BUMK742: Advanced Marketing Analytics

Project #5: New Product Development for Philips Coffee Maker

Group #1
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Honor Pledge:
We pledge on our honor that we have not given or received any unauthorized assistance on this assignment.

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Executive Summary

We used conjoint analysis to determine the optimal coffee maker attributes for Philips. Five features were measured with the multinomial logit model using GLIMMIX. Based on our analysis results, we determined that there are two potential segments. We designed one optimal product for each segment, and the detailed level of each feature can be found in key findings. We recommend launching the ideal product for segment one to the whole market because we estimate segment one takes up 74% of the entire market and we don't have data on production cost and do not know which people are in which segment, so we cannot recommend launching different products. The market share of this product in segment one and in segment two will be 68.8% and 3.3% respectively, and the overall market share will be 51.8 %.

Introduction and Background

Philips is a famous manufacturing brand for coffee makers and it is always looking to optimize its products to remain competitive within its industry. Yet, its market share has been declining in recent years, which is the outcome of not updating the products and the increasing number of unsatisfied consumers. Launching new products or modifying them often requires a large number of resources, making it a great risk. Launching a new product will build up costs such as research and development, engineering, and test marketing costs. It also leads Philips to be susceptible to a number of risks, as consumers' criteria and standards for coffee maker attributes can be subject to changes in the market, and new product failure rates are quite high in general.

We will be working with Philips and utilizing conjoint analysis to determine the opportunities that are present for new products, along with forecasting the market shares of these new products with existing ones to increase customer satisfaction, gain more competitiveness, and reduce risks.

Data and Methodology

The data we used was acquired from a conjoint analysis study on the coffee maker for the new product of Philips, an electronics manufacturer. Five features of coffee machines were included: Brand, Carafe Capacity, Price, Water Filter, and Auto-Grinder. Most of the features have three levels, but water filter and auto-grinder only have 2 levels (yes or no). Such features will be used as product attribute level variables through the effect coding method to define each feature's impact on customers. Moreover, consumers' purchase intention is different among various kinds of brands, so we used three brands in our study, Philips, Krups, and Cuisinart. We analyze brand name using two dummy variables, "Philips" and "Krups". In each of the dummy variables, three brands are included by the effect coding method.

In the study, we chose five current major products in the coffee maker market with the Philips, Krups, and Cuisinart brands to construct 16 product profiles. Then, we made eight choice sets, each of which has three different product profiles for respondents to choose from. To ensure every choice set has a common benchmark, we used a certain product profile (Philips, 5 cups, $79, with a water filter, without an auto-grinder) as every choice sets' baseline alternative. In addition, we separated respondents randomly into groups from a total of 185 respondents in this study. Each group received different choice sets and they selected their preferred product

profile in each choice set. Finally, they also needed to make a decision among all the eight choice sets. Overall, we got 1,480 observations for the dataset.

Since we were not certain whether there are different segments with different preferences, we conducted mixture multinomial logit models using GLIMMIX to determine the number of segments, as well as the characteristics of each segment. Firstly, we use GLIMMIX to determine that two segments are the most appropriate distribution with the lowest BIC/CAIC value (Figure 1). Then we ran the data with two segments 10 times and found out the parameters with the lowest BIC value (Figure 2 and 3). Such parameters will help us to evaluate the importance of product attributes in each segment and also assist us to recommend the product improvements for our client Philips.

Key Findings

According to Figure 1, the red line (CAIC, BIC) goes down from one segment into two segments and then goes up increasingly. This would indicate that the two segment solutions are the best. In Figure 2, BIC is the lowest compared to other models, and entropy is 0.886, which is relatively high, which means the models are separated.

Based on the results from GLIMMIX, there are two different segments with different parameters (Figure 3). For segment 1, the p-value of every level of each feature is below 0.05, which means they are significant. Krups-1 is slightly above 0.05 (p=.051), but we consider it significant for this analysis. Specifically referring to brands, consumers prefer Philips to Cuisinart and Cuisinart is over Krups because the coefficient of Philips is higher than that of Cuisinart (0-0.178-(-0.194)=0.016), and Krups. The only positive parameter for capacity is 15 cups, which means they prefer it and have negative feelings about the other two. Segment 1 does not want a coffee maker with a water filter, but they would react positively to an auto-grinder. The positive estimate of grinder indicates that this feature increases the probability that people would choose coffee makers that have an auto-grinder. This probability is much higher than the probability in segment two. For segment two, the only significant features are capacity and grinder as well as the price level of $79. Consumers in segment 2 regard other features as important. In terms of the significant attributes, they prefer the capacity of 5 cups to 10 cups and do not like 15 cups. Also, they would like the price to be $79 instead of $99. In addition, consumers in this segment prefer coffee makers without an auto-grinder (see Figure 4).

For segment one, the optimal product would be a Philips coffee maker with 15 capacity, a $59 price, no water filter and with an auto-grinder, which can lead to a high market share of 68.8% in segment one. The optimal product for segment two would be any brand, with 5 capacity, $79 price, no filter and no grinder. Although the coefficient of having a water filter is positive, the coefficient is not significant and making products with filters is much more costly, so we recommend the optimal product without water filter in segment two. Such product will lead the market share in segment two to be 36.8%. If Philips launched these two products for two segments, respectively, Philips would have 60.5% in the total coffee maker market. See Figure 4 for all of the estimate values (Other existing products' market share can be seen in Figure 5).

We calculated the revenues we would have if we had one or two products with market size of 185 (which is the size of the respondents). If we had only one ideal product of segment one or two, given our market share estimates we should obtain a revenue of $5670.81 by using the segment one ideal product, and $2344.68 for the segment two ideal product. If we had a product for each segment, then we would expect revenue of $7151.16. While we know this

would result in higher revenue, we do not know if this revenue increase of $1480.35 or $4806.47 would be greater or less than the cost increase from producing two different products (See Figure 9).

Since we don't know which segment people belong to, we can't tell how to launch different products, so we are launching only one product for the whole market. If we use the ideal segment one product for the whole market, then the product should take up 68.8% of the market share in segment one and 3.32% in segment two. This overall market share is higher than if we had exclusively used the ideal segment two product. Additionally, the estimated revenue (see Figure 9) would be higher by targeting segment one; therefore, we suggest exclusively designing the product for segment one.

As can be seen from Figure 6 and Figure 8, the market share can be very different with or without the new Philips product. The overall Philips market share increases from 13.2 % to 51.8% with the introduction of the new product. Krups's product 2 also will experience a growth from 12.2% to 12.6%. However, the overall share of the other three products: Krups' product 1 and both of Cuisinart's products will drop, from 12.2% to 11.2, from 52.3% to 17.9%, and from 11.2% to 6.8% respectively. The biggest impact of Philips new product is on Cuisinart (product 3), whose market share will plummet by 34.4%.

Conclusions and Recommendations

Our final recommendations include not adding a water filter but adding an auto-grinder. Moreover, if Philips would be open to modifying their product further, our analysis has shown that modifying the price to be $59 and the capacity to be 15 cups in addition to no water filter and adding an auto grinder would result in the highest overall market share while only selling one product. If Philips does not want to lower its price to $59 because this would cause too much of a loss in revenue, according to our analysis it would actually result in greater market share to set the price at $99 instead of $79, which should increase revenue drastically.

Although these recommendations will help Philips succeed in product development, there are some limitations that accompany the findings. The first limitation is that we are not aware of the production costs of the various products and various attributes of each product. While it would be optimal to offer a coffee maker for each segment, the only similarity in preferences is not wanting a water filter, so we cannot confidently recommend this because we do not know what the production costs would be for each attribute. By offering two separate products instead of just one we would expect to increase our overall market share from 51.8% with one product targeted for segment one to 60.5%, but due to the expected extra costs we assume that the small increase in market share would not offset the additional costs incurred.

The second limitation is that by having only two competing brands, this can limit the accuracy of the analysis in the real world. With more brands, a better comparison could have been made. In our analysis, Philips had the highest brand equity, so it may be useful for future analysis to include a high-end brand with greater brand equity for comparison.

Appendix

Figure 1: Plot of Statistics Against the Number of Segments

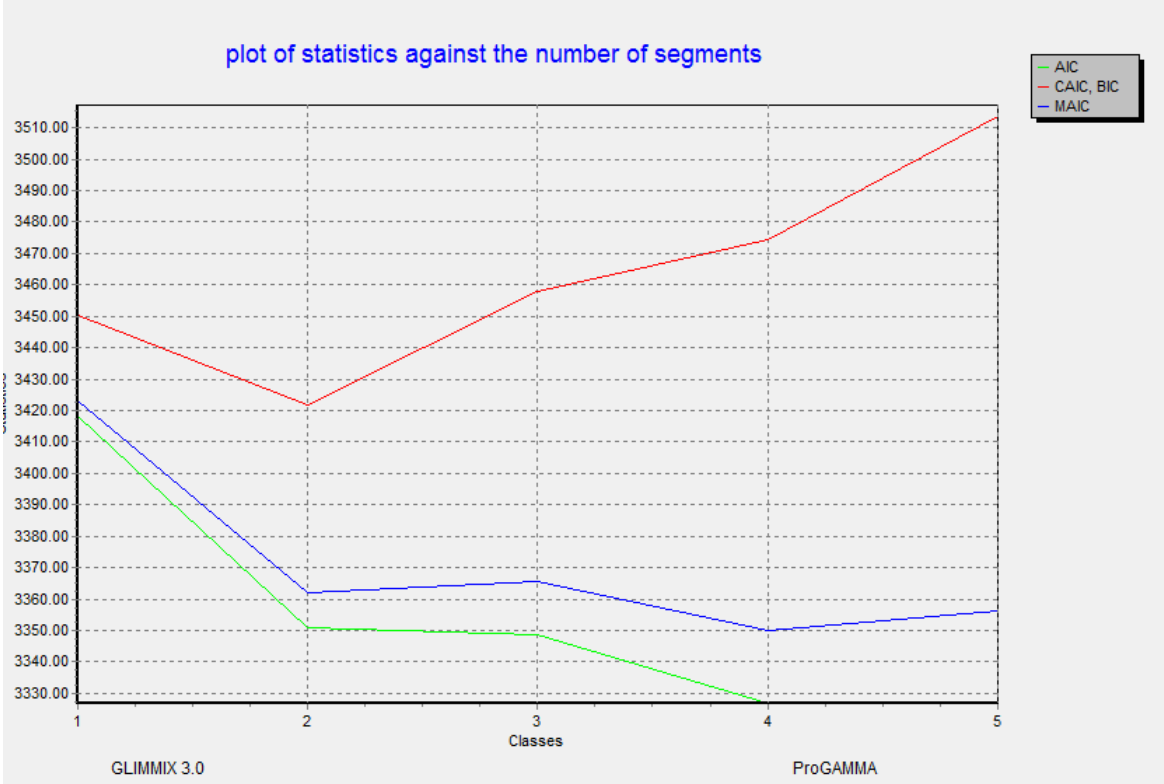

Figure 2: The lowest BIC value with 2 segments among 10 starts

```
#classes: 2 current: 0 startnr: 9 iteration: 27
LOG LIKELIHOOD =    -1346.526346235924000
AIC            =     2727.052692471848000
CAIC           =     2834.149247706737000
MAIC           =     2744.052692471848000
BIC            =     2817.149247706737000
Es             =        0.886014935222165
DF             =           17
R-square       =        0.107988
```

Figure 3: The parameter of the two segments with the lowest BIC value.

```
#classes: 2 current: 1 startnr: 9
Independent    Coefficient estimates         STD.ERR              T-value
 Philips-1                  0.178417              0.075672            2.357766
 Krups-1                   -0.194185              0.099537           -1.950879
 Capacity5-1               -0.172813              0.066073           -2.615471
 Capacity10-1              -0.321627              0.082270           -3.909396
 Price59-1                  0.190003              0.086378            2.199664
 Price79-1                 -0.276616              0.102368           -2.702178
 Filter-1                  -0.854565              0.126139           -6.774791
 Grinder-1                  1.119102              0.103314           10.832055

CLASS SIZE FOR SEGMENT  1 =    0.740568

#classes: 2 current: 2 startnr: 9
Independent    Coefficient estimates         STD.ERR              T-value
 Philips-1                  0.126941              0.152535            0.832209
 Krups-1                    0.031673              0.151560            0.208982
 Capacity5-1                0.413584              0.136361            3.033004
 Capacity10-1               0.270614              0.126548            2.138424
 Price59-1                  0.212705              0.114479            1.858029
 Price79-1                  0.571540              0.238908            2.392302
 Filter-1                   0.106796              0.238755            0.447304
 Grinder-1                 -0.697876              0.143310           -4.869690

CLASS SIZE FOR SEGMENT  2 =    0.259432
```

Figure 4: The importance estimate for all levels, including baseline levels

Segment 1		**Segment 2**	
Features	Estimates	Features	Estimates
Philips-1	**0.178**	Philips-1	0.127
Krups-1	**-0.194**	Krups-1	0.032
Cuisinart-1	**0.016**	Cuisinart-1	-0.159
Capacity5-1	**-0.173**	Capacity5-1	**0.414**
Capacity10-1	**-0.322**	Capacity10-1	**0.271**
Capacity15-1	**0.494**	Capacity15-1	-0.684
Price59-1	**0.190**	Price59-1	0.213
Price79-1	**-0.277**	Price79-1	**0.572**
Price99-1	**0.087**	Price99-1	-0.784
Filter-1	**-0.855**	Filter-1	0.107
No Filter	**0.855**	No Filter	-0.107
Grinder-1	**1.119**	Grinder-1	**-0.698**
No Grinder	**-1.119**	No Grinder	0.698

(Numbers in bold are significant and in red are levels we used for the optimal product)

Figure 5:

Market Share of Scenario 1: One Optimal Product for Each Segment.

SEGMENT 1	Product 1 (Krups)		Product 2 (Krups)		Product 3 (Cuisinart)		Product 4 (Cuisinart)		Product 5 (Philips)	
VARIABLE	X-VALUES	b*X	X-VALUES	b*X	X-VALUES	b*X	X-VALUES	b*X	X-VALUES	b*X
Philips-1	0	0.000	0	0.000	-1	-0.178	-1	-0.178	1	0.178
Krups-1	1	-0.194	1	-0.194	-1	0.194	-1	0.194	0	0.000
Capacity5-1	1	-0.173	0	0.000	0	0.000	-1	0.173	-1	0.173
Capacity10-1	0	0.000	1	-0.322	1	-0.322	-1	0.322	-1	0.322
Price59-1	1	0.190	0	0.000	-1	-0.190	0	0.000	1	0.190
Price79-1	0	0.000	1	-0.277	-1	0.277	1	-0.277	0	0.000
Filter-1	-1	0.855	-1	0.855	-1	0.855	-1	0.855	-1	0.855
Grinder-1	-1	-1.119	-1	-1.119	1	1.119	-1	-1.119	1	1.119
exp(b*X)		0.643		0.348		5.780		0.970		17.057
Probability/Market Share		0.026		0.014		0.233		0.039		0.688

SEGMENT 2	Product 1 (Krups)		Product 2 (Krups)		Product 3 (Cuisinart)		Product 4 (Cuisinart)		Product 5 (Philips)	
VARIABLE	X-VALUES	b*X	X-VALUES	b*X	X-VALUES	b*X	X-VALUES	b*X	X-VALUES	b*X
Philips-1	0	0.000	0	0.000	-1	-0.127	-1	-0.127	1	0.127
Krups-1	1	0.032	1	0.032	-1	-0.032	-1	-0.032	0	0.000
Capacity5-1	1	0.414	0	0.000	0	0.000	-1	-0.414	1	0.414
Capacity10-1	0	0.000	1	0.271	1	0.271	-1	-0.271	0	0.000
Price59-1	1	0.213	0	0.000	-1	-0.213	0	0.000	0	0.000
Price79-1	0	0.000	1	0.572	-1	-0.572	1	0.572	1	0.572
Filter-1	-1	-0.107	-1	-0.107	-1	-0.107	-1	-0.107	-1	-0.107
Grinder-1	-1	0.698	-1	0.698	1	-0.698	-1	0.698	-1	0.698
exp(b*X)		3.487		4.327		0.228		1.377		5.491
Probability/Market Share		0.234		0.290		0.015		0.092		0.368
Overall Probability/Share		0.080		0.086		0.177		0.053		0.605

Figure 6:

Market Share of Scenario 2:Segment One Product for Both Segments

SEGMENT 1	Product 1 (Krups)		Product 2 (Krups)		Product 3 (Cuisinart)		Product 4 (Cuisinart)		Product 5 (Philips)	
VARIABLE	X-VALUES	b*X	X-VALUES	b*X	X-VALUES	b*X	X-VALUES	b*X	X-VALUES	b*X
Philips-1	0	0.000	0	0.000	-1	-0.178	-1	-0.178	1	0.178
Krups-1	1	-0.194	1	-0.194	-1	0.194	-1	0.194	0	0.000
Capacity5-1	1	-0.173	0	0.000	0	0.000	-1	0.173	-1	0.173
Capacity10-1	0	0.000	1	-0.322	1	-0.322	-1	0.322	-1	0.322
Price59-1	1	0.190	0	0.000	-1	-0.190	0	0.000	1	0.190
Price79-1	0	0.000	1	-0.277	-1	0.277	1	-0.277	0	0.000
Filter-1	-1	0.855	-1	0.855	-1	0.855	-1	0.855	-1	0.855
Grinder-1	-1	-1.119	-1	-1.119	1	1.119	-1	-1.119	1	1.119
exp(b*X)		0.643		0.348		5.780		0.970		17.057
Probability/Market Share		0.026		0.014		0.233		0.039		0.688

SEGMENT 2	Product 1 (Krups)		Product 2 (Krups)		Product 3 (Cuisinart)		Product 4 (Cuisinart)		Product 5 (Philips)	
VARIABLE	X-VALUES	b*X	X-VALUES	b*X	X-VALUES	b*X	X-VALUES	b*X	X-VALUES	b*X
Philips-1	0	0.000	0	0.000	-1	-0.127	-1	-0.127	1	0.127
Krups-1	1	0.032	1	0.032	-1	-0.032	-1	-0.032	0	0.000
Capacity5-1	1	0.414	0	0.000	0	0.000	-1	-0.414	-1	-0.414
Capacity10-1	0	0.000	1	0.271	1	0.271	-1	-0.271	-1	-0.271
Price59-1	1	0.213	0	0.000	-1	-0.213	0	0.000	1	0.213
Price79-1	0	0.000	1	0.572	-1	-0.572	1	0.572	0	0.000
Filter-1	-1	-0.107	-1	-0.107	-1	-0.107	-1	-0.107	-1	-0.107
Grinder-1	-1	0.698	-1	0.698	1	-0.698	-1	0.698	1	-0.698
exp(b*X)		3.487		4.327		0.228		1.377		0.317
Probability/Market Share		0.358		0.444		0.023		0.141		0.033
Overall Probability/Share		0.112		0.126		0.179		0.066		0.518

Figure 7:

Market Share of Scenario 3:Segment Two Product for Both Segments

SEGMENT 1	Product 1 (Krups)		Product 2 (Krups)		Product 3 (Cuisinart)		Product 4 (Cuisinart)		Product 5 (Philips)	
VARIABLE	X-VALUES	b*X	X-VALUES	b*X	X-VALUES	b*X	X-VALUES	b*X	X-VALUES	b*X
Philips-1	0	0.000	0	0.000	-1	-0.178	-1	-0.178	1	0.178
Krups-1	1	-0.194	1	-0.194	-1	0.194	-1	0.194	0	0.000
Capacity5-1	1	-0.173	0	0.000	0	0.000	-1	0.173	1	-0.173
Capacity10-1	0	0.000	1	-0.322	1	-0.322	-1	0.322	0	0.000
Price59-1	1	0.190	0	0.000	-1	-0.190	0	0.000	0	0.000
Price79-1	0	0.000	1	-0.277	-1	0.277	1	-0.277	1	-0.277
Filter-1	-1	0.855	-1	0.855	-1	0.855	-1	0.855	-1	0.855
Grinder-1	-1	-1.119	-1	-1.119	1	1.119	-1	-1.119	-1	-1.119
exp(b*X)		0.643		0.348		5.780		0.970		0.585
Probability/Market Share		0.077		0.042		0.694		0.116		0.070

SEGMENT 2	Product 1 (Krups)		Product 2 (Krups)		Product 3 (Cuisinart)		Product 4 (Cuisinart)		Product 5 (Philips)	
VARIABLE	X-VALUES	b*X	X-VALUES	b*X	X-VALUES	b*X	X-VALUES	b*X	X-VALUES	b*X
Philips-1	0	0.000	0	0.000	-1	-0.127	-1	-0.127	1	0.127
Krups-1	1	0.032	1	0.032	-1	-0.032	-1	-0.032	0	0.000
Capacity5-1	1	0.414	0	0.000	0	0.000	-1	-0.414	1	0.414
Capacity10-1	0	0.000	1	0.271	1	0.271	-1	-0.271	0	0.000
Price59-1	1	0.213	0	0.000	-1	-0.213	0	0.000	0	0.000
Price79-1	0	0.000	1	0.572	-1	-0.572	1	0.572	1	0.572
Filter-1	-1	-0.107	-1	-0.107	-1	-0.107	-1	-0.107	-1	-0.107
Grinder-1	-1	0.698	-1	0.698	1	-0.698	-1	0.698	-1	0.698
exp(b*X)		3.487		4.327		0.228		1.377		5.491
Probability/Market Share		0.234		0.290		0.015		0.092		0.368
Overall Probability/Share		0.118		0.106		0.518		0.110		0.148

Figure 8:

Market share with existing products

SEGMENT 1	Product 1 (Krups)		Product 2 (Krups)		Product 3 (Cuisinart)		Product 4 (Cuisinart)		Product 5 (Philips)	
VARIABLE	X-VALUES	b*X	X-VALUES	b*X	X-VALUES	b*X	X-VALUES	b*X	X-VALUES	b*X
Philips-1	0	0.000	0	0.000	-1	-0.178	-1	-0.178	1	0.178
Krups-1	1	-0.194	1	-0.194	-1	0.194	-1	0.194	0	0.000
Capacity5-1	1	-0.173	0	0.000	0	0.000	-1	0.173	0	0.000
Capacity10-1	0	0.000	1	-0.322	1	-0.322	-1	0.322	1	-0.322
Price59-1	1	0.190	0	0.000	-1	-0.190	0	0.000	0	0.000
Price79-1	0	0.000	1	-0.277	-1	0.277	1	-0.277	1	-0.277
Filter-1	-1	0.855	-1	0.855	-1	0.855	-1	0.855	-1	0.855
Grinder-1	-1	-1.119	-1	-1.119	1	1.119	-1	-1.119	-1	-1.119
exp(b*X)		0.643		0.348		5.780		0.970		0.504
Probability/Market Share		0.078		0.042		0.701		0.118		0.061

SEGMENT 2	Product 1 (Krups)		Product 2 (Krups)		Product 3 (Cuisinart)		Product 4 (Cuisinart)		Product 5 (Philips)	
VARIABLE	X-VALUES	b*X	X-VALUES	b*X	X-VALUES	b*X	X-VALUES	b*X	X-VALUES	b*X
Philips-1	0	0.000	0	0.000	-1	-0.127	-1	-0.127	1	0.127
Krups-1	1	0.032	1	0.032	-1	-0.032	-1	-0.032	0	0.000
Capacity5-1	1	0.414	0	0.000	0	0.000	-1	-0.414	0	0.000
Capacity10-1	0	0.000	1	0.271	1	0.271	-1	-0.271	1	0.271
Price59-1	1	0.213	0	0.000	-1	-0.213	0	0.000	0	0.000
Price79-1	0	0.000	1	0.572	-1	-0.572	1	0.572	1	0.572
Filter-1	-1	-0.107	-1	-0.107	-1	-0.107	-1	-0.107	-1	-0.107
Grinder-1	-1	0.698	-1	0.698	1	-0.698	-1	0.698	-1	0.698
exp(b*X)		3.487		4.327		0.228		1.377		4.760
Probability/Market Share		0.246		0.305		0.016		0.097		0.336
Overall Probability/Share		0.122		0.110		0.523		0.112		0.132

Figure 9: Revenue Difference with Difference Product Design

Senario 1: One Product for Each Segment						
	Current Size	Segment Size	Market Share	Price	Revenue	Total Revenue
segment1	185	0.741	0.688	59	5564.55432	7151.15872
segment2	185	0.295	0.368	79	1586.6044	
Assumption Size						
segment1	185000	0.741	0.688	59	5564554.32	7151158.72
segment2	185000	0.295	0.368	79	1586604.4	
Senario 2: Segment One Product for Both Segments						
	Current Size	Segment Size	Market Share	Price	Revenue	Total Revenue
segment1	185	0.741	0.688	59	5564.55432	5670.811845
segment2	185	0.295	0.033	59	106.257525	
Assumption Size						
segment1	185000	0.741	0.688	59	5564554.32	5670811.845
segment2	185000	0.295	0.033	59	106257.525	
Senario 2: Segment Two Product Two for Both Segments						
	Current Size	Segment Size	Market Share	Price	Revenue	Total Revenue
segment1	185	0.741	0.07	79	758.08005	2344.68445
segment2	185	0.295	0.368	79	1586.6044	
Assumption Size						
segment1	185000	0.741	0.07	79	758080.05	2344684.45
segment2	185000	0.295	0.368	79	1586604.4	

Market Size	Revenue Difference Between Senario 1&2	Revenue Difference Between Senario 1&3
185	1480.346875	4806.47427
185000	1480346.875	4806474.27