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- Quantitative Economics -

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Content

Introduction

The luxury goods market is both complex and ever-evolving, capturing the interest of scholars and business analysts alike. Luxury goods sales are increasing year over year, but prices are also increasing year over year. Oddly, the behaviour does not appear to follow the normal pattern as we examine it. In this report, we explore the recent trends in sales and pricing strategies among prominent fashion brands. These trends reflect broader economic conditions, as well as psychological phenomena like the Snob Effect and Veblen Goods.

Understanding these phenomena is essential because they help explain why luxury items become more desirable and valuable as their prices increase—a concept known as the Veblen effect. This effect is a key focus of our analysis, offering insight into consumer psychology and market dynamics. Additionally, we will examine how changes in the prices of luxury goods affect consumer decisions, particularly in comparison to other spending choices such as dining out. We will discuss how these price changes influence demand elasticity and consumer behaviour.

The report also addresses the challenges presented by counterfeit products and the strategic positioning of luxury brands that often exclude the middle class. Furthermore, we analyse the economic impacts of new regulations and evaluate the potential of luxury goods as investments, such as high-end handbags.

Our methodology includes numerical analysis and graphical representation, utilising Python and Jupyter Notebooks. This structured approach helps us thoroughly understand the intricacies of the luxury market. By synthesising insights from different sections, we aim to provide an in-depth discussion on the dynamics of the market, consumer behaviours, and potential policy recommendations. This introduction sets the stage for a comprehensive examination of the interactions between market forces, consumer preferences, and regulatory frameworks in the luxury goods sector, shedding light on how these elements shape the industry's future.

The Model

In this paper, we aim to present and analyse estimates on the dynamics of luxury and luxury goods, with a particular focus on how social status and economic shifts influence their consumption patterns. Throughout the paper, we presented different models by illustrating three dimensions that are concerned with luxury goods: a. one individual and two goods; b. two income groups with two goods; and c. economic welfare. As the paper progresses, these three distinct aspects become increasingly interwoven. We also need to refine a few assumptions already made in the model. First, we assume each individual's demand is independent of another. We generalised the demand for a clearer and simpler illustration. However, in the final scenario involving externalities, we deviate from this assumption. Secondly, we do not include external monetary variables in our equations unless explicitly stated. Within paragraphs, we discuss or include each variable in our models and parameter meanings. This paper simplified models and simulations, including income, quantity, and demand, and presented them using real-life examples.

To begin, we start with an overview on luxury market, model framework/outline, and focus key points of our comparison groups. Second-half of the paper, we will then delve into the details of each groups with their respective cases and numeric analysis with graphic illustrations. Finally, we provide an assessment of the reasons behind the structure of the luxury goods market and compare our model with its real-world counterpart with respect to economic welfare.

Veblen Goods

Named after American economist Thorstein Veblen; Veblen goods are goods that a) portray one's status, and b) demand increases as the price increases. (J. Ravichandra, 2022) Let us start off with the market structure in luxury markets.

Part I: Market Structure

Consumers' social class, which directly correlates with their income levels, largely influences the demand for luxury goods. Middle-class individuals tend to be more price-sensitive, which affects their purchasing decisions and the types of luxuries they can afford, making their demand more elastic. However, high-class individuals with higher disposable incomes have lower prices, making their demand inelastic.

The luxury goods market is distinct from typical markets, primarily due to the strong brand loyalty among consumers, driven by both quality and customer relationships. This loyalty elevates some firms to monopoly-like status within their niches, leading to higher pricing power under monopolistic competition. However, entry-level luxury brands face a different scenario. These brands, which are positioned above the mass market but face more competition and lower brand loyalty, adopt competitive pricing strategies to more delicately attract and retain customers.

The high-class society's purchasing behaviour, unaffected by price increases and solely motivated by the prestige and quality of these products, drives these luxury firms' price discrimination strategies.

We need to understand how social class and income impact the purchasing power of luxury goods. Now let's take a look at this utility function, using Cobb-Douglas to explain how a middle-class consumer may differ from a high-class consumer:

$$\text{Middle-Class Consumer (M): } U_M(x, y) = x^\alpha y^{1-\alpha}$$

- Where x represents basic goods and y represents luxury goods.
- α is closer to 1, indicating a stronger preference for basic goods over luxury goods due to budget constraints.

$$\text{High-Class Consumer (H): } U_H(x, y) = x^\beta y^{1-\beta}$$

- Where x represents basic goods and y represents luxury goods.
- β is much smaller than α, indicating a substantial preference for luxury goods.

In *Figure 1*, we explore consumer behaviour across two socioeconomic classes: luxury and basic goods. We use the utility functions mentioned above to understand the dynamics.
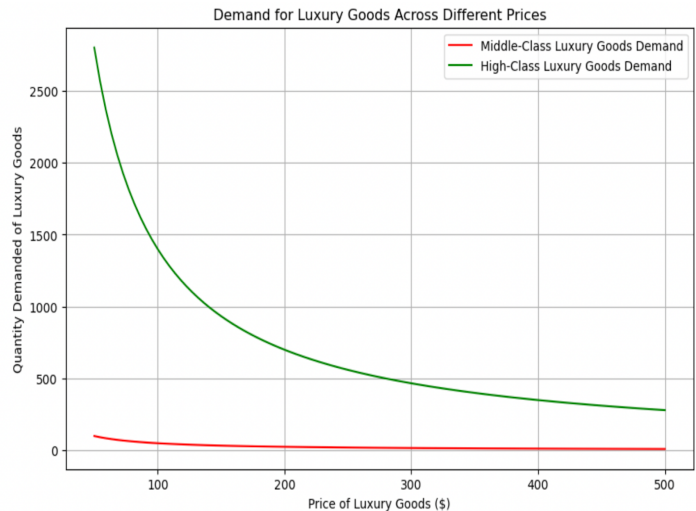

Figure 1. Demand for Luxury Goods Across Different Prices

We can see that as the price of luxury goods increases from $50 to $500, the demand for the middle class significantly decreases. Before, they were able to afford 10 units at $50, but now that the price has increased, it drops to just 1 unit at $500. However, for the upper class, the reduction in demand is less drastic due to their higher income, as they can still afford to buy over 50 units when the price increases to $500.

Key Parameters	
Middle-Class Preferences	A high preference for basic goods ($\alpha = 0.9$), reflecting budget constraints.
High-Class Preferences	A pronounced preference for luxury goods ($\beta = 0.3$), indicative of higher disposable income.
Income Levels	Middle-class income is set at $50,000, while high-class income is $200,000.
Prices	Basic goods are priced consistently at $20, while luxury goods prices vary from $50 to $500.

Table 1.

Different Incomes, Perception and Happiness: Basic Goods vs Luxury Goods

As we dive deeper, we try to understand how the demand for luxury goods varies with income levels among middle- and high-class consumers. Let's assume that we have six income limits: three for the middle class and three for the high class. We use these income levels to examine how different income levels can influence the number of units of the same luxury they can afford. *Figure 2* illustrates the results of this analysis.
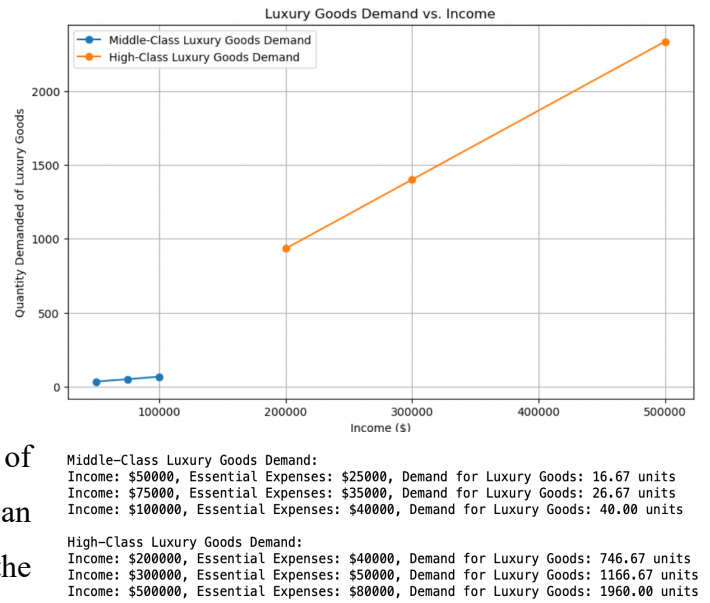


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Luxury Goods Demand vs. Income

Middle-Class Luxury Goods Demand:
Income: $50000, Essential Expenses: $25000, Demand for Luxury Goods: 16.67 units
Income: $75000, Essential Expenses: $35000, Demand for Luxury Goods: 26.67 units
Income: $100000, Essential Expenses: $40000, Demand for Luxury Goods: 40.00 units

High-Class Luxury Goods Demand:
Income: $200000, Essential Expenses: $40000, Demand for Luxury Goods: 746.67 units
Income: $300000, Essential Expenses: $50000, Demand for Luxury Goods: 1166.67 units
Income: $500000, Essential Expenses: $80000, Demand for Luxury Goods: 1960.00 units
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Figure 2. Luxury Goods for Demand vs. income

As we can see from the graph and its results above, income drastically affects the number of luxury goods an individual can buy. We use a $150 luxury product with a basic monthly expense of $50 in this example to compare the impact of an individual's income on their buying power, happiness, and perception.

Parameters	
Price of Luxury Good	set at $150
Price of Basic Goods	set at $50
Monthly Essential Expenses	
Middle-Class	Generally higher as a percentage of income due to lower disposable income.
High-Class	Lower as a percentage of income, reflecting greater disposable income.

Table 2.

Because middle-class consumers have limited disposable income and a large portion of their budget goes towards necessities, there is a small leftover portion for luxury items, which is not a priority for them. Middle-class consumers often feel constrained and limited due to budget restrictions that impede access to luxury goods and symbols of success and enjoyment. This financial reality may lead to dissatisfaction and a sense of exclusion from a higher-status lifestyle. Such constraints on purchasing luxury items can negatively impact their social standing, self-esteem, and overall happiness.

Categories of Luxury Goods (High-end vs Lower-end)

Here we are comparing two individuals and their incomes from buying the same luxury product, but based on different spectrums of the luxury market. This is a direct result of their respective income levels, which indicate the level of luxury they can afford.

Take a look at *Figure 3*. We see two social classes, and they both have bought a watch. The middle-class individual bought it from a brand like Seiko, which has a respectable reputation and quality at more accessible price points. The high-class individual gets his watch from Rolex, which is known for its high status and luxury.
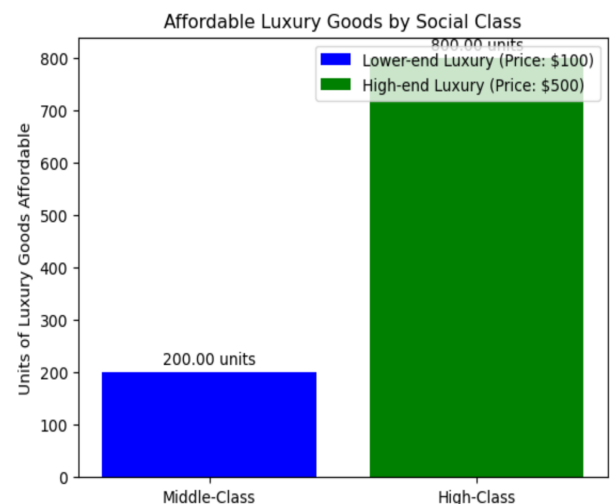

Figure 3. Luxury Goods by Social Class Affordability Histogram

Speaking of social and psychological impacts, the middle class may admire the quality and status associated with high-end brands, but knowing that they can only afford an affordable option may make them feel more content. However, they feel a sense of lower status when in the presence of a higher-class individual or comparing their possessions to their own. And this shows us how their level of happiness might be mixed, as any satisfaction they may get from owning a Seiko watch may be replaced by feelings of envy or longing for high-end luxury.

On the other hand, the high class may perceive that owning a luxury watch such as a Rolex enhances their status and self-esteem in society. And this is a show of wealth, status, and success that may potentially lead to them looking down on individuals with less expensive items. Their ability to purchase unlimited luxury products, whether high-end or low-end, could lead to greater levels of satisfaction and happiness, directly derived from the quality and social prestige they may offer.

Marco-markets

Let us consider the following utility function:

$$U(Q, P) = \frac{a}{Q^\gamma} + b \cdot ln(P) \quad (1)$$

where a and b are significance parameters, and P stands for price. Notice that we set $\frac{a}{Q}$ that utility decreases as Q increases and $ln(P)$, a logarithmic relationship for price. The choice for this was to present one important concept in Veblen goods: utility gained from status and prestige as price increases, but at a decreasing rate instead of increasing. Moreover, let us add a power relationship to scarcity quality so as to enhance and have the ability to modify for macro-environment discussion.

Unlike most goods, in the case of Veblen Goods, the higher the price of the goods, the more utility the consumer gains. It is often easy to mix up the concepts of Veblen goods and normal goods. It is indeed true that Veblen goods are considered normal goods in consumer theory since, as income rises, consumption of Veblen goods also rises. However, in *Figure 4*, let us use a utility graph to present its key differences. As the quantity of goods increases, consumers gain more utility with normal goods, whereas with vegetable goods, it is the opposite. This highlights two significant key points on Veblen goods that will be used throughout our paper: first, prestige and status of the goods are key factors holding Veblen Goods' value; second, quantity removes scarcity and thus is another key factor holding Veblen Goods' value. Engel's curve is another simple illustration to start off our topic. We can see on *Figure 5* that for inferior goods, as we earn more, the quantity of inferior goods we consume decreases. The reverse is true for both Veblen and normal gods. However, Veblen goods are steeper, so the quantity consumed will not reach as much as normal goods such as necessities.
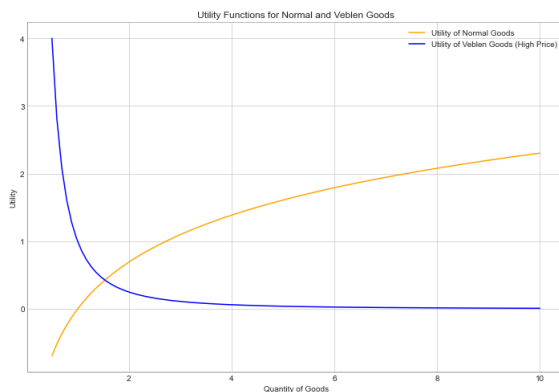

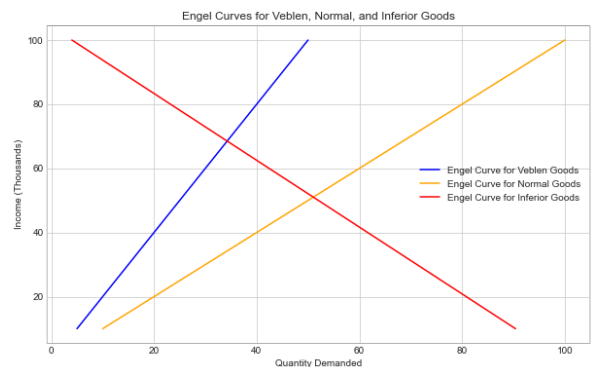*Figure 4.* Utility Function. Normal vs. Veblen Goods

Figure 5. Engel Curve. Veblen, Normal, Inferior Goods

Case 1: Individuals with Two Goods

So far, all of the previous models have been generalized to explain luxury goods as a whole. Let's explore an individual case illustration of maximizing the utility function and elaborating on basic consumer theory using our Veblen Goods utility function. This will allow us to quantitatively demonstrate our previous findings.

$$U(x, y) = x + ln(y) \quad (2)$$

, with luxury goods (x), we remove the diminishing marginal utility to amplify their impact on satisfaction and weight, while for normal goods (y), we consider the diminishing marginal utility for each additional consumed good in this individual case. The assumption is made that any goods of purchase y weigh less than luxury goods of purchase x, as the more capability they can purchase, the better goods, and luxury goods will be preferred. Below, we also have an example of an individual's budget constraint

$$max\ U(x) = x + ln(\frac{1000 - 200x}{7})$$
$$s.t.\ 1000 = 200x + 7y$$

Given the utility function, we first express y in terms of x, including the budget constraint, with substitution. Mathematically, we can differentiate $U(x)$ with respect to x, find its first derivative, set the set to zero, and then solve for x, followed by y. We also use Newton's Maximiser to test accuracy. The optimal consumption choices for x and y with our code generate optimal values: x ≈ 4.00, y ≈ 27.58, while setting the initial guess for maximisation at 4 because our mathematical calculation already provides a better expected range for x.
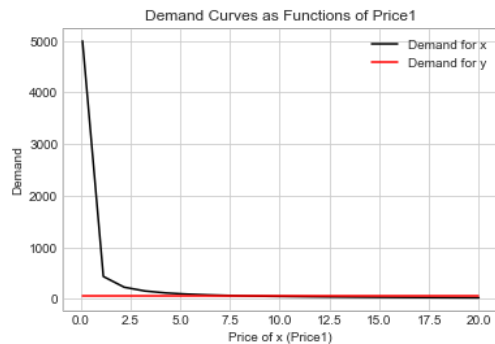

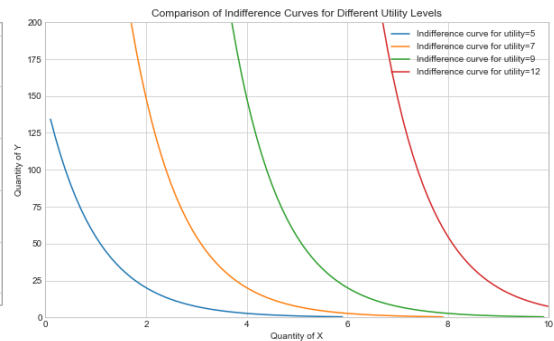Figure 6. Demand Curves based from *Equation (2)*.

Figure 7. Indifference Curves at Different Utility Levels

After we have derived the demand curves (see *Figure 6*) and indifference curves (*Figure 7*), what is this individual's optimal bundle choice given our budget?

We present the optimal choice for this individual given his budget constraint with optimal values: x ≈ 3.10, y ≈ 54.29. Note that the comparison is between a normal

good and a luxury good. The discussion now moves on to an introduction to a contemporary phenomenon in the luxury market: counterfeits and duplicates.

Let us discuss two scenarios: 1. What would happen to this individual's optimal choice? 2. Is there a substitution effect here?

We have already determined the best option for a genuine luxury bag (refer to *Equation 2*). We set the utility function for counterfeit goods to logarithmic character because it is considered a normal good. The more we can afford, the more we would like to purchase, but at a diminishing utility rate.

$$U_f(x_f, y) = ln(x_f) + ln(y) \quad (3)$$

We assume the same budget constraint as before for real luxury goods (note x_r.). For the counterfeit, the price is much lower.

$$1000 = 200x_r + 7y \quad (3.1)$$
$$1000 = 10x_f + 7y \quad (3.2)$$

The new found optimal choice after the change for good from x_r to x_f is presented with optimal values: x ≈ 51.34, y ≈ 69.51.

In *Figure 8*, we can see that the steepness of the budget line highlights the value of luxury goods. This illustrates the significant opportunity cost associated with replacing normal goods with genuine luxury goods, while the opposite is evident for counterfeit goods. This
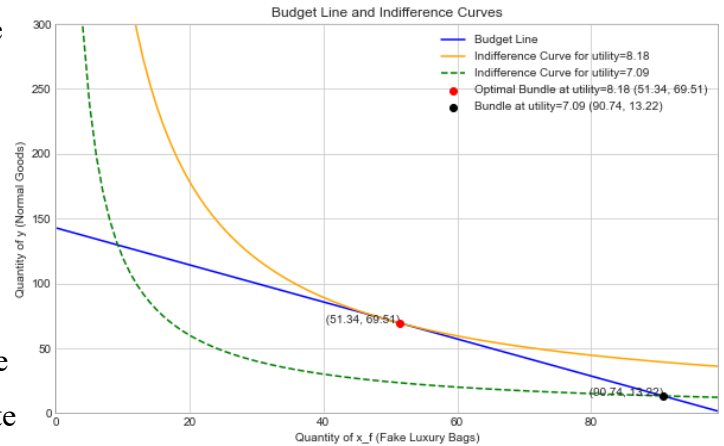

Figure 8. Budget Line with Fake Luxury Goods to Original Utility Level

in turn shows the economic implications; the optimal choice for a customer in the middle class is to be unwilling to pursue such high-priced goods nowadays (KPMG International, 2022).

Case 1-1: Counterfeits and Substitution Effect
In this case, we have already discussed our individual optimal choice. In short, this type of counterfeit goods can actually be considered a type of price change in luxury goods. Given the globalisation and spread of luxury manufacturing, distinguishing real from fake goods in the luxury industry has become increasingly challenging (Donadio, 2010).

In this context, we can conceptualise this phenomenon as a shift in prices for the targeted audience members who desire luxury goods but cannot fully afford them. However, if they manage to accumulate sufficient savings, they can still afford the price range of genuine luxury goods. In other words, the emergence of counterfeits can be considered a price change in good x, and we can thus highlight a possible substitution effect.

Figure 9 illustrates that, prior to the introduction of fake goods at a price of x, the optimal bundle for an individual with an income of $1,000 was x ≈ 2.50, y ≈ 71.43. At this optimal bundle, the individual can achieve a utility of ≈ 5.185. After the introduction of fake goods x of price, which was from 200 per x to 10 per x, we observe the
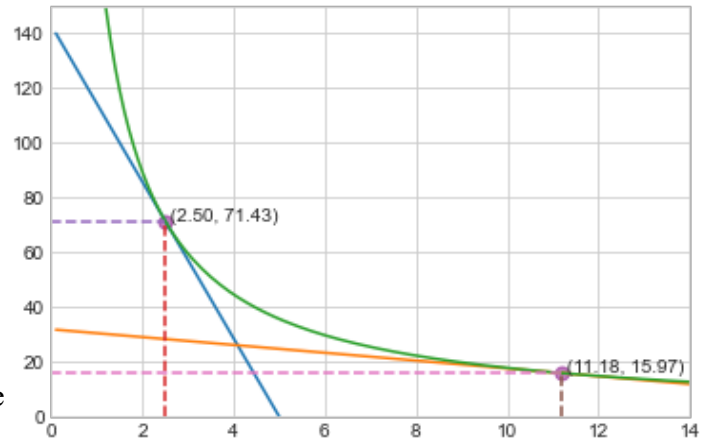

Figure 9. Change in Price for Good x in Luxury and Substitution Effect

bundle move along the indifference curve to x ≈ 11.18, y ≈ 15.97. We take a closer look at the Slutsky equation, partially on the substitution part, and we can see there is an 8.68 difference in its choice of goods, x.

$$\Delta x^s = x\left(p'_{new} - m'\right) - x(p_{old} - m) \qquad (4)$$
$$= 11.18 - 2.50$$
$$= 8.68$$

So far, we have seen a simple illustration of an individual's optimal choice between luxury and normal goods. Thus far, we can draw several conclusions: First, similar to normal goods' behaviour, Veblen and luxury goods present themselves in a much more extreme and drastic way. Second, consumers are often willing to have a high marginal rate of substitution for Veblen goods. Each additional unit of purchase for Veblen Goods is willing to give up a high number of units of goods while remaining at the same level of utility.

Case 2: Different Incomes and Price Effects

Let us now focus our discussion on comparing the impact of higher budget constraints with the initial budget constraints for Veblen goods. This approach will help to illustrate how different levels of income affect consumption choices between luxury goods and possibly common or inferior goods.

In real life, marginal effects often impact high-income individuals when they purchase Veblen Goods, so we modify *Equation 2* to

$$U(x, y) = 0.8 \cdot ln(x) + 0.2 \cdot ln(y) \qquad (5)$$

We raise the initial budget constraint to 0.8 for x (luxury goods), which is due to the fact that higher-income people tend to have more disposable income to allocate to the purchase of luxury goods. This is because higher prices can also lead consumers to perceive the product's quality as higher. This perception may influence their purchasing decisions, especially when the increase in cost is minimal compared to their disposable income.

To discuss different income effects, let's set up a higher budget constraint:

$$5000 = 200x + 7y \qquad (5.1)$$

Combined with *Equation 5* and Budget *5.1*, as before we use Newton's Maximiser in Python to calculate:

$$U'(x) = \frac{0.8}{x} - \frac{40}{5000 - 200x} \qquad (5.2)$$

which give us the optimal values: $x \approx 20, y \approx 142.86$.

Contrasting the middle class with the high-income group in terms of utility preferences: the middle class may prioritize basic consumption $x + ln(y)$, while the high-income group may focus on consumption proportional satisfaction $0.8 \cdot ln(x) + 0.2 \cdot ln(y)$.
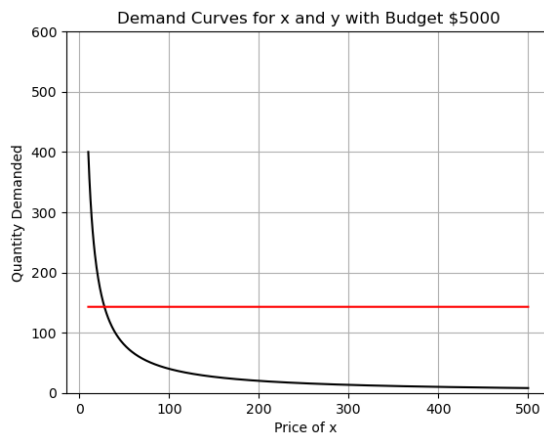

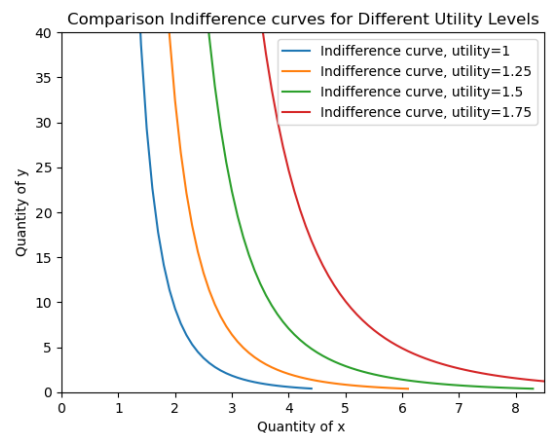*Figure 10.* Demand Curves with Budget of $5000

Figure 11. Indifference Curves at Different Utility Levels

As discussed in Case 1, the middle class exhibits a steeper indifference curve, indicating a drastic reduction in their consumption of one good to increase their consumption of the other. According to the graph, the higher income groups have a flatter curve, suggesting that they can adjust their consumption between x and y while sacrificing less of one or the other.

When we compare two different classes using the Budget Line and Indifference Curve at the Optimal Bundle, It is easy to see that the middle class is more sensitive to price changes due to their narrower budget line. In contrast, the upper-income group is willing to consider a wider range of prices, and they are less sensitive to price changes, which is typical of increased wealth.
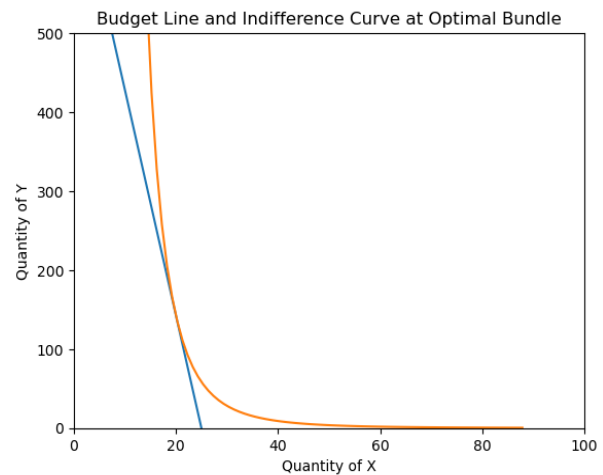

Figure 12. Budget Line and Indifference Curve for Wealth

After setting up a different indirect utility function in Python to determine the income level of 5000 when the x price rises to 500 and the y price stays at 7, This leads to a new income of 10406.915. Using the new income, we try to make a plot with the new budget line:

The right graph's various budget lines show the quantity of each good (x and y) available at various income levels and prices. The budget lines' steepness mirrors the representation of x in this scenario. A steeper line implies a higher price, which may not deter high-income consumers but rather attract them because of the increase in perceived value.
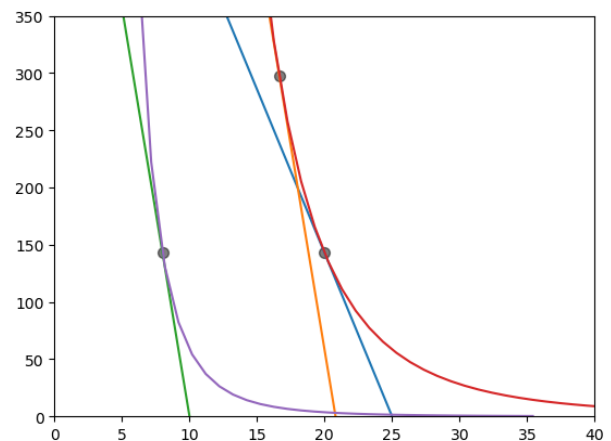

Figure 13. The Wealth in Total Effect

The plotted indifference curves show combinations of x and y that yield the same utility. Their positions and shapes will

reflect consumer preferences for Veblen products. And the points marked in the graph are optimal consumption bundles. The shift in the optimal consumption mix point and the increase in price X suggest that the higher income brackets are more inclined to maintain the same level of utility despite the rising cost of Veblen goods. Rather than seeking alternatives or drastically cutting back on another product's consumption to sustain the existing level.

As the price of Veblen goods rises, we find that the graphs cannot show a good representation of the typical nature of the Veblen goods due to the limitations of the 0.8 parameters we set in the model. In the current post-epidemic environment, the theories we have derived through modelling appear to be not well-rounded enough. Higher income brackets have shown greater resilience to risk in the face of high inflation and constant interest rate hikes by central banks. This is because interest rate hikes usually affect the cost of credit and disposable income, whereas the high-income class is less affected due to higher incomes and greater wealth accumulation. This is why luxury groups have been able to continue to grow their performance and stabilise their revenues during the epidemic, as well as in the post-epidemic economic environment. At the same time, high-income groups' stable spending during economic fluctuations has allowed many brands to rethink their brand positioning and raise prices in order to move closer to the high-income group.

Also, it is crucial for policymakers to understand the impact of price changes on the welfare of the luxury market. Although price increases seem to have less impact on higher-income consumers, policymakers should consider the broader implications for economic inequality and resource allocation.

The current analysis in Part I, based on utility function models, underscores the significant differences in luxury goods consumption between middle-class and high-class consumers. Middle-class individuals, often constrained by tighter budgets, typically opt for lower-end luxury items, while those in the high class, benefiting from substantial disposable income, prefer purchasing high-end luxury brands. This economic disparity not only shapes purchasing behaviours but also influences social perceptions and personal satisfaction across different socioeconomic groups. These findings are critical for marketers seeking to effectively target these distinct consumer segments, as well as for policymakers

seeking to address the underlying economic inequalities. This part contributes to a deeper understanding of how consumption patterns impact social dynamics and personal well-being. Next, we go into the reasons and economic welfare matters.

Part II: Market Dynamics

We focus heavily on the discussion throughout the paper, from individuals to different income groups. We can observe a distinct concept here: higher income groups present a very odd and different utility relationship. We are thus now moving on from utility to willingness to pay (WTP). With this, we can observe the groups' consumer surpluses shown as *Figure 14*, with

$$CS_a = WTP - Price$$

Consumers would not purchase a good that could result in a negative surplus; however, it's interesting to note that the wealthy tend to have a consumer surplus that is somewhat closer to reality state of depiction
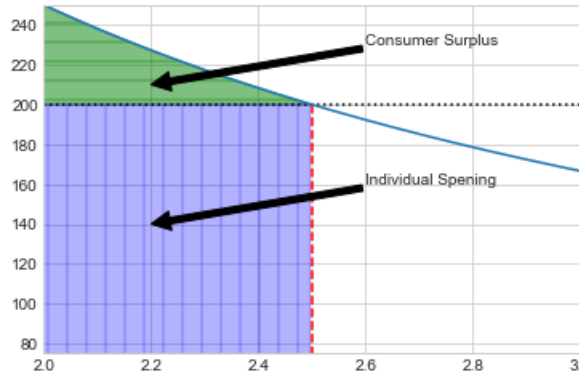
$$WTP * status_{item} - Price$$

Figure 14. Consumer Surplus with Veblen Demand

when it comes to luxury purchases. Note that we are only discussing consumer demand here. As the price rises, their WTP increases. This is the strange phenomenon we are witnessing in the luxury goods market after the pandemic. (Deloitte, 2020) The graph illustrates a normal purchase of luxury items when it comes to consumer surplus. However, in order to adjust the model to fit modern phenomena, we added the $status_{item}$ parameters. The concept stems from the simplicity of consumer surplus: if a luxury item costs 20 dollars, but the value of the bag to consumers is 100 dollars, then we have an 80-dollar consumer surplus. If each item has different status powers that are associated with it, this would bring out much more than the consumer surplus. The luxury bag currently costs 20 dollars, but consumers are willing to pay more than the current price of 100 * $status_{item}$ dollars. This explains why modern luxury companies are able to raise their prices indefinitely, while simultaneously seeing an increase in sales. However, from a deeper theoretical perspective, this provides a significant introduction to the concept of network externalities.

Externalities are usually the reason why markets fail to maximise total surplus; network externalities are associated with one's utility for a good that often depends on the number of other people's consumption. In terms of network externalities, we are now dealing with a significant case of the so-called bandwagon effect and the Snob effect. Usually, we assume each individual demand is independent of another.

However, in reality, at the social utility level, externality affects people socially and economically and can make each individual worse or better off. If too many people already own an ultra-luxury watch, the demand for this watch will diminish drastically due to its insignificance compared to other rare watches; this is categorised as a negative network externality. Corneo and Jeanne (1997b) suggest that the snob effect is most pronounced at the societal level when a limited number of elite members engage in the consumption of status goods. They also argue that the allure of a status good increases due to the bandwagon effect when the number of consumers hits a sufficiently high threshold. (Kovacs, 2015)

Therefore, as more people buy a particular status good, the greater the bandwagon effect becomes on a societal level. (Kovacs, 2015) This particular part can almost answer most of our questions as to why luxury goods do not follow the normal economic trend. We can see that the first half of our paper targeted consumers who were in bandwagon effect. It is a trending desire. Their quest for conformity stems from their risk-taking purchase. This could be the reason they are willing to save up to a hundred dollars to purchase one luxury item.

Case 3: Bandwagon and Snob Effect

We sampled the model from Krovacs (2015) in a more appropriate manner. We generate the following graph using the demand model.

$$Demand^{from\ i\ to\ j} : Quantity = \alpha \cdot Price + \beta \cdot total\ Q^{from\ i\ to\ j} \quad (6)$$

In *Equation 6*, we exemplified the Krovacs added parameters α, β which are price sensitivity parameters and network externalities at the individual level to total quantity demand in the market Q parameter. (Krovacs, 2015)

This provides an explanation for the majority of the demand curves discussed thus far. The snob effect (see *Figure 15; J.Singh, 2015*) was a significant reason behind the steep decline in our demand for status goods. Our paper delves into this
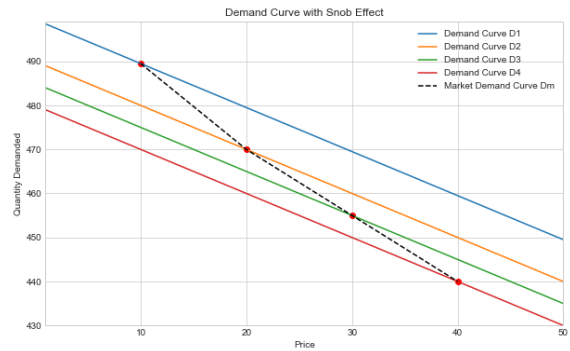

Figure 15. Snob Effect and Negative Externality (Q. per thousands)

situation extensively and serves as the foundational discussion on Veblen goods. For most of the status goods in the market, the snob effect outweighs the bandwagon effect, leading to an increase in utility level. A higher price leads to an increase in demand, particularly among consumers with significant buying power (a parameter < 0, indicating relatively low price sensitivity to purchasing goods). (Krovacs, 2015) These consumers often purchase status goods at high prices early in the product's lifecycle, when the snob effect dominates the bandwagon effect.

Thus, for the higher-income class, the snob effect dominates the bandwagon effect. This leads us to the second intriguing measurement: price sensitivity. The bandwagon effect may significantly influence the middle class's purchase of status goods. This comes after the snob effect, as it starts to wear off. The stronger the snob effect is, the more inelastic the market demand. The price sensitivity of different income groups influences this. Reversely, the more dominant the bandwagon effect takes charge, the more elastic we see in market demand. This is a chain reaction, or tug of war, so-to-speak. After the pandemic, the snob effect slowly dimmed down, and the middle class obtained an extra sum of savings that enabled them to pursue status goods. This reduced their sensitivity to price during the pandemic, leading to a subsequent period where the bandwagon effect

dominated the market. In the luxury market, middle-class consumers saw an all-time high percentage of sales. (J.P. Morgan, 2023; Ryan, 2024) As a result, we can first answer one key fact we have been searching for: why do firms such as Richemont, LVMH, and Kering Group increase the retail price for status goods instead of lowering their prices? Their target audience is aiming for the top 1% contribution, i.e., loyal customers. This is due to the inelastic market demand for the less price-sensitive consumer group.

Case 3-1: Welfare and Negative Externality
In *Figure 16*, we have generated this graph to conclude the effect on status goods.
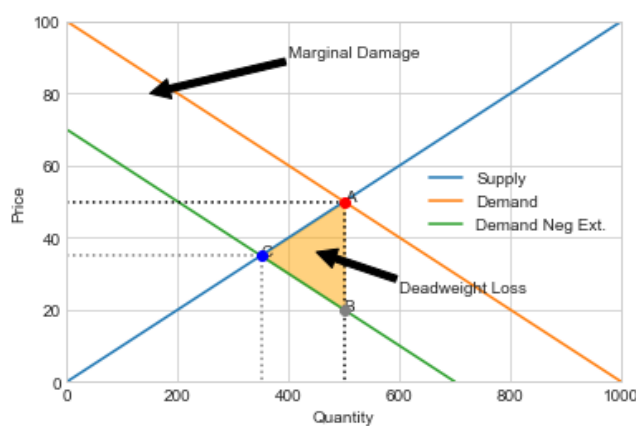

Figure 16. Snob Effect and Economic Welfare

We think of the snob effect as a negative externality. Negative externality will have an effect on market equilibrium. In other words, if no one purchases luxury goods today, social welfare will remain equal, as shown on the graph $\Delta 100toAto0$. However, the graph above elucidates why the luxury goods consumption market's negative externality prevents price and quality from reaching equilibrium on the free market. Each purchase of luxury goods will generate marginal damage to the social market. In other words, the social marginal utility for producing each quantity of this product is lower than the market utility. When we take this into consideration, we see that the distribution of goods moves from point A to point C. The best price dropped, as did the quantity. When the consumption of luxury goods decreases from quantity point A to quantity point C, the economic surplus suffers a deadweight loss due to the marginal damage caused by the goods' lower social utility compared to their market value. In short, the combination of lower social utility and overproduction creates a triangle in ΔABC.

Thus, as *Figure 17* presents, we can see that each consumption of wealth, status, or luxury goods actually makes the social utility as a whole worse off. To put it into perspective, the movement from point A to point B is a chain reaction that contributes to the increased demand for luxury goods, resulting in the unique and distorted market we are currently experiencing.
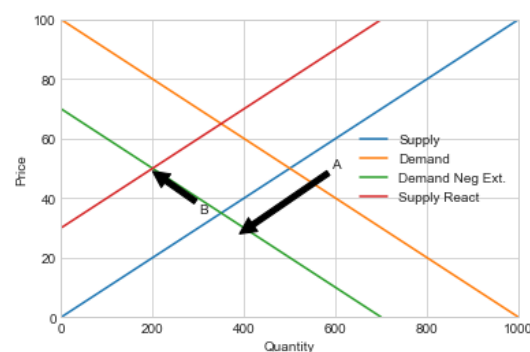

Figure 17. Reaction in Demand and Supply for Status Goods

We start with movement A. At point C, the market's marginal damage to consumers prompts producers to reduce their output. Upon reaching point C, suppliers increased the price, as indicated by movement B, to secure a higher profit and amplify the snob effect. This serves as a conclusion and findings for our paper, as it suggests the reason behind this status of goods in the current economy. Most people are worse off due to the negative externality of luxury goods consumption; however, without any regulation, the economic circle between the wealth and supplier of luxury goods is exacerbating without a proper scheme for dealing with the big marginal damage being created during the industry.

Conclusion

Throughout the paper, we strive to understand the behaviour of luxury goods. The paper as a whole discussed three general aspects of this topic: first, one individual's choice of utility in luxury consumption; second, two individuals from one lower income level and one higher income level and their differences in luxury consumption; and last, a possibility analysis for the reasons of the current economic concept in the luxury industry. During the model initiation and derivation, we certainly encountered a fair share of problems throughout the paper. One is to find the correct initial guess for our optimization and maximization. Due to the differences in each model, we encountered multiple negatives in derivatives or zeros by division. Mathematical calculations were mainly the biggest obstacles as we thrived to generate an accurate plot and numerical analysis for luxury goods. As a result, the discussion in this paper appears to lead to a deeper understanding of the literature and models used. Upon realizing and creating the substitution, income, and total effect for the higher-income group, we found that the actual situation differed significantly from our model, necessitating frequent adjustments throughout the paper. We added a significant amount of complexity to the paper, both theoretically and model-wise. However, the complexity of luxury goods sparked our desire to dive deeper into this approach numerically and present the findings graphically.

Appendix A. Reference

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