Article Title Page

[Article title] Veblen Effect in the U.S. Housing Market: Spatial and Temporal Variation

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Structured Abstract:

The finance literature suggests that the Veblen effect (i.e. luxury consumption behavior) could be translated into consumers' behavior with other goods and assets. This study is the first to examine the role that the Veblen effect plays in housing market dynamics, with a focus on spatial and temporal variation in this role. It uses a unique dataset that matches the consumers' appetite for non-housing luxury goods from Google Insights for Search to the premium that they pay for high-end houses in US Metropolitan Statistical Areas (MSAs) during 2004-2011. The results demonstrate that controlling for other MSA demographic and economic characteristics, the Veblen effect has a significant, positive relationship with a premium paid in the housing market. This suggests that high-end houses may have been purchased for the enjoyment of signaling wealth and status and this housing consumption behavior may have partly driven the large deviation of high-end house prices from the median. Housing consumption tends to be motivated more by the Veblen effect in the areas where people pay a steady, higher premium than in other areas with a more volatile, lower premium. In fact, the higher Veblen effect substantially contributes to maintaining the higher level of the premium in these areas even during the bust period.

Keywords: Veblen effect, housing market, luxury housing, housing premium, price variation

Article Classification: Research paper

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Running Heads: Veblen Effect in the U.S. Housing Market

Introduction

Some consumers are motivated to consume highly conspicuous goods and services in order to flaunt their wealth, thereby achieving greater social status (Veblen 1899). Because of this "Veblen effect," (named after Thorstein Veblen, an economist who focused on conspicuous consumption), wealthy individuals consume luxury goods even at higher prices than their intrinsic values, and luxury brands earn strictly positive profits when a significant Veblen effect is induced in the society (Bagwell and Bernheim 1996, Corneo and Jeanne 1997). If certain types of homes are more visible in terms of size, design, and location, consumers may purchase these homes not only for the pleasure of their intrinsic value (e.g., the pleasure of living in a spacious home with excellent neighborhood amenities), but also for additional enjoyment by signaling their own wealth. Therefore, it is plausible that housing consumption is partly motivated by behaviors characterized by the Veblen effect. Especially given that such consumption behaviors lead the prices of goods to deviate from their fundamental values (Bagwell and Bernheim 1996), the Veblen effect may be associated with housing price dynamics and housing bubble (Stiglitz 1990, Case and Shiller 2004).

This study is the first to investigate the potential role of the Veblen effect to housing market dynamics. Specifically, we examine the relationship between consumers' appetite for non-housing luxury goods such as fashion, watches, and cars and the premium that they pay for high-end houses in US Metropolitan Statistical Areas (MSAs) during the time period of 2004-2011. We expect a positive relationship between them since housing consumption motivated by the Veblen effect should induce greater deviations from fundamental house prices. Then, we explore the temporal variation in the relationship between the Veblen effect and housing premium. By doing so, we are able to report the extent to which housing consumption driven by the Veblen effect has contributed to the recent housing bubble and bust in the US. Finally, we examine how spatial variation in housing market dynamics is influenced by spatial variation in the translation of the Veblen effect into the premium for high-end homes. We are able to identify whether housing consumption is motivated more by the Veblen effect in the areas where people are willing to pay higher premium or experience higher price volatility.

We propose a novel and direct measure of consumers' appetite for conspicuous luxury goods such as fashion, watches, and cars, utilizing unique data available through Google Insights for Search. As a measure of possible manifestation of the Veblen effect in the housing market, we use information from Dataquick on median home prices at the ZIP-code level and calculate price deviations of high-end houses (i.e. highest decile) from the median price at the MSA level. To account for other MSA characteristics that could influence housing market dynamics, we include several controls such as median household income, the degree of racial segregation, and unemployment rates. Finally, we use the panel regressions with random effects to further address the concern of unobserved heterogeneity between MSAs.

The results demonstrate that even after controlling for demographic and economic conditions, the Veblen effect, which measures consumers' desire for non-housing luxury goods, has a significant, positive association with a premium paid in the housing markets. This suggests that high-end houses located in conspicuous and high-status neighborhoods may have been purchased for the enjoyment of signaling wealth and status rather than for the intrinsic values of these houses. Hence, this housing consumption behavior could partly drive the large deviation of high-end house prices from the median house price, and in turn, potentially lead to pricing bubbles. Also evident is that the Veblen effect plays a more significant role to an increase in house prices in the MSAs with a steady, higher housing premium during the boom period. In these MSAs, the Veblen effect stays at the high level even during the bust period, contributing to maintaining the higher level of the housing premium.

Background and Theory

Past research on the Veblen effect has primarily focused on the consumption of non-housing luxury goods. The finance literature suggests that luxury consumption behavior could be translated into consumers' behavior with other goods and assets. There is also evidence that the Veblen effect varies over time and across geographic areas. Much less well-known is if and how the Veblen effect influences housing consumption. Several recent studies suggest that housing consumption is partly motivated by behaviors that could be characterized by the Veblen effect. This study advances the previous research by using the direct measures of the Veblen effect. Since we use the nation-wide panel sample of MSAs, we are also able to examine spatial and temporal variation in the role of Veblen effect in housing market dynamics.

The Role of Veblen Effect in Consumer Behavior

Most empirical studies of the Veblen effect have focused on the consumption of non-housing luxury goods. Chao and Schor (1998) found evidence of consumption motivated to achieve higher status in the case of woman's cosmetic products. They also found a low price/quality correlation with the visible status cosmetic products, consistent with the theoretical prediction of Veblen effects. More recently, Shukla (2008), focusing on middle-aged consumers of the ages between 40-60, found evidence of conspicuous automobile consumption motivated mostly to signal symbols of prestige and success and enhanced self-image among others. Anecdotal

evidence also suggests the existence of the Veblen effect with consumer behaviors associated with luxury brands. For example, the French fashion brand Chanel has raised the prices of its popular handbag lines by 20 to 30 percent per year for the last several years in most countries, yet consumers buy its products under any circumstances (The Chosunilbo, 20 January, 2012). In the same newspaper article, a fashion industry insider said, "customers spend recklessly due to their label addiction".

The finance literature suggests that the Veblen effect may also affect consumers' behavior with goods/assets other than luxury goods. Ait-Sahalia, Parker, and Yogo (2004) and Hiraki, Ito, Spieth, and Takezawa (2009) show that the risk aversion implied by luxury consumption rather than by basic consumption is more consistent with the observed equity premium, suggesting a possible link between stock investors' behavior and the Veblen effect evident with luxury consumption.[1] Furthermore, Mandel (2009) argued that the determinants of an artwork's value are distinct from equities and other investments, because owning art, especially a masterpiece, is considered to be luxury consumption as well as an investment, with which owners signal their wealth. The author then found that, once the luxury consumption nature of art is accounted for in a consumption-based pricing model, the very low observed returns on art investments are justified.

Spatial and Temporal Variation in Veblen Effect across MSAs

Some studies suggest the importance of the spatial and temporal variation of Veblen effect. Veblen (1899) suggested that the degree of the Veblen effect should differ across different areas, arguing that consumption behaviors that signal wealth are more evident in communities where human contact for the consumer is wider and the mobility of the population is greater. Furthermore, Ferreira and Gyourko (2011) suggest that the start of the housing boom during the period between 1993 and 2009 was not a single national event; rather, the housing boom started at different times at different degrees across 94 MSAs. Thus, the examination of the potential role of the Veblen effect and its spatial and temporal variation will provide important insights into the reasons behind different housing cycles of boom and bust across different housing markets in the U.S.

The Role of Veblen Effect in Housing Consumption

Much less well-known is how the Veblen effect can influence housing consumption behaviors. Existing evidence is mixed and fragmentary. Using the data on 80,000 property transactions for six MSAs in Ohio for the year 2000, Leguizamon (2010) found that individuals prefer to have a house larger than their nearest neighbor and live in a district with a smaller difference between their own house size and that of the largest houses in the district. Zahirovic-Herbert and Chatterjee (2011) provided empirical support that real property buyers, especially wealthier buyers, pay price premiums for conspicuous property names such as those containing the phrase "country club." Both Leguizamon (2010) and Zahirovic-Herbert and Chatterjee (2011) suggest the possible Veblen effect on housing prices. While using the similar framework to Leguizamon (2010), however, Turnbull, Dombrow, and Sirmans (2006) found no evidence of the Veblen effect. They rely on the data of 2,111 property transactions in East Baton Rouge Parish, Louisiana, during the period of January 1992 through September 1997.

Other Potential Reasons to Pay Higher Premium for Housing in Certain MSAs

In addition to the desire to purchase luxury homes that is closely associated with Veblen effect, households residing in certain MSAs may pay a higher premium for housing than those residing in other MSAs. First, higher variation in demographics across neighborhoods within the MSA could lead households who are sensitive to the attributes of surrounding neighbors to pay higher premium. As Cutler et al. (1999) demonstrate, white households residing in more segregated MSAs tend to pay higher premium for equivalent housing than blacks to collectively exclude blacks from their neighborhoods. Research on white flight suggests that white households may wish to avoid predominantly black neighborhoods by paying a higher premium for housing (Crowder 2000). On the other hand, if neighborhoods within the MSA are relatively homogenous in terms of racial composition, households may be indifferent to the choice of neighborhoods. We use the dissimilarity index from Census to control for the level of demographic homogeneity in the MSAs.

Second, some MSAs are more heterogeneous with respect to neighborhood quality than others. For instance, certain neighborhoods within the MSA feature significantly higher or lower level of amenities than others, in terms of education, higher social capital, or physical amenities such as beach and parks. If this is the case, households may wish to move in to or avoid these neighborhoods, and in turn, realize this wish by paying higher premium for housing units. Hedonic research (Grieson and White 1989; Lynch and Rasmussen 2001) has verified the capitalization of neighborhood quality into house prices. In our research, therefore, we will try to use the degree of variation (standard deviation, skewness, and range) in median house prices across ZIP codes within the given MSA as a proxy for cross-neighborhood variation in neighborhood quality for the MSA in the later version of the analysis.

Finally, households residing in different MSAs may have different abilities to pay higher premium during the boom period as well as to avoid the default risk from higher cost housing during the bust period. These abilities would be associated with the strength of MSA's economy as well as income and wealth distribution in the MSA. We are able to account for this by controlling for median household income as well as unemployment rate of MSAs. Another mechanism through which these abilities could be influenced is mortgage market circumstances in different MSAs such as the share of subprime loans. We will try to account for this in the later version of the analysis.

Data and Methodology

We utilized a unique dataset available through Google Insights for Search to extract consumers' appetite for luxury goods as a measure of their desire to signal their wealth (the Veblen effect). Google search is considered a good representative of Internet search behavior among the general population. In particular, Google accounted for 65.3% of all search queries performed in the

[1] These studies effectively showed that the inclusion of luxury consumption in the consumption CAPM framework largely solves the equity premium puzzle, which states that the risk of the stock market as measured by its co-movement with aggregate consumption is insufficient to justify the extent to which its average return exceeds the return on short-term government debt.

U.S. during the month of September 2011.[2] More importantly, Internet search is a revealed attention measure, thus it can be a direct measure of a variety of economic activities in real time. Google's tool, Google Insights for Search, contains the Search Volume Index (SVI) of search keywords. Weekly SVI for a search keyword is the number of searches for that keyword, relative to the total number of searches done on Google over time. Data since the year 2004 is available for all countries by country, by state, and by MSA. The information quality of the SVI data as a direct measure of consumers' interest/attention was recently validated by Da, Engelberg, and Gao (2011). The authors used the Google's SVI as a direct measure of investors' attention. Utilizing the SVI for stock ticker symbols, they showed that SVI captures the attention of investors (especially of retail investors) in a timely fashion and that an increase in SVI predicts higher stock prices over the next two weeks and an eventual price reversal within the year. They also find the significant relationship between SVI and the large first-day return of IPO stocks.

We propose a novel measure of consumers' appetite for luxury goods by calculating the proportion of SVI for luxury brand names to SVI for the name of a product. For example, we collected the SVI for "car" (*product SVI*) and SVIs for luxury car brands such as "BMW," "Mercedes," "Jaguar," and "Porsche" (*brand SVI*). We calculated the proportion of the aggregated brand SVI to the product SVI. Through this process, we measure consumers' appetite specifically for goods that are significantly conspicuous, controlling for their general appetite for a product, and use it as a proxy for the Veblen effect. Since the nature of consumers' appetite for luxury goods may differ depending on types of luxury products, other than luxury automobiles, we applied the same method to product categories of "Fashion and Leather", "Watches and Jewelry", and "Cosmetics and Perfume", with SVIs for respective luxury brands that offer these products. Appendices A explains a detailed description of category selection and luxury brand selection process and shows the list of luxury brand key words for four product categories (Table A). The SVI data is available from 2004 on a weekly basis at the MSA level (185 MSAs), and we converted weekly data to annual data.

To match these data with the potential Veblen effect in the housing market, we obtained information from Dataquick on the median home price in every ZIP code annually from 2004 to 2011.[3] With this information, we calculated the decile distribution and the median of these median home prices for each MSA in each year. Then we calculated the difference between the highest decile and the median, which indicates the premium people in each MSA pay for the high-end homes, potentially motivated by the Veblen effect.

The dependent variable is the price deviation of high-end houses from the median price in each MSA. This is a measure of possible manifestation of the Veblen effect in the housing market. To test whether this possible manifestation of the Veblen effect in the housing market is actually driven by this effect, our main independent variable is the ratio of brand SVI to product SVI, as explained earlier. We used a series of ratios based on four different product types. To account for other possible factors that can also influence variation in the price deviations, we included control variables: population, median age, median household size, and proportion of houses build after 2000 as fundamental demographics controls; the dissimilarity indices (Black-White and Asian-White) to control potential effects of segregation/integration on the house price premium; and median household income, proportion of rental units with contract rent above $1,500, and unemployment rate to control for wealth and economy differences across MSAs. Most demographic data are from American Community Survey (ACS) and the data on dissimilarity indices are from the U.S. Census Bureau. Table 1 summarizes these variables used for regression analyses.

We limited our sample to MSAs that are covered by Google Insights for Search and have more than ten observations in Dataquick in each of all years between 2004 and 2011. The final sample consists of 101 MSAs for 8 years from 2004 to 2011 (11 MSAs from Northeast region, 24 MSAs from Midwest region, 37 MSAs from South region, and 29 MSAs from West region). We first utilized a random effects panel regression[4] to examine if and to what extent consumption of high-end homes is motivated by the Veblen effect in general.

Our study period allows us to examine the possible housing Veblen effect both in boom period and bust period. To define the boom period and the bust period, we followed the method used by Sinai (2012). Briefly, we obtained the Federal Housing Finance Agency (FHFA)'s quarterly house price index from data on repeat sales of homes (i.e. constant quality house price index) for MSAs. After annualizing the data by averaging the index over the four quarters in a calendar year, we converted the price indexes from nominal to real terms by deflating using the CPI (all urban consumers). For each MSA, we identified peak by finding all the local maxima, years where the real house price is above those of adjacent years from 2004 to 2011. Then, we chose the local maximum with the highest real house price. In addition, to examine the spatial variation of the Veblen effect, we divide 101 MSAs into top 30%, middle 40%, and bottom 30% groups based on the price deviation of high-end houses from the median price (premium) averaged over the study period. Thus, we ran regressions for the full sample and for sub premium groups both before and after the peak years.

Results

Descriptive Statistics

Figure 1 compares housing markets and the Veblen effect in Seattle and New York Metropolitan Statistical Areas (MSAs). This comparison is interesting because two MSAs have relatively strong and tight housing markets and income level is very similar.[5] Figure 1 suggests that while the level of median house prices is similar in two MSAs, people tend to pay a lot higher premium for homes in the highest decile in New York (average $444,955) than in Seattle (average $332,433). It also shows that the Veblen effect, calculated by the search volume of luxury brands relative to the search volume of the product, is significantly higher across all

[2] Source: http://technolog.msnbc.msn.com/_news/2011/10/12/8289269-google-holds-steady-with-65-percent-of-us-search-queries

[3] The data is collected in every March for this time period.

[4] Breusch-Pagan LM test suggested that a random effects panel regression is more appropriate than a pooled regression. For the choice between a random effects panel regression and a fixed effects panel regression, we followed model selection guidance provided by Clark and Linzer (2012) that considers the number of units and the number of observations per unit as well as the hausman test.

[5] Of course, they have a difference in other demographic characteristics. Later for our formal statistical analyses, we will control for these characteristics.

industries in New York than Seattle, possibly suggesting the potential role of the Veblen effect in housing consumption. In both MSAs, when consumers became less interested in searching for luxury watches and perfume in 2007, house price has also started to drop. Although the house price has decreased for all the price levels and the premium for high-end homes became lower, people in New York still pay about $442,541in 2010 compared to what people pay for the premium ($293,782) in Seattle. This potentially indicates that the Veblen effect could contribute to maintaining the level of the premium even during the bust period.

Then, Figure 2 compares New York with Las Vegas, another MSA with a very high Veblen effect. While the degree of consumers' desire for luxury goods is similar at the peak in two MSAs, this desire especially for watches and perfume changes more dramatically in Las Vegas than New York. According to the Case-Shiller (CS) tiered price Index, Las Vegas shows much higher volatility in housing prices and this is particularly true for the higher-tier prices. A dramatic increase in the Veblen effect in Las Vegas has been translated into a significant increase in both the aggregate and higher-tier prices before the peak year. However, the premium paid for the homes in the highest decile has also dropped substantially (more than 23%) in Las Vegas after the peak year. This is comparable to New York where the premium was maintained at the same level and the high-tier CS index is much more stable even during the bust period. This result suggests that MSAs with the volatile Veblen effect are likely to be more vulnerable to both housing bubbles and busts.

We further identify 5 MSAs with the highest Veblen effect and 5 MSAs with the lowest Veblen effect among 17 major MSAs where the CS tiered index is available.[6] Since this rank is based on the average Veblen effect over time, people residing in the top 5 MSAs are likely to show the relatively stable, higher desire for the non-housing luxury consumption.[7] Table 2 shows how housing market dynamics during the boom and bust periods differ between these MSAs with the level of consumers' desire for non-housing luxury goods.

During the boom period, the MSAs with the higher Veblen effect have experienced a much higher increase in both aggregate and high-tier HPIs compared with other MSAs. In particular, the premium paid for the houses in the highest decile in these areas is as twice high as the premium in other MSAs. During the bust period, the MSAs with the higher Veblen effect have experienced a lower drop in HPIs, especially in high-tier HPIs, than other MSAs. The premiums for the houses in the highest decile and quartile are also well maintained in these MSAs. These results basically tell us the similar story as the New York case that the stable, high Veblen effect could drive housing bubbles and help avoid substantial busts. As mentioned in the earlier section, however, the results may be related to variation in economic and demographic characteristics across MSAs so we will control for these characteristics for the statistical analyses.

Table 3 summarizes the descriptive statistics of all variables used in the regression analyses for the study period between 2004 and 2011. In addition to the statistics for the full sample of 808 observations for 101 MSAs, we present those for two sub-samples: a high-premium sample that includes the top 30% of MSAs (30 MSAs) and a low-premium sample that includes the bottom 30% of MSAs (31 MSAs) —both based on the average price deviation of high-end houses from the median price (housing premium) over the study period. The list of MSAs in these sub-groups is provided in Appendix B. For each variable, the between (across MSAs) standard deviation and the within (over time within MSA) standard deviation are shown as well as the overall standard deviation. Detailed descriptions of these variables are provided in Table 1.

On average, a $168,713 difference occurs between the top 10% of house prices and the median house prices in the full sample. In high-premium MSAs, people pay a premium of $310,643; meanwhile, people pay a premium of $84,928 in low-premium MSAs (less than one third of the premium for the high-premium group). Most importantly, all the Veblen effect measures (i.e., ratios of brand search to product search in four different categories) show the same pattern, having higher-than-average ratios for the high-premium group and lower-than-average ratios for the low-premium group. For example, the Veblen effect for the fashion category in the high-premium group (0.167) is more than double the Veblen effect in the low-premium group (0.081). The same pattern is observed with both housing premium and Veblen effect measures between sub-groups, thereby strongly suggesting the existence of a clear association between these two constructs—namely, in MSAs with high (low) Veblen effects, people pay high (low) premiums for high-end houses, which is consistent with our hypothesis.

In addition, all the control variables show notable differences between sub-groups in the way we expected, although to different degrees. In general, compared to low-premium MSAs, high-premium MSAs tend to have a larger population, higher age, larger household size, more new houses, more segregated, higher household income, more expensive rental units, and lower unemployment rates. Since our dataset consists of 101 MSAs for 8 years, most of the variation comes from across MSAs (between) rather than over time (within), with the exception of unemployment rate, which shows a slightly higher variation over time than across MSAs.

Estimation Results

Table 4 shows the results of the random effect panel regressions for the full sample for the entire study period of 2004-2011. In this table, a dependent variable is the log of housing premium whereas the main independent variable is the ratio of the brand search to the product search in the fashion-leather category (the Veblen effect). We chose the fashion category as a representative for most of the analyses because it covers the widest variety of luxury products and luxury brands. The results for other categories are provided in Appendix C as one of the robustness checks, which confirms that the choice of the category does not change any of main interpretations and conclusions. The first model is for the univariate regression, the second model also includes controls for basic demographics, the third column adds the dissimilarity indices, and the fourth model is the most comprehensive, including wealth and economic condition control variables along with other control variables.

[6] Although the CS tiered index could be a more precise indicator of the change in difference tiered prices than the data calculated based on Dataquick, it is available only for 17 MSAs. Therefore, we still use Dataquick data for our main statistical analyses.

[7] For example, Las Vegas shows the high Veblen effect at the peak year but its Veblen effect is very volatile. So, while it does not belong to top 5 MSAs, New York does.

Overall, the Veblen effect was found to have a strong significant relationship with the housing premium (B = 2.406, 1.662, 1.645, and 1.207 for the four models, respectively; all of them are significant at the 1% level). MSAs and periods with high (low) Veblen effects extracted via a Google search exhibit high (low) housing premiums. Our Veblen effect measure proxies the degree to which consumers desire conspicuous goods and services to flaunt their wealth and achieve greater social status, even at higher prices than their intrinsic values. When/where people show strong Veblen effects, they may also consume certain types of houses according to the same motivation. Thus, the strong relationship of the Veblen effect measure to the housing premium as shown in Table 4 suggests that high-end houses—which are often conspicuous in terms of location, quality of neighbor, size, and design—are purchased for the enjoyment of signaling their wealth and status, which at least partly drives the large deviation of high-end house prices from the median house price.[8]

The housing premium may be affected by other factors as well. For example, in the highly racially segregated MSAs, majority households may wish to avoid minority-dominated neighborhoods by paying a higher premium; on the other hand, majority households may be indifferent to the choice of neighborhoods in racially more integrated MSAs with relatively homogeneous neighborhoods. In addition, the difference in housing premium especially across MSAs may simply stem from the difference in the ability of households to pay the higher premium (i.e., wealth and economic conditions). However, the fourth model in Table 4 shows that the Veblen effect still plays a strong significant role in explaining the housing premium even after controlling for the dissimilarity indices (Asian-White and Black-White) and wealth and economic conditions as well as more fundamental demographic differences. Significant effects of some control variables on housing premium in the fourth model indicate that housing premium tends to be high in MSAs/periods that have a larger population, higher income, more of expensive rental units, and lower unemployment rate; such results are consistent with what we naturally expect.[9]

Although the significant relationships of Veblen effect with housing premium are found with the full sample over the entire study period, it is plausible to expect that housing consumptions motivated by the Veblen effect are more strongly evident among MSAs with high premiums than among MSAs with low premiums. In addition, the relationship between housing premium and Veblen effect during a housing boom may be different from that during a housing bust. Therefore, we conducted analyses for the top 30% of the housing premium group both before the peak year (boom period) and after the peak year (bust period) as well as for the bottom 30% of the housing premium group in both boom and bust periods. The peak year for each MSA was identified using the Sinai's (2010) method, as explained in the Data and Methodology section.

Table 5 summarizes the results of these sub-sample regressions. Most importantly, the results clearly indicate that the Veblen effect has a significantly positive relationship on housing premium only among MSAs within the top 30% of the housing premiums. In the bottom 30% housing premium group, no significant relationship of the Veblen effect emerges regardless of the boom or bust period. In the top 30% group, the Veblen effect results in significantly positive effects on the housing premium during both boom and bust periods, with effects being lower during the boom period ($B = 2.376$, $p = 0.077$) than the bust period ($B = 4.657$, $p < 0.00$). These statistical significances translate into economic significances of a 15.4% change in housing premium during the boom period and a 24.1% change in the housing premium during the bust period, based on a one standard deviation (in each sub-sample) change in the Veblen effect. Although not shown in the table, we also found no significant relationship between Veblen effect and the housing premium in the middle 40% housing premium group. We observed that the Veblen effect in the fashion-leather category in the top 30% group tends to stay at the high level even during the bust period, [10] contributing to maintaining the higher level of the housing premiums even during the bust period in the top 30% group. Panel A in Appendix E illustrates such a situation using San Francisco-Oakland-Fremont (CA) as an example.[11]

Effects of some control variables in regressions for the top 30% premium group are worth mentioning as well. Table 5 shows that MSAs with smaller populations tend to have higher housing premium in the top 30% premium group, which is contrary to the results obtained for the full sample. Most MSAs in the top 30% premium group are dominated by single-family, large-lot houses. The areas also have relatively large number of vacation homes. Therefore, it may be natural to expect relatively small populations in these MSAs. The dissimilarity index (especially Asian-White) turned out to have a significantly positive effect on housing premiums in the top 30% premium group. As shown in Appendix B, the top 5 MSAs in the top 30% premium group in terms of housing premium are from California. These MSAs are known to have relatively large Asian populations, which may make the racial segregation or integration an important issue for the racial majority households in deciding how much premium they are willing to pay to avoid minority-dominated neighbors. Therefore, more segregated MSAs tend to have higher housing premiums. Finally, the unemployment rate has a significantly negative effect on housing premiums in the top 30% premium group, but only during the bust period, suggesting that the economic condition of MSAs play an important role in the high-end housing markets, especially during recessions.

[8] We constructed the housing premium measure from the zip code level data, as explained in the Data and Methodology section. Therefore, "high-end houses" in this paper refers to houses in high-status, visible neighborhoods.

[9] Note that the argument applies mostly to the cross-sectional variation due to the nature of our dataset (8 years for every 101 MSAs). In fact, for the fourth model of the regression, the within R-squared is only 0.08 while the between R-squared is 0.67 (the overall R-squared is 0.55).

[10] The temporal dynamics observed with the luxury search ratio in the fashion category are consistent with those of LVMH business performance. The LVMH profit in the fashion and leather goods segment has increased since 2008 (1,927 EUR million) for several years during the recession (1,986 EUR million in 2009; 2,555 EUR million in 2010; 3,075 EUR million in 2011) according to LVMH's annual reports.

[11] The temporal dynamics of the Veblen effects observed in some MSAs from the top 30% premium group also provide one possible reason that the Veblen effect on housing premium is less significant during the boom period. As shown in Panel B of Appendix E (Charleston-North Charleston-Summerville, SC), several MSAs with relatively high housing premiums during the study period exhibit very low Veblen effects in early years for various reasons, which results in low cross-sectional correlation and, consequently, a less significant effect in the regression during the boom period. Even with such MSAs, the Veblen effects usually stay at the high level during the bust period, making housing premiums also stay at the high level or decrease only moderately during the bust period.

Robustness Checks

We conducted several robustness checks in addition to the one provided in Appendix C. As there is no clear definition for selecting "luxury" brands, we created the lists of top luxury brands for the fashion-leather category and the watch-jewelry category, as explained in Appendix A. As a robustness check, we ran the regressions using Veblen effects measured by utilizing these top luxury brands with the same control variables. We still found a significantly positive relationship of the Veblen effect to the housing premium with both the true luxury fashion category ($B = 1.411$, $p = 0.084$) and the true luxury watch category ($B = 0.924$, $p < 0.00$). Another robustness check involves running regressions using the Veblen effect for the watch-jewelry category in sub-samples based on the housing premium groups (top 30% and bottom 30%) for both the boom and bust periods. The results are almost identical to those obtained using the luxury search ratio for the fashion-leather category (Table 5) and do not change any major interpretations or conclusions. Finally, we divided the full sample into the top 30%, middle 40%, and bottom 30% using the average luxury ratio in the fashion-leather category over the entire study period (Veblen groups) as such a categorization may also describe characteristics of consumers of MSAs. The results are shown in Appendix D. The results again show the significantly positive Veblen effects on housing premiums in the top 30% Veblen group both during the boom and bust periods. One difference from the results of the sub-sample analysis based on the housing premium group is that the significantly positive Veblen effect on housing premiums was found in the bottom 30% Veblen group during the bust period.[12]

Concluding Remarks

Given the plausible relationship between the consumers' desire for non-housing luxury goods and housing consumption behavior, this study is the first to examine the role that the Veblen effect plays in housing market dynamics. The panel regression models controlled by the MSA's demographic and economic characteristics suggest that the premium for high-end homes is much higher in MSAs with the higher Veblen effect than in other MSAs. There is spatial variation in the relationship between the Veblen effect and housing premium. In the areas with a steady, higher premium for high-end homes, we observe that the Veblen effect plays an even more significant role in higher housing premium than in the areas with a more volatile, lower premium. With respect to temporal variation, there is evidence that high Veblen effect could drive housing bubbles but also help avoid substantial busts.

These results suggests that high-end houses located in conspicuous and high-status neighborhoods may have been purchased for the enjoyment of signaling wealth and status rather than for the intrinsic values of these houses. Hence, this housing consumption behavior could partly drive pricing bubbles in the housing market. This study also provides important insights into the reasons behind different housing cycles of boom and bust across different MSAs in the US. If we observe non-housing luxury consumption becomes substantially high or lower in certain MSAs, this could be a potential indicator of the housing booms and busts in these MSAs. The areas where consumers' desire for luxury consumption changes dramatically may be more vulnerable to pricing bubbles. The results will be also of great importance for developers in the process of home development and for real estate agents in price determination and negotiation processes. If we consistently observe that the Veblen effect is translated into housing consumption more substantially in certain areas, we would expect higher demand for high-end homes in these areas even during the bust period.

We have several research plans to improve the current paper in the near future. First, we will further examine the causality of the revealed relationship between the Veblen effect and housing premium by testing additional control variables such as measures of demographic variation within each MSA and utilizing the method of instrumental variables to control for missing or unknown control variables. We will also test the profitability of trading strategies with the Case-Shiller Home Price Futures formed based on the Veblen effect that serves as an indirect test of the causality between the Veblen effect and housing market dynamics. Second, we currently have only 8 waves for the housing premium data which is based on the annual housing transactions as of March provided by Dataquick. Therefore, we plan to update our house price data by every month and further examine temporal variation during the study period of 2004-2011. Higher frequency data would also allow us to test dynamic models that specify the housing premium for each MSA to depend in part on its values in previous periods. Finally, we plan to investigate spatial variation more in detail, for example, by examining the extent to which the Veblen effect has led to housing bubbles and busts in different states, regions, or divisions.

[12] Unreported robustness check results are available from the authors upon request.

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Figure 1 Housing Markets and the Veblen Effect in Seattle and New York MSAs

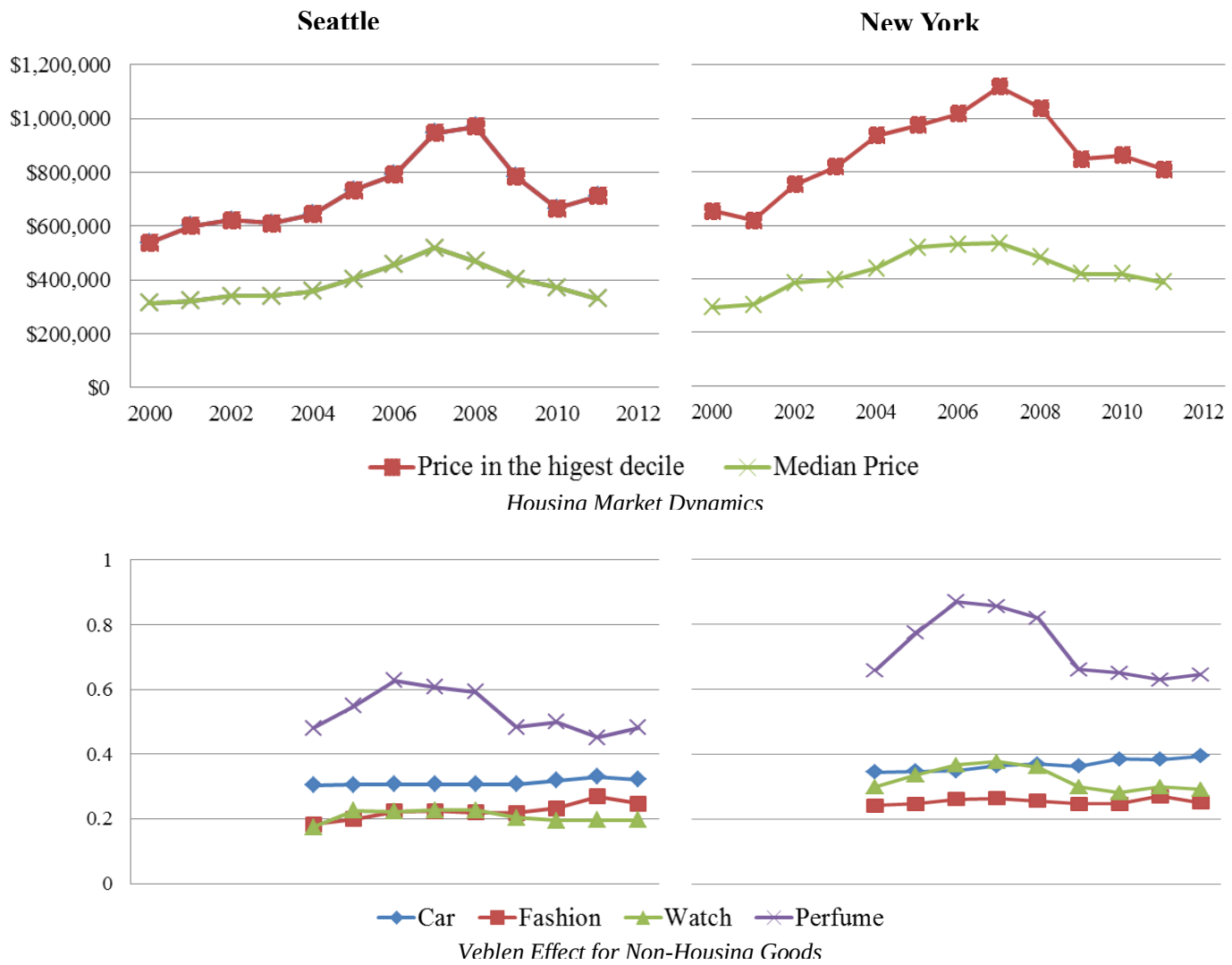


Figure 2 Housing Markets and the Veblen Effect in Las Vegas and New York MSAs

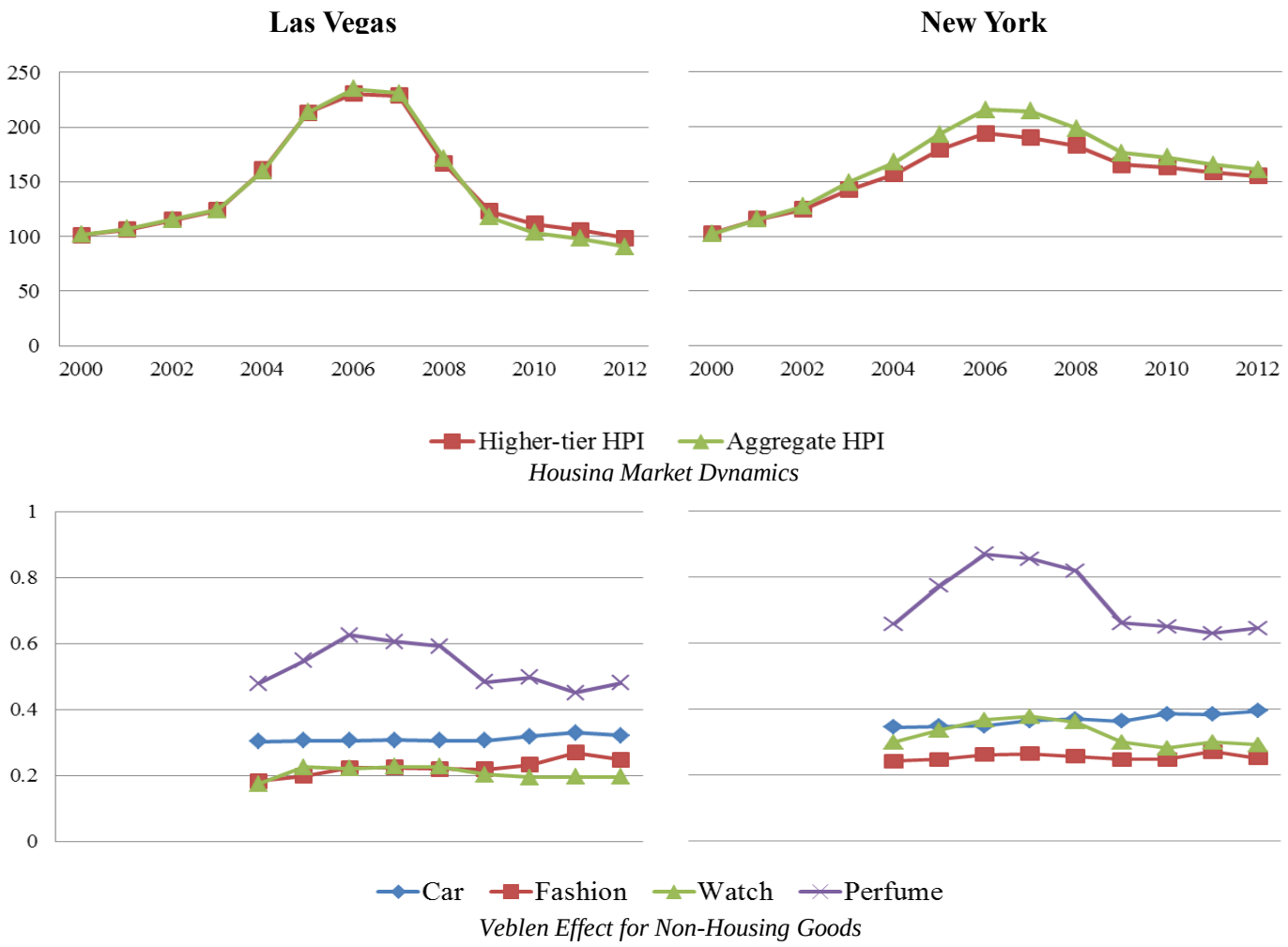


Table 1 Dependent variable and independent variables

Dependent variable	
Top10% house price minus median house price (log)	Log of top 10% house price minus median house price within each MSA in each year in real term
Luxury Veblen effect	
Lux search(car)	Ratio of automobile brand search to automobile product search for each MSA in each year
Lux search(fashion)	Ratio of fashion&leather brand search to fashion&leather product search for each MSA in each year
Lux search(watch)	Ratio of watch&jewerlry brand search to watch&jewerly product search for each MSA in each year
Lux search(perfume)	Ratio of cosmetics&perfume brand search to cosmetics&perfume product search for each MSA in each year
Demographics	
Population(log)	Log of population for each MSA in each year
Median age	Median age for each MSA in each year
Median household size	Median household size for each MSA in each year
% year built after 2000	Proportion of houses build after 2000 for each MSA in each year
Dissimilarity index	
D-index (Asian)	Dissimilarity index (Asian-White) for MSA as of 2000
D-index (Black)	Dissimilarity index (Black-White) for MSA as of 2000
Wealth and economy	
Median household income(log)	Log of median household income for each MSA in each year
% of units with contract rent>=$1500	Proportion of rental units with contract rent above $1,500 for each MSA in each year
Unemployment rate	Unemployment rate for each MSA in each year

Table 2 Housing Markets of MSAs with the Different Level of the Veblen Effect

	5 MSAs with the highest Veblen effect[1]	5 MSAs with the lowest Veblen effect[2]	All other MSAs
During the boom period[3]			
Annual change in aggregate HPIs	8.84%	5.89%	6.29%
Annual change in high-tier HPIs	8.54%	5.21%	5.73%
Premium for homes in the highest decile	$452,227	$217,783	$236,677
Premium for homes in the highest quartile	$188,168	$92,242	$103,761
During the bust period[3]			
Annual change in aggregate HPIs	-8.54%	-8.79%	-9.43%
Annual change in high-tier HPIs	-6.67%	-7.68%	-8.05%
Premium for homes in the highest decile	$433,733	$214,470	$266,667
Premium for homes in the highest quartile	$181,436	$83,675	$105,511

Note 1. San Francisco, Los Angeles, New York, Washington DC, and Miami
2. Tampa, Seattle, Portland, Minneapolis, and Cleveland
3. Boom periods are when MSA HPI increases and but periods are when MSA HPI decreases. They are determined based on the CS aggregate index.
4. HPIs are from the CS tiered index and premiums are from Dataquick.

Table 3 Descriptive statistics for a dependent variable and independent variables

Variable	Full Sample				House price premium[a]							
					High-premium (top 30%)				Low-premium (bottom 30%)			
	Mean	Standard Deviation			Mean	Standard Deviation			Mean	Standard Deviation		
		overall	between[b]	within[c]		overall	between	within		overall	between	within
Top10% house price minus median house price[d]	168,713	144,205	135,545	50,813	310,643	194,544	179,358	81,366	84,928	27,331	14,037	23,570
Lux search(car)	0.255	0.078	0.071	0.032	0.313	0.060	0.056	0.025	0.209	0.088	0.077	0.044
Lux search(fashion)	0.118	0.069	0.063	0.030	0.167	0.059	0.054	0.025	0.081	0.071	0.063	0.036
Lux search(watch)	0.139	0.097	0.088	0.041	0.207	0.085	0.078	0.038	0.085	0.086	0.074	0.045
Lux search(perfume)	0.390	0.279	0.229	0.160	0.542	0.216	0.151	0.157	0.247	0.276	0.229	0.160
Population[e]	1,790,471	2,621,962	2,631,673	95,162	3,780,973	3,935,896	3,992,729	127,733	605,906	458,321	462,361	48,365
Median age	36.369	2.728	2.687	0.536	36.444	2.497	2.489	0.471	35.622	2.901	2.873	0.632
Median household size	2.573	0.198	0.193	0.047	2.657	0.180	0.175	0.052	2.546	0.203	0.200	0.050
% year structure buit after 2000	0.133	0.065	0.057	0.033	0.138	0.070	0.063	0.032	0.131	0.065	0.056	0.035
D-index (Asian)	0.296	0.093	0.093	0.000	0.334	0.097	0.099	0.000	0.283	0.069	0.070	0.000
D-index (Black)	0.542	0.146	0.147	0.000	0.579	0.124	0.126	0.000	0.488	0.138	0.140	0.000
Median household income[f]	50,054	8,654	7,974	3,444	57,078	9,035	8,246	3,952	45,176	5,241	4,339	3,028
% of units with contract rent>=$1500	0.047	0.065	0.063	0.018	0.104	0.095	0.092	0.030	0.021	0.015	0.011	0.009
Unemployment rate	0.079	0.027	0.015	0.022	0.078	0.027	0.012	0.025	0.082	0.027	0.016	0.021
Observations	808				240				248			

[a]Full sample of 808 observations (101 MSAs times 8 years) is divided into 10 percentile ranks based on the average difference between top 10% house price and median house price (house price premium), which is a dependent variable in regressions. Summary statistics for the top 30% group and the bottom 30% group are presented.
[b]Over MSAs
[c]Over time
[d, e, f] Log of these variables are included in regressions.

Table 4 Regression for the Full Sample

	1		2		3		4	
Independent Variable	***Beta***	***z***	***Beta***	***z***	***Beta***	***z***	***Beta***	***z***
Luxury Veblen effect								
Lux search(fashion)	2.406	7.92 ***	1.662	4.06 ***	1.645	4.02 ***	1.207	3.00 ***
Demographics								
Population(log)			0.205	4.50 ***	0.253	4.32 ***	0.148	3.21 ***
Median age			0.005	0.40	0.013	0.97	0.019	1.59
Median household size			0.088	0.49	0.019	0.11	0.136	0.81
% year built after 2000			-0.013	-0.04	-0.111	-0.29	-0.100	-0.24
Dissimilarity index								
D-index (Asian)					0.658	1.23	0.345	0.87
D-index (Black)					-0.865	-2.16 **	-0.435	-1.40
Wealth and economy								
Median household income(log)							0.520	2.70 ***
% of units with contract rent>=$1500							2.715	5.62 ***
Unemployment rate							-2.316	-3.50 ***
R-squared	0.285		0.300		0.325		0.552	

Note: This table shows the results of the random effect panel regressions for the full sample for the entire study period from 2004-2011. In this table, a dependent variable is the log of housing premium and the main independent variable is the ratio of the brand search to the product search in the fashion-leather category. The first model is for the univariate regression, the second model also includes controls for basic demographics, the third column adds the dissimilarity indices, and the fourth model is most comprehensive including wealth and economy control variables, too. *** indicates significance at the 1% level, ** indicates significance at the 5% level, and * indicates significance at the 10% level. R-squared measures are overall R-squared from random effects model that account for both within R-squared and between R-squared.

Table 5 Regression for the sub samples

	Top 30%				Bottom 30%			
	Before peak year		After peak year		Before peak year		After peak year	
Independent Variable	***Beta***	***z***	***Beta***	***z***	***Beta***	***z***	***Beta***	***z***
Luxury Veblen effect								
Lux search(fashion)	2.376	1.77 *	4.657	3.27 ***	1.252	1.35	0.717	0.74
Demographics								
Population(log)	-0.272	-2.28 **	-0.350	-3.71 ***	0.023	0.28	0.061	0.62
Median age	-0.004	-0.13	-0.031	-1.40	-0.016	-0.89	-0.005	-0.29
Median household size	0.224	0.46	0.190	0.60	-0.104	-0.45	0.003	0.01
% year built after 2000	2.053	2.12 **	-1.622	-1.81 *	-0.443	-0.43	-1.490	-1.43
Dissimilarity index								
D-index (Asian)	1.878	2.39 **	1.738	2.59 ***	-0.048	-0.08	0.084	0.13
D-index (Black)	1.634	2.18 **	0.811	1.27	-0.299	-0.73	-0.502	-1.01
Wealth and economy								
Median household income(log)	0.114	0.25	-0.009	-0.02	0.462	1.15	0.333	0.72
% of units with contract rent>=$1500	4.788	4.24 ***	1.228	1.63	4.609	1.41	3.763	1.26
Unemployment rate	3.076	0.66	-4.83	-3.91 ***	0.872	0.38	1.163	0.77
# of observations	96		144		105		143	
R-squared	0.598		0.645		0.209		0.117	

Note: This table shows the results of the random effect panel regressions for sub-samples. A dependent variable is the log of housing premium. The first column is for the top 30% housing premium group before peak year (boom period), the second column is for the top 30% housing premium group after peak year (bust period), the third column is for the bottom 30% housing premium group during the boom period, and the fourth column is for the bottom 30% housing premium group during the bust period. Peak year for each MSA was identified following the method used by Sinai (2010) as we explained in the Data and Methodology section. The main independent variable is the ratio of the brand search to the product search in the fashion-leather category. *** indicates significance at the 1% level, ** indicates significance at the 5% level, and * indicates significance at the 10% level. R-squared measures are overall R-squared.

Appendix A Measures of the Veblen Effect

To quantify the degree of the Veblen effect in each MSA for each year, we generate two lists: key words for the product search and key words for the brand search. We first define the major industries associated with luxury consumption. Following Uche (2007) and Michel and Gerald (2008), we include four industries, "Automobiles", "Fashion & Leather", "Watches & Jewelry" and "Cosmetics & Fragrance". Within each industry, we generate the key words of product search. For instance, keywords of product search for Automobile industry is "car" and "cars". For other industries, we define their products based on the information from the websites of major brands. For the "Watches & Jewelry" industry, there is a long list of products such as watches, jewelry, rings, diamonds, earrings, necklaces, bracelets, pendants, and so on.

Then, we define the luxury brands within each industry based on the price of the products, company sales, and brand reputation. First, to generate the list of luxury car brands for the "Automobiles" industry, we compare two lists: Hideki (2002), Pavel and André (2006) and Forbes "world's most expensive cars" list.[13] Second, as suggested by Yacine, Jonathan, and Motohiro (2004), we select five most luxurious brands for the "Fashion & Leather" industry following the analyses from Morgan Stanley and Merrill Lynch. They include Saks (1991), Tiffany (1960), Bulgari(1992), Gucci (1991), Hermes (1992) and LVMH (1993). Since LVMH produces multiple brands, we include all of them in the list of luxury brands, including Louis Vuitton, Celine, Loewe, Berluti, and Kenzo (List 1). In addition, we include other popular luxury brands for the "Fashion & Leather" industry and divide them into two lists (List 2 and 3) by the price information provided on their websites (List 2 is more expensive than List 3). Finally, for the "Watches & Jewelry" and "Cosmetics & Perfume" industries, we select the most luxury brands based on the Merrill Lynch Lifestyle Index and Luxury Institute Wealth Report (List 1). Again, we add other popular luxury brands and group them by the price range (List 2 and 3).

If one brand produces products in multiple industries, the key words for brand searches combine the brand name with the product name to avoid the additional counts of searches related with other products. For instance, in the "Watches & Jewelry" industry, the brand search for Bulgari is "Bulgari watches" and "Bulgari Jewelry" instead of "Bulgari". Table A shows the lists of the product search and luxury brand search. We separate the list longer than 30 words into multiple lists since the Google insight search has the limit of 30 words. The "+" sign indicates "or". Therefore, "Brand name A + Brand name B" means that we count all searches for either "Brand name A" or "Brand name B".

Table A: List of the product and brand searches

Industry	Product Search	Brand Search
Automobile	Car+Cars	Bentley+Bugatti+BMW+Ferrari+Koenigsegg+Lamborghini+Leblanc +Maserati+Maybach+Mercedes-Benz+ Benz+Mercedes+Pagani+Porsche+Rolls-Royce+"RollsRoyce"+Saleen+"ShelbySuperCars"+SSC+ Spyker+Jaguar
Fashion &Leather	Handbag+handbags+bag+bags+ shoes+clothes+clothing+pant+ pants+jacket+jackets+dress+ dresses+shirt+shirts+ "ready to wear"+ready-to-wear+ skirts+skirt+suits+suit+belt+belts+wallet+wallets+sunglasses	*List 1:* "LouisVuitton"+LV+Celine+Loewe+Berluti+Kenzo+Givenchy+"Marc Jacobs"+Fendi+"Emilio Pucci"+"Thomas Pink"+"Donna Karan" +Nowness+ "Bvlgari fashion"+ "Bulgari fashion"+Gucci +Hermes+Saks+"saks fifth avenue"+ "Chanel fashion"
		List 2: "Jimmy Choo"+"Dolce and Gabbanna"+ "Dolce & Gabbanna"+D&G+"Christian Louboutin"+Burberry+Etro+ Ferragamo+ Zegna+ "Miu Miu"+Prada+"Giorgio Armani"+"Bottega Veneta"+Bally+Tods+ Chloe+Balenciaga+ Valentino+Marni+Lanvin
		List 3: "Vera Wang"+Missoni+ "Max Mara"+Tomford+ designer+Barneys+ "Neiman Marcus"+Nordstrom
Watches& Jewelry	Watches+jewelry+earrings +diamonds+rings+necklaces+necklace+bracelet+bracelets+pendant+pendants+charms+locket+lockets+ "wedding bands"+couplings	*List 1:* "Patek Philippe"+patek+"Vacheron Constantin" + Vacheron+ "Audemars Piguet"+Audemars+Piguet+"Ulysse Nardin"+ Ulysse+Nardin+"Richard Mille"+Breguet+Bovet+A. Lange & Sohne + Lang & Sohne+ "a Lange & Sohne"+blancpain
		List 2: IWC+Rolex+Jaeger-LeCoultre+ "Omega watch"+Zenith watch+Glashutte +Panerai+ Girard-Perregaux+Hublot+"Chanel watch" + "Christian Dior watch"+ "Dior watch"+Breitling + "Tag Heuer"+ "Bvlgari watch"+ "Bulgari watch"
		List 3: Boucheron+Graff+Buccellati+Tiffany+Mikimoto+Asprey+ "Van Cleef & Arpels"+ "Van Cleef Arpels"+ Cartier "Bvlgari Jewelry"+"Bulgari Jewelry"+"Carrera y Carrera"+ "Harry Winston"+Chopard+Chaumet+Piaget
Cosmetics& Perfume	Perfume+fragrances+cosmetics+makeup+"skin care"+anti-aging+"sun care"	"Christian Dior Cosmetic"+ "Dior Cosmetic"+Guerlain + "Givenchy Cosmetic"+"Fresh skincare"+"Acqua di Parma" +"Perfume Loewe"+"Perfume Fendi"+"Perfume Emilio Pucci"+ Sisley+ "La Prairie" + "Chanel Cosmetic" +Aesop+Lancome+SKII+Shiseido+"Estee Lauder"

[13] http://www.forbes.com/2010/02/01/porsche-bugatti-expensive-lifestyle-vehicles-cars-lamborghini.html

Appendix B List of MSAs in high-premium and low-premium sub-samples

Top 30% house premium MSAs (Descending order)	Average Premium	Bottom 30% house premium MSAs (Ascending order)	Average Premium
San Francisco-Oakland-Fremont, CA	862,847	Yuma, AZ	59,839
Salinas, CA	822,875	Sherman-Denison, TX	67,918
Santa Barbara-Santa Maria-Goleta, CA	799,703	Green Bay, WI	70,828
Los Angeles-Long Beach-Santa Ana, CA	614,703	Erie, PA	74,401
San Diego-Carlsbad-San Marcos, CA	481,203	Augusta-Richmond County, GA-SC	76,683
New York-Northern New Jersey-Long Island, NY-NJ-PA	447,876	Corpus Christi, TX	76,960
Boston-Cambridge-Quincy, MA-NH	432,769	Rockford, IL	79,260
Charleston-North Charleston-Summerville, SC	402,086	Grand Rapids-Wyoming, MI	79,639
Miami-Fort Lauderdale-Pompano Beach, FL	366,434	Columbia, SC	84,158
Washington-Arlington-Alexandria, DC-VA-MD-WV	362,215	Youngstown-Warren-Boardman, OH-PA	84,173
Seattle-Tacoma-Bellevue, WA	341,124	Gainesville, FL	86,331
Chicago-Joliet-Naperville, IL-IN-WI	332,688	Billings, MT	87,876
Honolulu, HI	311,323	Boise City-Nampa, ID	90,283
Baltimore-Towson, MD	308,944	El Paso, TX	90,790
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	299,843	Toledo, OH	96,767
Reno-Sparks, NV	288,761	Greenville-Mauldin-Easley, SC	96,889
Cape Coral-Fort Myers, FL	251,378	Indianapolis-Carmel, IN	97,497
Phoenix-Mesa-Glendale, AZ	233,544	Tallahassee, FL	98,647
Sacramento--Arden-Arcade--Roseville, CA	232,094	Spokane, WA	98,988
Atlanta-Sandy Springs-Marietta, GA	223,721	Omaha-Council Bluffs, NE-IA	102,107
Denver-Aurora-Broomfield, CO	205,866	Lincoln, NE	102,500
Minneapolis-St. Paul-Bloomington, MN-WI	201,498	Champaign-Urbana, IL	103,859
Panama City-Lynn Haven-Panama City Beach, FL	199,413	Missoula, MT	107,033
Austin-Round Rock-San Marcos, TX	192,913	Bakersfield-Delano, CA	108,422
Richmond, VA	186,577	New Orleans-Metairie-Kenner, LA	109,051
Portland-Vancouver-Hillsboro, OR-WA	178,333	Oklahoma City, OK	109,125
Charlotte-Gastonia-Rock Hill, NC-SC	171,732	Duluth, MN-WI	110,700
Dallas-Fort Worth-Arlington, TX	170,146	Las Vegas-Paradise, NV	112,484
Cincinnati-Middletown, OH-KY-IN	169,891	Salisbury, MD	113,802
Tampa-St. Petersburg-Clearwater, FL	169,600	Springfield, MA	114,304
		Providence-New Bedford-Fall River, RI-MA	115,878

Appendix C Regressions for the full sample for all luxury product categories

	Automobile		Fashion		Wacth-Jewelry		Cosmetics-Perfume	
Independent Variable	***Beta***	***z***	***Beta***	***z***	***Beta***	***z***	***Beta***	***z***
Luxury Veblen effect								
Lux search	0.738	2.52 **	1.207	3.00 ***	0.938	3.43 ***	0.157	2.28 **
Demographics								
Population(log)	0.161	3.88 ***	0.148	3.21 ***	0.150	3.34 ***	0.184	4.24 ***
Median age	0.020	1.76 *	0.019	1.59	0.017	1.42	0.017	1.4
Median household size	0.116	0.72	0.136	0.81	0.092	0.55	0.073	0.43
% year built after 2000	0.167	0.43	-0.100	-0.24	-0.117	-0.28	0.078	0.19
Dissimilarity index								
D-index (Asian)	0.420	1.15	0.345	0.87	0.317	0.80	0.328	0.82
D-index (Black)	-0.370	-1.29	-0.435	-1.40	-0.498	-1.60	-0.463	-1.49
Wealth and economy								
Median household income(log)	0.582	3.16 ***	0.520	2.70 ***	0.493	2.56 ***	0.531	2.74 ***
% of units with contract rent>=$1500	2.936	6.23 ***	2.715	5.62 ***	2.804	5.85 ***	2.961	6.14 ***
Unemployment rate	-2.138	-3.30 ***	-2.316	-3.50 ***	-1.533	-2.31 **	-1.688	-2.53 **
R-squared	0.585		0.552		0.551		0.558	

Note: This table shows the results of the random effect panel regressions for the full sample during the entire study period from 2004-2011. A dependent variable is the log of housing premium. Four models use different main independent variables, the ratio of brand search to product search for automobile category, fashion-leather category, watch-jewelry category, and cosmetics-perfume category. *** indicates significance at the 1% level, ** indicates significance at the 5% level, and * indicates significance at the 10%

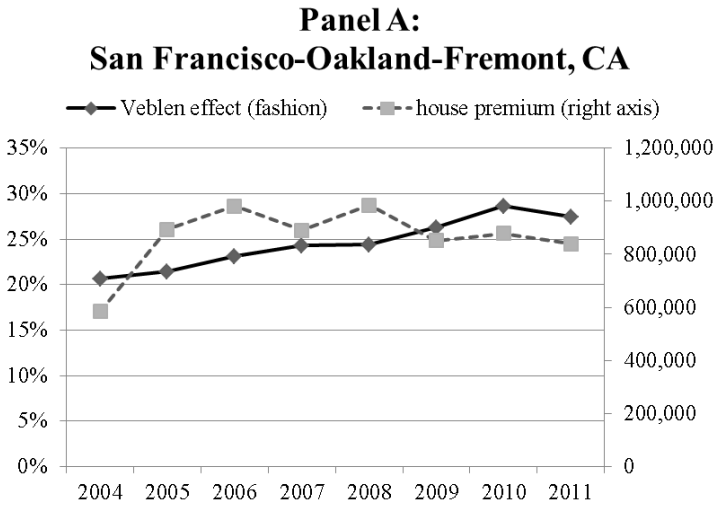
level. R-squared measures are overall R-squared from random effects model that account for both within R-squared and between R-squared.

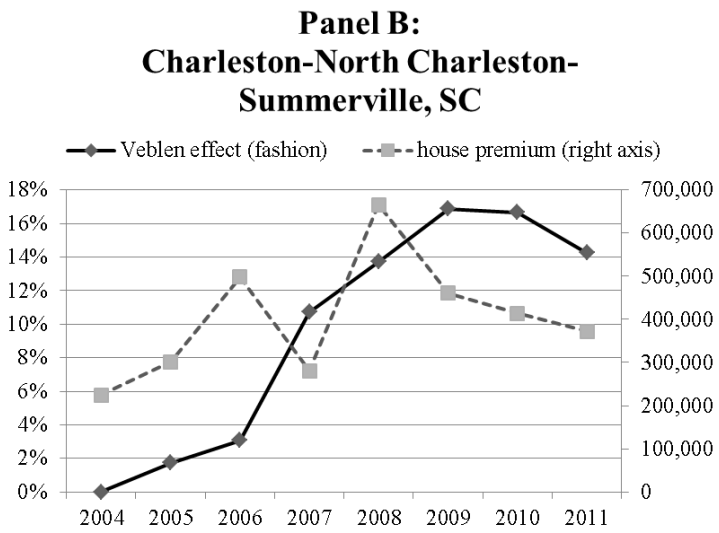
Appendix D Regression for the sub samples categorized based on the average Veblen effect in the fashion-leather category

	Top 30%				Bottom 30%			
	Before peak year		After peak year		Before peak year		After peak year	
Independent Variable	***Beta***	***z***	***Beta***	***z***	***Beta***	***z***	***Beta***	***z***
Luxury Veblen effect								
Lux search(fashion)	2.823	1.84 *	3.170	2.30 **	-0.787	-0.51	2.529	1.94 *
Demographics								
Population(log)	0.056	0.37	0.139	1.06	0.092	0.80	0.049	0.39
Median age	0.032	0.86	-0.016	-0.53	0.005	0.14	-0.007	-0.28
Median household size	-0.313	-0.59	-0.005	-0.01	0.128	0.31	-0.420	-1.19
% year built after 2000	2.147	2.44 **	-2.052	-1.81 *	2.451	1.82 *	0.104	0.09
Dissimilarity index								
D-index (Asian)	1.955	1.85 *	0.214	0.24	-0.213	-0.30	-1.045	-1.66 *
D-index (Black)	-0.203	-0.21	-0.448	-0.52	0.579	1.03	0.046	0.09
Wealth and economy								
Median household income(log)	0.858	1.81 *	0.212	0.55	0.073	0.14	0.674	1.29
% of units with contract rent>=$1500	4.721	4.35 ***	1.952	2.64 **	13.602	6.17 ***	10.892	6.35 ***
Unemployment rate	7.120	2.61 ***	-4.010	-3.38 **	-4.755	-1.52	-1.748	-0.98
# of observations	101		139		104		144	
R-squared	0.614		0.681		0.580		0.538	

Note: This table shows the results of the random effect panel regressions for sub-samples. A dependent variable is the log of housing premium. The top 30% group and the bottom 30% group are created based on the average ratio of brand search to product search in the fashion-leather category (Veblen groups). The first column is for the top 30% Veblen group before peak year (boom period), the second column is for the top 30% Veblen group after peak year (bust period), the third column is for the bottom 30% Veblen group during the boom period, and the fourth column is for the bottom 30% Veblen group during the bust period. Peak year for each MSA was identified following the method used by Sinai (2010) as we explained in the Data and Methodology section. The main independent variable is the ratio of the brand search to the product search in the fashion-leather category. *** indicates significance at the 1% level, ** indicates significance at the 5% level, and * indicates significance at the 10% level. R-squared measures are overall R-squared.

Appendix E


Panel A:
San Francisco-Oakland-Fremont, CA
Veblen effect (fashion)
house premium (right axis)
35%
30%
25%
20%
15%
10%
5%
0%
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
2004
2005
2006
2007
2008
2009
2010
2011


Panel B:
Charleston-North Charleston-Summerville, SC
Veblen effect (fashion)
house premium (right axis)
18%
16%
14%
12%
10%
8%
6%
4%
2%
0%
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
2004
2005
2006
2007
2008
2009
2010
2011