

# ***Applications of Analytical Methods in Business Economics & Strategy: Part II, Microeconomics***

## **Final Assignment**

### **Introduction**

The purpose of this study is to analyze a product experiment to identify the characteristics influencing consumer preference. This study is focused on television specifically. . The experiment was conducted using a questionnaire, from which the responses were gathered before we moved on to the analysis. The goal of this analysis is to determine which attributes consumers value the most when buying a TV and what is their willingness to pay for each feature. Next, market shares were determined by simulating a market with two different customer profiles.

### **The experiment**

The experiment took place in Greece, and 60 people were requested to take part in an economic experiment that lasted 2-5 minutes and was administered in the form of anonymous questionnaires. The questionnaires were distributed via social media, and all participants were notified that they were participating in a study for the course Applications of Analytical Methods in Business Economics & Strategy. The questionnaire was divided into 3 blocks, each of which had 3 times the same question with 4 different options. The questionnaire was created from the following attributes: size, functions-features, analysis and price. The levels of the attribute "size" were 43, 65, and 75 inches. This relates to the size of the screen and the entire TV, the larger the inches, the larger the TV. The "functions-features" attribute featured levels HDR, HDMI 2.1, and smart TV levels. A "*smart TV*" is a form of TV that can access the Internet and "run" programs like those on a computer or tablet. On a TV screen, *HDR* (High Dynamic Range) enhances the contrast between extremely dark and extremely light colors. Using HDR technology, you can view everything on screen as it was intended to be seen with accurate colors, shadows, and detail. The *HDMI 2.1* standard also enables a number of higher frame rates and video resolutions, including 8K and 4K, as well as resolutions up to 10K. The next attribute is the resolution and it has the levels HD, Full HD and 4K. HD (high definition) is a display resolution measuring 1280 x 720 pixels. Resolution explains how many pixels a display has in width x height format (the more pixels a display has, the sharper its image quality). These days when we say HD we're talking about what gets called 'Full HD', a resolution which measures 1,920 x 1,080 pixels, often called 1080p. "4K" refers to horizontal resolutions of around 4,000 pixels. The "K" stands for "kilo" (thousand). As things stand, the majority of 4K displays come with 3840 x 2160 pixel (4K UHD TV) resolution, which is exactly four times the pixel count of full HD displays (1920 x 1080 pixels). And finally the attribute "price" has 3 levels which are 200, 500 and 800 euros.

The questionnaire was as follows:

### Block 1

**1. Which TV would you choose?**

- a) Smart TV, 75 inches, resolution Full HD, price 800 €
- b) HDMI 2.1, 75 inches, resolution HD, price 800 €
- c) HDR, 43 inches, resolution Full HD, price 200 €
- d) None of the above

**2. Which TV would you choose?**

- a) HDR, 75 inches, resolution 4K, price 200€
- b) HDR, 75 inches, resolution 4K, price 500€
- c) HDR, 65 inches, resolution HD, price 500 €
- d) None of the above

**3. Which TV would you choose?**

- a) HDMI 2.1, 75 inches, resolution HD, price 500 €
- b) HDMI 2.1, 43 inches, resolution 4K, price 200€
- c) HDR, 43 inches, resolution HD, price 800€
- d) None of the above

### Block 2

**1. Which TV would you choose?**

- a) HDR, 65 inches, resolution HD, price 800 €
- b) HDMI 2.1, 65 inches, resolution 4K, price 500 €
- c) HDR, 75 inches, resolution HD, price 800€
- d) None of the above

**2. Which TV would you choose?**

- a) HDR, 43 inches, resolution Full HD, price 500€
- b) HDR, 65 inches, resolution HD, price 200€
- c) HDMI 2.1, 75 inches, resolution HD, price 200€
- d) None of the above

**3) Which TV would you choose?**

- a) HDMI 2.1, 43 inches, resolution 4K, price 800€
- b) Smart TV, 65 inches, resolution 4K, price 800€
- c) Smart TV, 75 inches, resolution Full HD, price 500€
- d) None of the above

### Block 3

#### 1. Which TV would you choose?

- a) Smart TV,43 inches, resolution HD, price 200 €
- b) HDR,43 inches, resolution Full HD, price 800€
- c) Smart TV,65 inches, resolution 4K, price 200€
- d) None of the above

#### 2. Which TV would you choose?

- a) HDMI 2.1,65 inches, resolution Full HD, price 200€
- b) Smart TV,75 inches, resolution Full HD, price 200€
- c) HDMI 2.1,65 inches, resolution Full HD, price 800€
- d) None of the above

#### 3. Which TV would you choose?

- a) Smart TV,65 inches, resolution 4K, price 500€
- b) Smart TV ,43 inches, resolution HD, price 500€
- c) HDMI 2.1,43 inches, resolution 4K, price 500€
- d) None of the above

### The Analysis

	<i>Block</i>	<i>QES</i>	<i>RES</i>	<i>ACS</i>	<i>65</i>	<i>75</i>	<i>HDMI</i> <i>2.1</i>	<i>HDR</i>	<i>Full</i> <i>HD</i>	<i>4K</i>	<i>Price</i>	<i>idx</i>
1	1	1	TRUE	1	0	1	0	0	1	0	800	101:1
2	1	1	FALSE	1	0	1	1	0	0	0	800	101:2
3	1	1	FALSE	1	0	0	0	1	1	0	200	101:3
4	1	1	FALSE	0	0	0	0	0	0	0	0	101:4
5	1	2	TRUE	1	0	1	0	1	0	1	200	102:1
6	1	2	FALSE	1	0	1	0	1	0	1	500	102:2

Table 1.New Format Long-Panel

Table 1 displays the first six observations made by the new Long Panel format. This contributed to the estimation of the Multinomial Logit , the outcomes of which are displayed in Table 2. The levels 65 inches and 75 inches, HDR, Full HD, 4K resolution, and the Price attribute appear to be statistically significant.

<i>Levels/Attribute</i>	<i>Coefficient</i>	<i>P-Value</i>
<b>65 inches</b>	1.331	2.17E-06
<b>75 inches</b>	1.563	1.81E-09
<b>HDMI 2.1</b>	-0.341	0.153191
<b>HDR</b>	-0.960	0.002364
<b>Full HD</b>	1.806	8.17E-10
<b>4K</b>	1.279	2.61E-06
<b>Price</b>	-0.002	5.14E-07

Table 2Multinomial Logit Estimation

<i>Levels</i>	<i>Willingness To Pay</i>
<b>65 inches</b>	540.3159
<b>75 inches</b>	634.5187
<b>HDMI 2.1</b>	-138.462
<b>HDR</b>	-389.9553
<b>Full HD</b>	733.4953
<b>4K</b>	519.4262

Table 3.Willingness To Pay

The Willingness to Pay for each attribute is shown in table 3. Willingness to pay, sometimes abbreviated as WTP, is the maximum price a customer is willing to pay for a product or service. When the value is positive, the respondent is willing to pay the amount indicated for each attribute, however when the price is negative is the opposite. More particular, we can observe that in this instance, consumers are more willing to pay more for features like 65 inches, 75 inches, Full HD, and 4K than they are for features like HDMI 2.1 and HDR which in this case have to "pay" them to have these traits.

	<i>Market Share</i>	<i>65 inches</i>	<i>75 inches</i>	<i>HDMI 2.1</i>	<i>HDR</i>	<i>Full HD</i>	<i>4K</i>	<i>Price</i>
<b>Option 1</b>	0.486	1	0	1	0	0	1	500
<b>Option 2</b>	0.342	0	1	0	1	1	0	700
<b>No choice</b>	0.172	0	0	0	0	0	0	0

Table 4.Market Share

Table 4 shows how the market would look with just three options. Out of total purchases of a customer of a product or service, what percentage goes to a company defines its market share. In other words, if consumers as a whole buy 100 TVs, and 40 of which are from one company, that company holds 40% market share. Option 1 appears to have the biggest market share, followed by option 2, and then No choice. The three options are:

**Option 1 is:** A 65 inches TV with HDMI 2.1 with 4K resolution at a price of 500 euros.

**Option 2 is:** A 75 inches TV with HDR with Full HD resolution at a price of 700 euros.

**Option 3 is:** No choice.

**Link for the Questionnaire:** [https://docs.google.com/forms/d/1Xa14uWoKiu80z-0WkEZakkeHoZleSoY2I7nqtU9XIUs/edit?fbclid=IwAR1ccdLDuQgDMFRr8MTLMDqeZPMk5V9H0zzGD\\_aZl2PbePGXUXHcIQ1bIIY#response=ACYDBNi0-C5PmpM97w6037JBM1LFE16vMI90PfXcRfPqX6tZXW70JBwXMowG8RF1LIV94e0](https://docs.google.com/forms/d/1Xa14uWoKiu80z-0WkEZakkeHoZleSoY2I7nqtU9XIUs/edit?fbclid=IwAR1ccdLDuQgDMFRr8MTLMDqeZPMk5V9H0zzGD_aZl2PbePGXUXHcIQ1bIIY#response=ACYDBNi0-C5PmpM97w6037JBM1LFE16vMI90PfXcRfPqX6tZXW70JBwXMowG8RF1LIV94e0)

**CODE:****To create the questionnaire:**

```
library('support.CEs')

rm<- rotation.design(attribute.names = list(leitourgia= c('smart tv','Hdmi 2.1','HDR'),
                                             inches = c('fourtyrthree','sixty five','sevanty five'),
                                             resolution= c('HD','Full HD','4K'),
                                             Price= c('200','500','800')),

                     nblocks=3,
                     nalternative = 3,
                     randomize = TRUE,
                     seed = 123)

rm$alternatives$alt.1
rm$alternatives$alt.2
rm$alternatives$alt.3

Questions<- questionnaire(choice.experiment.design = rm,
                           common = NULL,
                           quote = TRUE)
```

**For the analysis:**

```
library("mlogit")
library("dfidx")
library("Formula")

res <- data.frame(ID = c(1:60),
```



```

-coef(ml.tv)[2]/coef(ml.tv)[7]
-coef(ml.tv)[3]/coef(ml.tv)[7]
-coef(ml.tv)[4]/coef(ml.tv)[7]
-coef(ml.tv)[5]/coef(ml.tv)[7]
-coef(ml.tv)[6]/coef(ml.tv)[7]
op1=c(1,0,1,0,0,1,500)
op2=c(0,1,0,1,1,0,700)
op3=c(0,0,0,0,0,0,0)
simulation=matrix(rbind(op1, op2,op3), nrow = 3, ncol=7,
                  dimnames = list(c("Option1","Option2","no choice"),
                                   c("sixty.five","sevanty.five", "Hdmi.2.1",
                                     "HDR", "Full.HD","X4K","Price"))))
utility=simulation%*%ml.tv$coef
utility
share =exp(utility)/sum(exp(utility))
cbind(share , simulation)

```