell == 6 | cell == 7)

```

```

quietly replace TVSocial          = TV * Social
quietly replace TVSearch          = TV * Search
quietly replace SocialSearch      = Social * Search
quietly replace TVSocialSearch    = TV * Social * Search

```

```

gen Fixed_effect_CN = 1
gen Fixed_effect_NL = 0
gen Fixed_effect_US = 0

```

```

gen Clicks_social = 0
gen id = "CN_"+userid

```

```

quietly replace Age = q105
quietly replace Gender = q110
quietly replace Education = q820
quietly replace Employed = 1 if (q835 == 1 | q835 == 2)
quietly replace Income = q840
quietly replace Income = . if Income == 12 /* acknowledge 12 is the

quietly replace WeeklyUsage_TV = q315_4
quietly replace WeeklyUsage_Social = q135_1
quietly replace WeeklyUsage_Search = q135_6

quietly replace Two_or_More_Treats = 1 if (cell == 4 | cell == 6 | cell == 7

quietly replace Distance_to_Purchase = q120
quietly replace Imminence_of_Purchase = 1 if (Distance_to_Purchase == 5)
quietly replace Imminence_of_Purchase = 2 if (Distance_to_Purchase == 4)
quietly replace Imminence_of_Purchase = 3 if (Distance_to_Purchase == 3)
quietly replace Imminence_of_Purchase = 4 if (Distance_to_Purchase == 2)
quietly replace Imminence_of_Purchase = 5 if (Distance_to_Purchase == 1)

* Interactions
quietly replace Interact_Social_Imminence_Buy = Social * Imminence_of
quietly replace Interact_Search_Imminence_Buy = Search * Imminence_of
quietly replace Interact_TV_Imminence_Buy = TV * Imminence_of_Pur
quietly replace Interact_Banner_Imminence_Buy = Banner * Imminence_o

```

```

/*****
*
*                               Compute Model-level DV
*****
quietly replace pre_model_consider_bin = 1 if ((segment == 1 & q325_1 == 1) |
quietly replace pre_model_consider_bin = 1 if ((segment == 2 & q325_1 == 1) |
quietly replace pre_model_consider_bin = 1 if ((segment == 3 & q325_1 == 1) |

quietly replace post_model_consider_bin = 1 if ((segment == 1 & q525_1 == 1) |
quietly replace post_model_consider_bin = 1 if ((segment == 2 & q525_1 == 1) |
quietly replace post_model_consider_bin = 1 if ((segment == 3 & q525_1 == 1) |

quietly replace lift_model_consider_bin = post_model_consider_bin - pre_model_consider_bin

quietly replace pre_consider_prob_car_model = q329_1 if (segment == 1 & q325_1 == 1) |
quietly replace pre_consider_prob_car_model = q329_2 if (segment == 1 & q325_1 == 2) |
quietly replace pre_consider_prob_car_model = q329_3 if (segment == 1 & q325_1 == 3) |
quietly replace pre_consider_prob_car_model = q329_4 if (segment == 1 & q325_1 == 4) |
quietly replace pre_consider_prob_car_model = q329_5 if (segment == 1 & q325_1 == 5) |
quietly replace pre_consider_prob_car_model = q329_1 if (segment == 2 & q325_1 == 1) |
quietly replace pre_consider_prob_car_model = q329_2 if (segment == 2 & q325_1 == 2) |
quietly replace pre_consider_prob_car_model = q329_3 if (segment == 2 & q325_1 == 3) |
quietly replace pre_consider_prob_car_model = q329_4 if (segment == 2 & q325_1 == 4) |
quietly replace pre_consider_prob_car_model = q329_5 if (segment == 2 & q325_1 == 5) |
quietly replace pre_consider_prob_car_model = q329_1 if (segment == 3 & q325_1 == 1) |
quietly replace pre_consider_prob_car_model = q329_2 if (segment == 3 & q325_1 == 2) |
quietly replace pre_consider_prob_car_model = q329_3 if (segment == 3 & q325_1 == 3) |
quietly replace pre_consider_prob_car_model = q329_4 if (segment == 3 & q325_1 == 4) |
quietly replace pre_consider_prob_car_model = q329_5 if (segment == 3 & q325_1 == 5) |

quietly replace post_consider_prob_car_model = q529_6 if (segment == 1 & q525_1 == 1) |

```


quietly replace lift_consider_prob_car_model = post_consider_prob_car_model

quietly replace pre_model_purchase = q330_1 if (segment == 1 & q325_1 == :
quietly replace pre_model_purchase = q330_2 if (segment == 1 & q325_2 == :
quietly replace pre_model_purchase = q330_3 if (segment == 1 & q325_3 == :
quietly replace pre_model_purchase = q330_4 if (segment == 1 & q325_4 == :
quietly replace pre_model_purchase = q330_5 if (segment == 1 & q325_5 == :
quietly replace pre_model_purchase = q330_1 if (segment == 2 & q325_1 == :
quietly replace pre_model_purchase = q330_2 if (segment == 2 & q325_2 == :
quietly replace pre_model_purchase = q330_3 if (segment == 2 & q325_3 == :
quietly replace pre_model_purchase = q330_4 if (segment == 2 & q325_4 == :
quietly replace pre_model_purchase = q330_5 if (segment == 2 & q325_5 == :
quietly replace pre_model_purchase = q330_1 if (segment == 3 & q325_1 == :
quietly replace pre_model_purchase = q330_2 if (segment == 3 & q325_2 == :
quietly replace pre_model_purchase = q330_3 if (segment == 3 & q325_3 == :
quietly replace pre_model_purchase = q330_4 if (segment == 3 & q325_4 == :
quietly replace pre_model_purchase = q330_5 if (segment == 3 & q325_5 == :

quietly replace post_model_purchase = q530_6 if (segment == 1 & q525_1 == :
quietly replace post_model_purchase = q530_7 if (segment == 1 & q525_2 == :
quietly replace post_model_purchase = q530_8 if (segment == 1 & q525_3 == :
quietly replace post_model_purchase = q530_9 if (segment == 1 & q525_4 == :
quietly replace post_model_purchase = q530_10 if (segment == 1 & q525_5 == :
quietly replace post_model_purchase = q530_1 if (segment == 1 & q325_1 == :
quietly replace post_model_purchase = q530_2 if (segment == 1 & q325_2 == :
quietly replace post_model_purchase = q530_3 if (segment == 1 & q325_3 == :
quietly replace post_model_purchase = q530_4 if (segment == 1 & q325_4 == :
quietly replace post_model_purchase = q530_5 if (segment == 1 & q325_5 == :
quietly replace post_model_purchase = q530_6 if (segment == 2 & q525_1 == :
quietly replace post_model_purchase = q530_7 if (segment == 2 & q525_2 == :

```

quietly replace post_model_purchase = q530_8 if (segment == 2 & q525_3 ==
quietly replace post_model_purchase = q530_9 if (segment == 2 & q525_4 ==
quietly replace post_model_purchase = q530_10 if (segment == 2 & q525_5 ==
quietly replace post_model_purchase = q530_1 if (segment == 2 & q325_1 ==
quietly replace post_model_purchase = q530_2 if (segment == 2 & q325_2 ==
quietly replace post_model_purchase = q530_3 if (segment == 2 & q325_3 ==
quietly replace post_model_purchase = q530_4 if (segment == 2 & q325_4 ==
quietly replace post_model_purchase = q530_5 if (segment == 2 & q325_5 ==
quietly replace post_model_purchase = q530_6 if (segment == 3 & q525_1 ==
quietly replace post_model_purchase = q530_7 if (segment == 3 & q525_2 ==
quietly replace post_model_purchase = q530_8 if (segment == 3 & q525_3 ==
quietly replace post_model_purchase = q530_9 if (segment == 3 & q525_4 ==
quietly replace post_model_purchase = q530_10 if (segment == 3 & q525_5 ==
quietly replace post_model_purchase = q530_1 if (segment == 3 & q325_1 ==
quietly replace post_model_purchase = q530_2 if (segment == 3 & q325_2 ==
quietly replace post_model_purchase = q530_3 if (segment == 3 & q325_3 ==
quietly replace post_model_purchase = q530_4 if (segment == 3 & q325_4 ==
quietly replace post_model_purchase = q530_5 if (segment == 3 & q325_5 ==

```

```

quietly replace lift_model_purchase = post_model_purchase - pre_model_purc

```

```

/*****:
*      Label Variables - Interface with inference engine which is the same
*****:

```

```

* Main effect

```

```

label variable TV           "    TV"
label variable Social      "    Social"
label variable Search      "    Search"
label variable Banner      "    Banner"

```

* 2-way

label variable	TVSearch	" TV & Search "
label variable	TVSocial	" TV & Social "
label variable	SocialSearch	" Social & Search "
label variable	BannerTV	" Banner & TV "
label variable	BannerSearch	" Banner & Search "
label variable	BannerSocial	" Banner & Social "

* 3-way

label variable	TVSocialSearch	" TV & Social & Search "
label variable	BannerTVSearch	" Banner & Search & TV "
label variable	BannerTVSocial	" Banner & Social & TV "
label variable	SocialBannerSearch	" Banner & Social & Search "

* 4-way

label variable	BannerSocialTVSearch	" Banner & Social & Search & TV "
----------------	----------------------	-----------------------------------

* Usage

label variable	WeeklyUsage_TV	"Weekly Usage Video "
label variable	WeeklyUsage_Social	"Weekly Usage Social "
label variable	WeeklyUsage_Search	"Weekly Usage Search "

* Funnel

label variable	Interact_TV_Imminence_Buy	"Interaction TV and Imminence
label variable	Interact_Search_Imminence_Buy	"Interaction Search and Immin
label variable	Interact_Social_Imminence_Buy	"Interaction Social and Immin
label variable	Interact_Banner_Imminence_Buy	"Interaction Banner and Immin

```

* CN-specific
label variable brand_click
label variable video_click
label variable image_click
label variable like
label variable forward
label variable favorite
label variable comment
label variable search_main_click
label variable search_detail_click
label variable num_pages_viewed
label variable chevy_viewed

```

```

*****:
*           Summaries to inspect for obvious errors
*
*****:

```

```

/*tab segment
tab cell
tab Education
tab Gender
tab Employed
tab Distance_to_Purchase

```

```

table brand_click
table video_click
table image_click
table like

```



```

table forward
table comment
table favorite

tab lift_consider_prob_car_model
tab lift_chevy_consider_bin
tab lift_chevy_consider_prob_total
tab lift_chevy_purchase
tab lift_chevy_familiarity
tab lift_chevy_consider_prob_only*/

*****:
*           Inference Engine – Common code to all 3 countries
*****:

/*
* 1. Baseline – Null Model
regress  post_consider_prob_car_model pre_consider_prob_car_model
Age Gender Education Employed Imminence_of_Purchase, vce(robust)
estimates store Model_1

* 2. Main effects
regress  post_consider_prob_car_model pre_consider_prob_car_model
TV Social Search Banner  Age Gender Education Employed Imminence_of_Purch
estimates store Model_2

*/

* 3. Main effects using Lift as DV

```

```

regress lift_consider_prob_car_model
TV Social Search Banner Age Gender Education Employed Imminence_of_Purch
estimates store Model_3

```

* 4. Main Effects & 2-Way Interactions

```

regress lift_consider_prob_car_model
TV Social Search Banner Age Gender Education Employed Imminence_of_Purch
TVSocial TVSearch SocialSearch BannerSearch BannerSocial BannerTV, vce(rob
estimates store Model_4

```

* 5. Main Effects & 2&3-Way Interactions

```

regress lift_consider_prob_car_model
TV Social Search Banner Age Gender Education Employed Imminence_of_Purch
TVSocial TVSearch SocialSearch BannerSearch BannerSocial BannerTV
SocialBannerSearch BannerTVSearch BannerTVSocial , vce(robust)
estimates store Model_5

```

* 6 Main Effects & 2-Way Interactions & usage

```

regress lift_consider_prob_car_model
TV Social Search Banner Age Gender Education Employed Imminence_of_Purch
TVSocial TVSearch SocialSearch BannerSearch BannerSocial BannerTV
WeeklyUsage_Social WeeklyUsage_TV, vce(robust)
estimates store Model_6

```

* 7 Main Effects & 2&3-Way Interactions & usage

```

regress lift_consider_prob_car_model
TV Social Search Banner Age Gender Education Employed Imminence_of_Purch
TVSocial TVSearch SocialSearch BannerSearch BannerSocial BannerTV
TVSocialSearch SocialBannerSearch BannerTVSearch BannerTVSocial
WeeklyUsage_Social WeeklyUsage_TV, vce(robust)

```

estimates store Model_7

* 8 Main Effects & 2-Way Interactions & usage & Social Funnel Effects

regress lift_consider_prob_car_model

TV Social Search Banner Age Gender Education Employed Imminence_of_Purch

TVSocial TVSearch SocialSearch BannerSearch BannerSocial BannerTV

SocialBannerSearch BannerTVSearch BannerTVSocial WeeklyUsage_Social

WeeklyUsage_TV Interact_Social_Imminence_Buy Interact_Banner_Immir

Two_or_More_Treats, vce(robust)

estimates store Model_8

* 9 Main Effects & 2-Way Interactions & usage & All Funnel Effects

regress lift_consider_prob_car_model

TV Social Search Banner Age Gender Education Employed Imminence_of_Purch

TVSocial TVSearch SocialSearch BannerSearch BannerSocial BannerTV

SocialBannerSearch BannerTVSearch BannerTVSocial WeeklyUsage_Social

WeeklyUsage_TV Interact_Social_Imminence_Buy Interact_Search_Immi

Interact_Banner_Imminence_Buy Interact_TV_Imminence_Buy Two_or_More_Treat

estimates store Model_9

* 10 Main Effects & 2&3-Way Interactions & usage & Social Funnel Effects

regress lift_consider_prob_car_model

TV Social Search Banner Age Gender Education Employed Imminence_of_Purch

TVSocial TVSearch SocialSearch BannerSearch BannerSocial BannerTV

TVSocialSearch SocialBannerSearch BannerTVSearch BannerTVSocial

WeeklyUsage_Social WeeklyUsage_TV Interact_Social_Imminence_Buy

Two_or_More_Treats, vce(robust)

estimates store Model_10

* 11 Main Effects & 2&3-Way Interactions & usage & All Funnel Effects

```

regress lift_consider_prob_car_model
TV Social Search Banner Age Gender Education Employed Imminence_of_Purch
TVSocial TVSearch SocialSearch BannerSearch BannerSocial BannerTV
TVSocialSearch SocialBannerSearch BannerTVSearch BannerTVSocial
WeeklyUsage_Social WeeklyUsage_TV Interact_Social_Imminence_Buy
Interact_Banner_Imminence_Buy Interact_TV_Imminence_Buy Two_or_More_Treat
estimates store Model_11

```

```

*****

```

```

* Storage

```

```

*

```

```

*****

```

```

cd "/Users/yasho/Dropbox/PMMA-team/Data/Archive/China/yasemin/Results"

```

```

esttab Model_3 Model_4 Model_5 Model_6 Model_7 Model_8 Model_9 Model_10
using CN_estimates_May_12_YB.csv, b(4) r2 ar2 pr2 label

```

```

///

```

```

title("China Results - DV at top of each column. 0-1 coding. Interactions")

```

```

///

```

```

star(* 0.10 ** 0.05 *** 0.01) stats(N r2, labels("Observations" "R-Squared"))
mtitles("Consider Post" "Model 1: Null")

```

```

///

```

```

"Consider Post" "Model 2: Main Effects"

```

```

///

```

```

"Consider Lift" "Model 3: Main Effects"

```

```

///

```

```

"Consider Lift" "Model 4: Main Effects & Interactions"

```

```

///

```

```

"Consider Lift" "Model 5: Main Effects & Interactions"

```

```

///

```

```

"Consider Lift                                Model 6: Main Effects & 2
///
"Consider Lift                                Model 7: Main Effects & 2
///
"Consider Lift                                Model 8: Main Effects & 2
///
"Consider Lift                                Model 9: Main Ef
///
"Consider Lift                                Model 10: Model 8
///
"Consider Lift                                Model 11: Model 9 + 3-way
) ///
addnote("Source: gongos_china_merge.csv. Code: CN May 9 2014.do")
compress nolines se(2) wide

/* exports dataset for pooling
keep id lift_consider_prob_car_model post_consider_prob_car_model pre_c
///
TV Social Search Banner
///
TVSocial TVSearch SocialSearch BannerSearch BannerSearch BannerSoci
///
SocialBannerSearch BannerTVSearch BannerTVSocial
///
Interact_Social_Imminence_Buy Interact_Search_Imminence_Buy
Interact_TV_Imminence_Buy ///
Age Gender Education Employed cell Two_or_More_Treats
///

```

```
Imminence_of_Purchase    WeeklyUsage_Social    WeeklyUsage_Video
///  
Fixed_effect_CN    Fixed_effect_NL    Fixed_effect_US  
  
aorder  
*outsheet using "Processed_CN_data_May_7_2014.csv", delimiter(",")  
replace */
```

Bibliography

- [1] Brandon Baker. High fidelity website research - using a browser extension to provide a natural environment'. Master's thesis, MIT, 2013.
- [2] Ryan Ko. Prospective marketing meta-analysis and a novel web-based media-mix modeling experiment'. Master's thesis, MIT, 2012.