

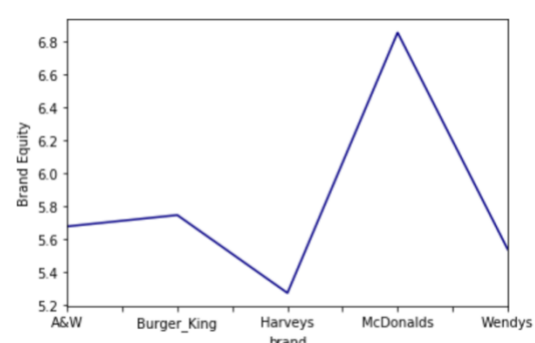
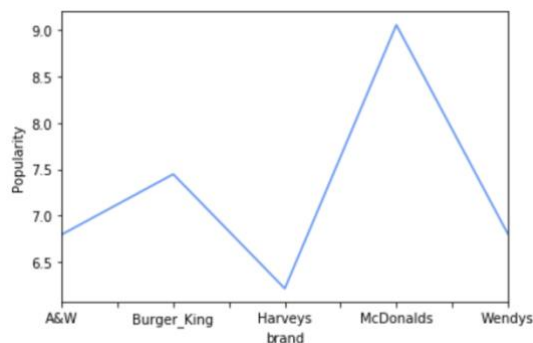
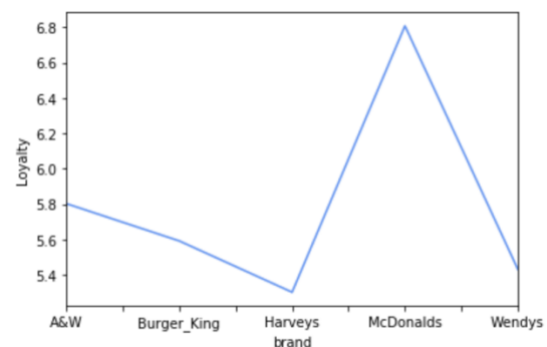
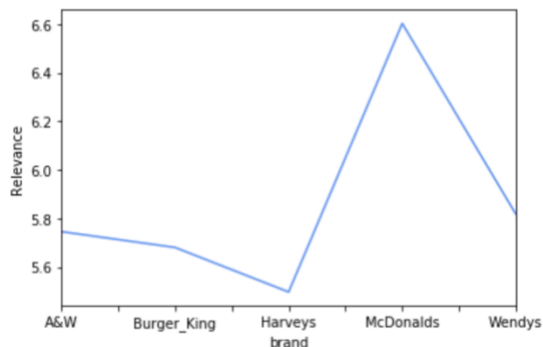
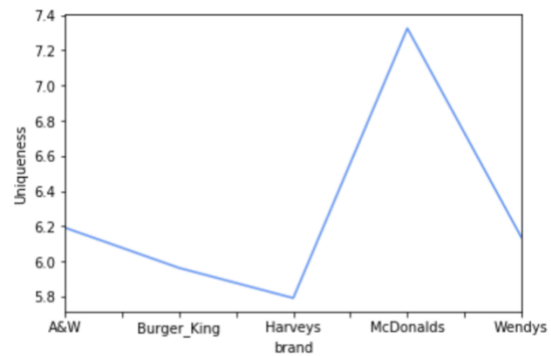
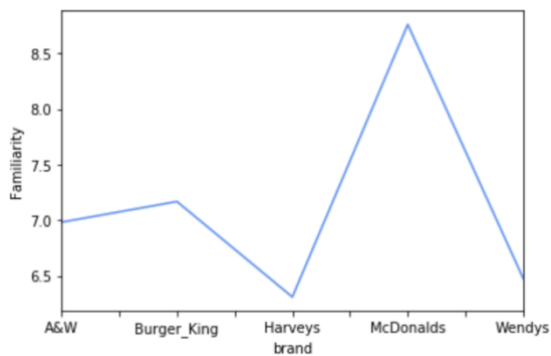
Assignment 3 – Brand Equity

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Question 1

Using the FAST.SAV data set, what statistical analysis is suitable to measure brand equity with the collected data? Why?

In order to compare the different measurements of brand equity with the various fast food brands, the mean for each factor, as well as the average brand_equity for each brand is computed and plotted. The first 4 charts represent each measure *Familiarity*, *Uniqueness*, *Relevance*, *Loyalty* and *Popularity*, and the last graph represents the mean values the overall brand equity for each fast food chain.



As seen from the above graphs, there are some brands that differ significantly, while there are others that seem to have quite similar average ratings. It is not possible to know whether these differences in means are significant or not just by analysing the graphs. Firstly, the data will be tested for normality using a normality test. If the data is normal, then an ANOVA test will be used to determine whether the differences in means between any of the brands for the 5 measures of brand equity are statistically significant. If the data is not normally distributed, then a Kruskal-Wallis test will be conducted which tests the differences in median values.

Further, it is required to know the measures in which the brands' averages are statistically different. To determine this, a multivariate ANOVA test will be conducted, where each pair of brands is tested for differences in the means for each of the 5 measures of brand equity.

For analysing the relationships between different demographics data and *loyalty* for each of the fast food brands, a chi-square test will be conducted to determine the different demographics on which the loyalty of a brand is dependent one. A chi-square test is chosen in place of a regular Student t-test because the variables are categorical. Finally a Linear Regression will be carried out to determine exactly how much effect a demographic variable has on loyalty – provided that the loyalty depends on this variable as given by the results of the chi-square test.

Question 2

Compare loyalty, relevance, familiarity, uniqueness and popularity for the brands using the appropriate statistical analysis.

Business Issue

In the case of Ariel Research, **Brand Equity** is measured in terms familiarity, uniqueness, popularity, relevance and loyalty to a product. It is useful for a company to determine which of these factors is most considered by customers to continue purchasing certain products from a specific companies. By comparing these factors amongst some of the the most popular fast-food chains, recommendations can be made to the companies on which factor to focus more on.

Statistical Issues

The factors that cause people to only purchase from certain brands are loyalty, relevance, familiarity, uniqueness and popularity. It needs to be determined whether these factors are all the same between different brands of fast food. It is also useful to determine which of these factors is more important for which of these chains, and which fast food chains have similar ratings for the above factors.

First it is required to determine whether the data collected on the five factors are normally distributed in order to determine the type of comparison test that needs to be carried out. This can be achieved using a Normality Test.

1. **Test for Normality:** The first test to be carried out is a normality test to determine if the values retrieved for the 5 factors are normal. A normality test is run on the data – using the following Hypotheses.
2. **Test of differences in means:** the test of how the central means differ will be tested using a MANOVA test – for each of the 5 factors across the brands. A pair-wise comparison between the different means of the different brands will be run to determine where the differences are among the brands in the ratings of the five factors.

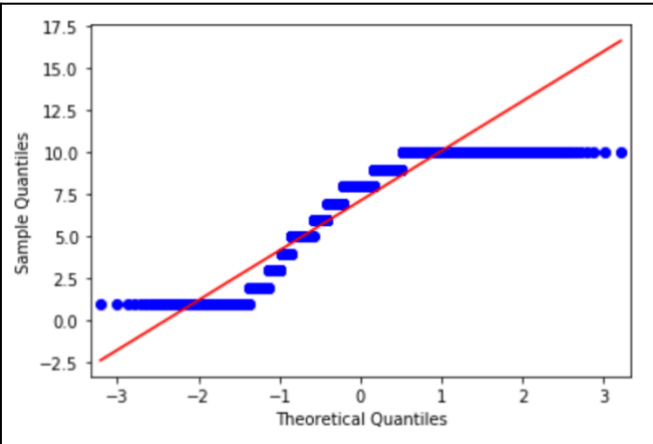
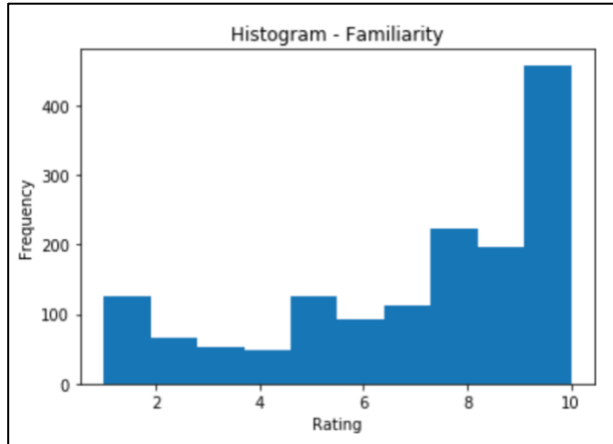
Statistical Tests and Analysis

1. **Test for Normality:** The hypotheses for this test are as given below:

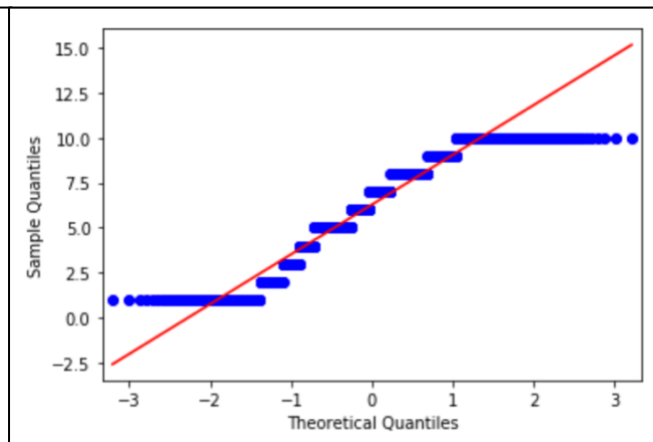
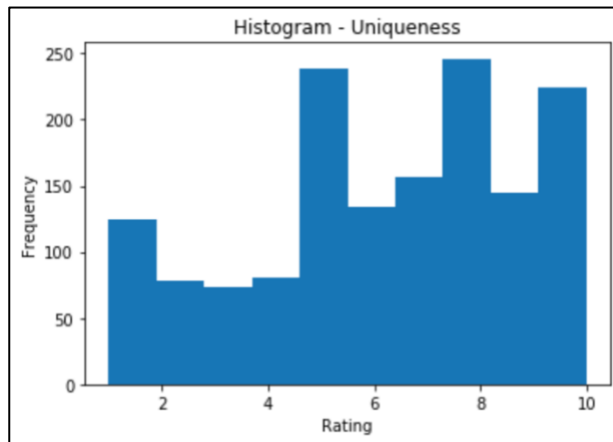
Null Hypothesis (H_0) : *The data collected follows a normal distribution.*

Alternate Hypothesis (H_a) : *The data collected does not follow a normal distribution.*

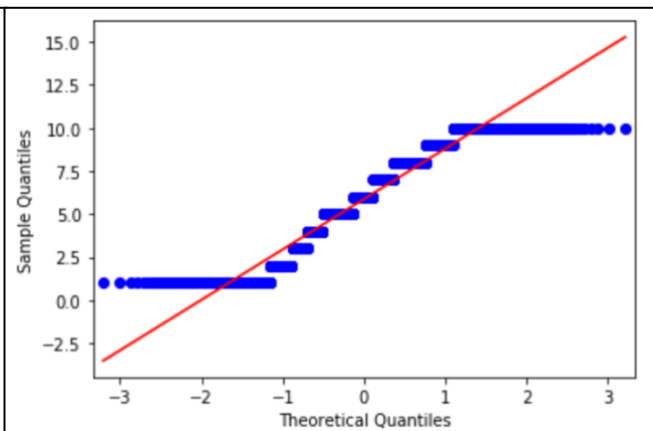
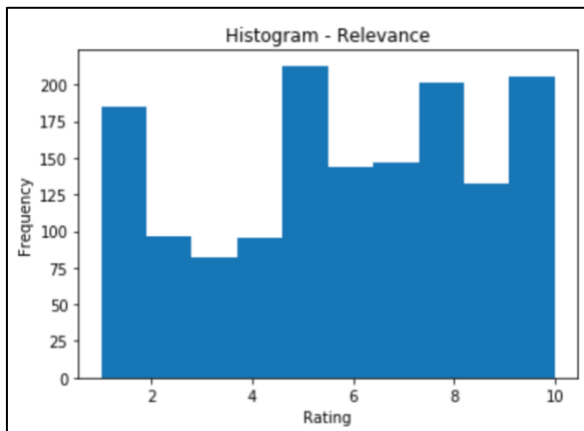
The results after running the Shapiro normality test, and by visualizing the values, and plotting the qqplot are as below.



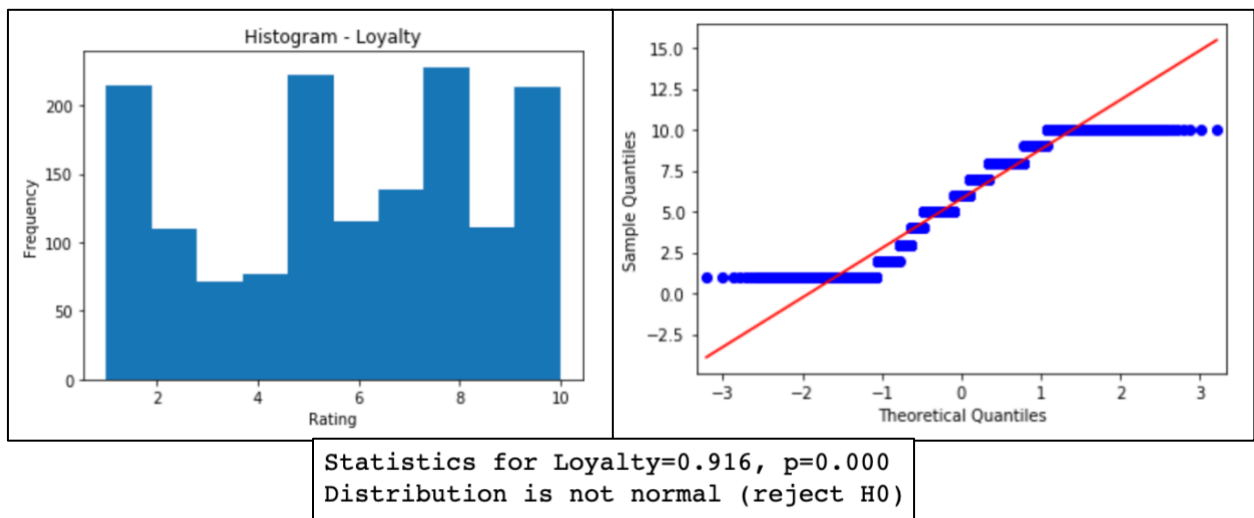
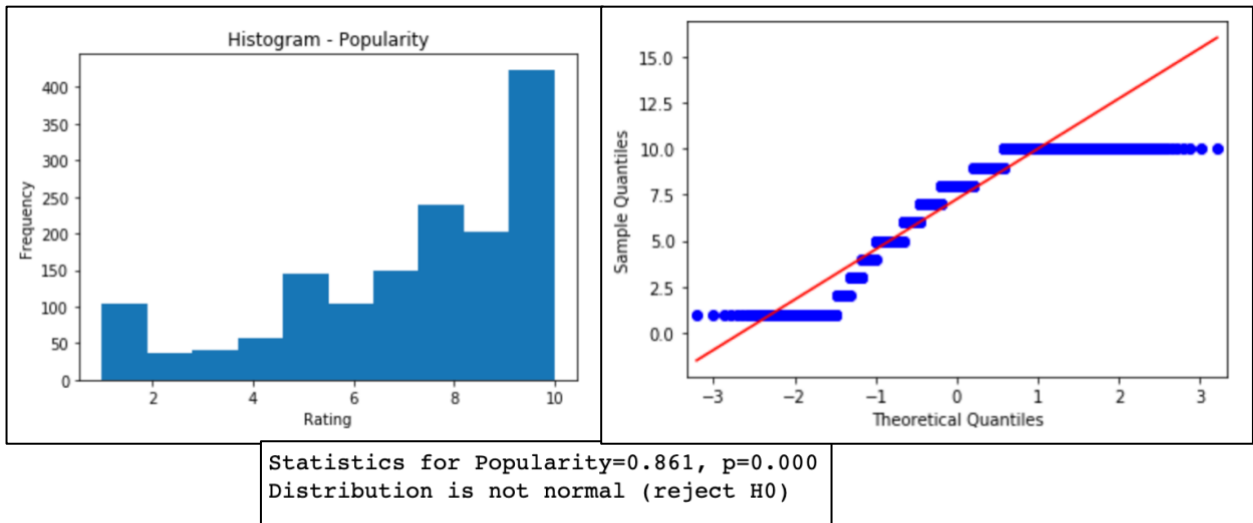
Statistics for familiarity=0.845, $p=0.000$
Distribution is not normal (reject H_0)



Statistics for uniqueness=0.928, $p=0.000$
Distribution is not normal (reject H_0)



Statistics for relevance=0.926, $p=0.000$
Distribution is not normal (reject H_0)



As seen from the results, the null hypothesis can be rejected for all the factors – none of them follow a normal distribution. Their respective values within each brand were also determined not to follow a normal distribution.

2. **Test of independence:** A statistical test to determine whether the values factors *familiarity*, *uniqueness*, *relevance*, *loyalty* and *popularity* have a significant relationship with the 5 fast-food stores will be conducted.

Null Hypothesis (H_0): The relationship between the brand and the 5 measures of brand equity is not significant.

Alternate Hypothesis (H_a): The relationship between the brand and the 5 measures of brand equity is significant.

	Chi-square test	results
0	Pearson Chi-square (36.0) =	197.9527
1	p-value =	0.0000
2	Cramer's V =	0.1816

Familiarity

	Chi-square test	results
0	Pearson Chi-square (36.0) =	101.5767
1	p-value =	0.0000
2	Cramer's V =	0.1301

Uniqueness

	Chi-square test	results
0	Pearson Chi-square (36.0) =	67.2526
1	p-value =	0.0012
2	Cramer's V =	0.1059

Relevance

	Chi-square test	results
0	Pearson Chi-square (36.0) =	99.2198
1	p-value =	0.0000
2	Cramer's V =	0.1286

Loyalty

	Chi-square test	results
0	Pearson Chi-square (36.0) =	307.0128
1	p-value =	0.0000
2	Cramer's V =	0.2262

Popularity

As seen from the above tests for independence, all 5 measures have a p-value < 0.05. Therefore the null hypothesis can be rejected – indicating that each factor is **not** independent of the different brands. Now that it has been established that they are not independent, we can determine how each factor differs between the difference brands.

The contingency tables used to run the Chi-square tests can be found in Appendix A

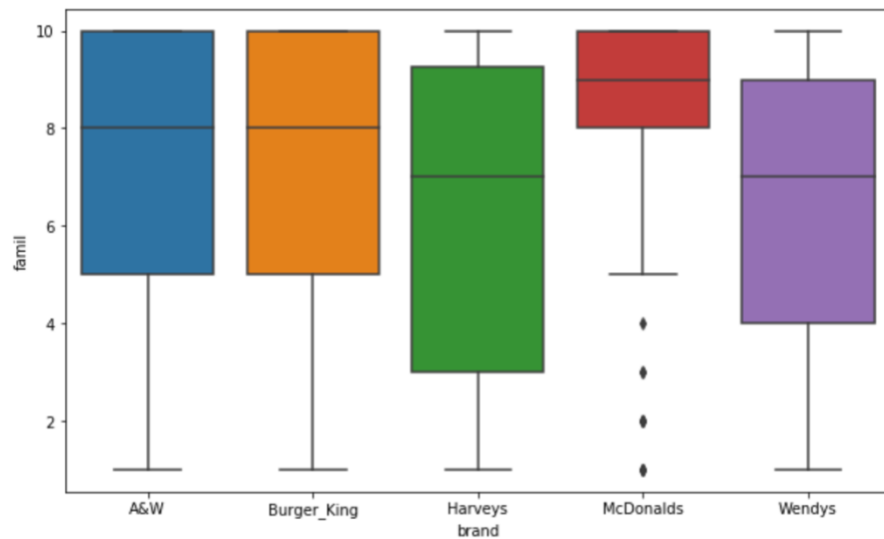
3. **Test of differences in means:** A statistical test to determine whether the values factors *familiarity*, *uniqueness*, *relevance*, *loyalty* and *popularity* are similar across the 5 fast-food stores will be conducted. As the data does not follow normal distribution, a Kruskal-Wallis test will be used, although a regular ANOVA test also showed very similar results.

Null Hypothesis (H_0) : *The difference in medians of the factors between the 5 brands is not significant.*

Alternate Hypothesis (H_a) : *The difference in medians of the factors between the 5 brands is significant.*

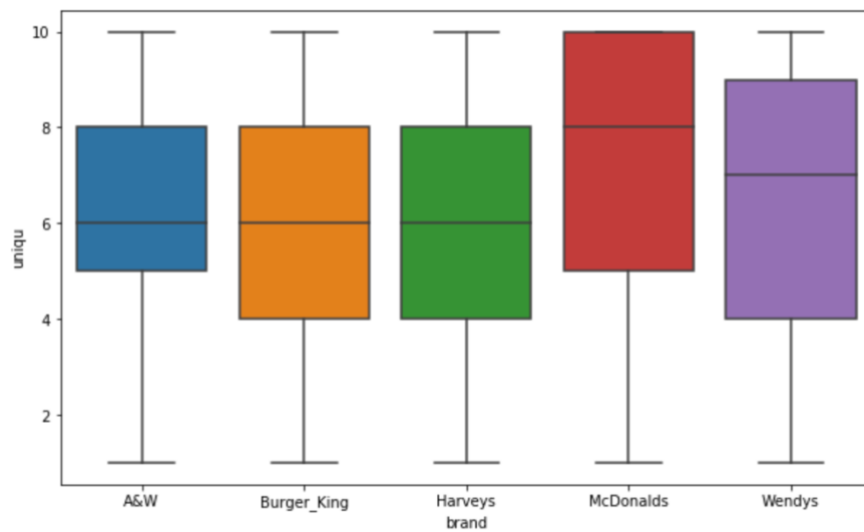
First a visualisation of the boxplots are done to get an idea of the range of the values of each factor within each brand.

Familiarity:



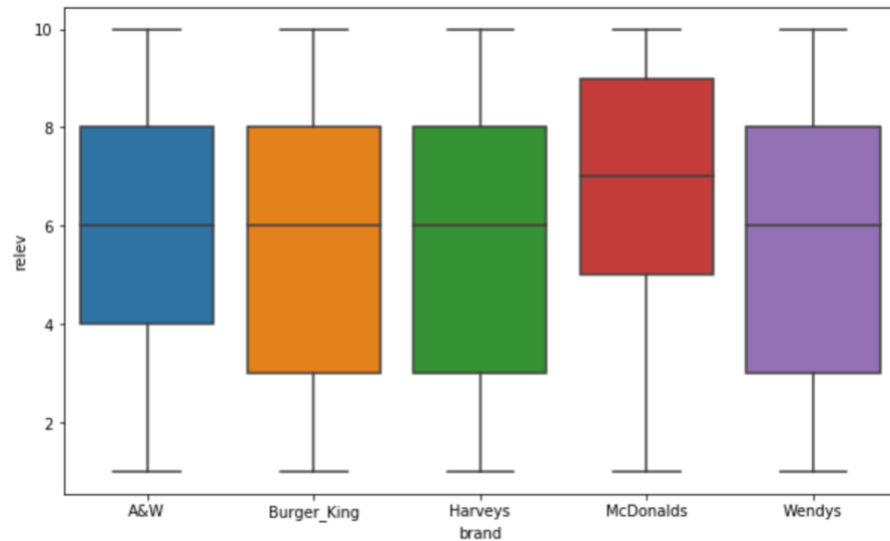
The above boxplot showing *Familiarity* ratings across the 5 brands show that McDonald's has most of its ratings in the higher range, above '5'. The 4 values below 5 are all outliers. Harvey's and Wendy's appear to have a larger number of lesser ratings compared to the others, while A&W and Burger King have 75% of their ratings above '5'. Therefore, a most people relate to **MacDonald's** as a place to go to because it's familiar.

Uniqueness:



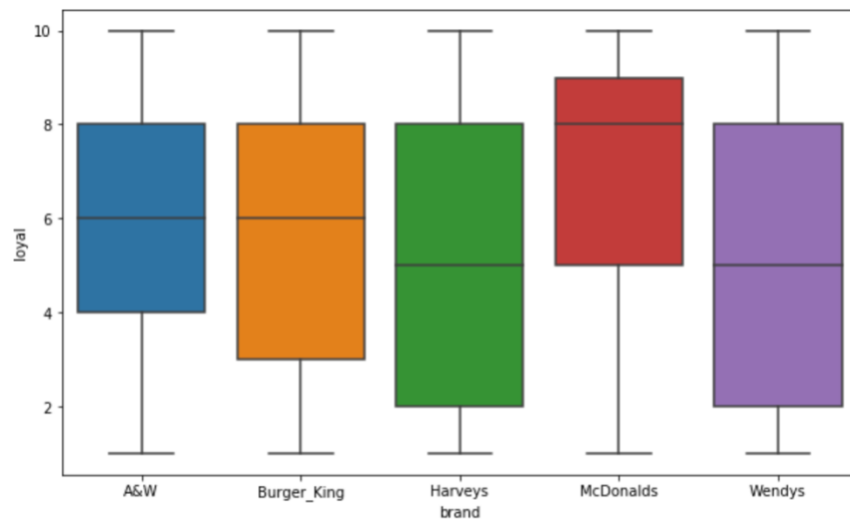
Uniqueness is also a reason people choose to go to McDonalds – with 50% of people giving uniqueness a rating of 8 or above. The medians for the other values are around the 6-7 range.

Relevance:



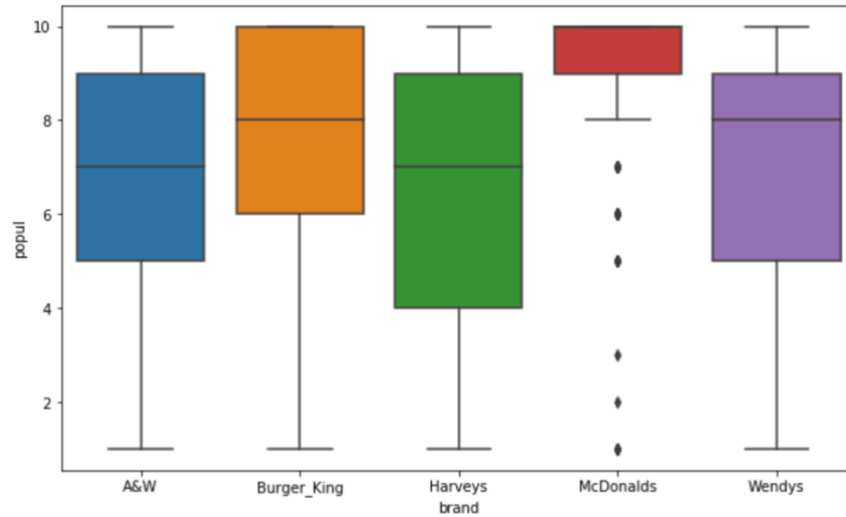
Relevance again is most important for McDonalds' customers, which has a slightly higher median of 7, compared to the other fast-food places (median=6).

Loyalty:



Loyalty plays a large role when choosing where to eat. The restaurants A&W and Burger King have the highest median values – more than 50% of people saying they eat in these places out of loyalty. The customers of McDonalds show the most loyalty – with 50% of customers giving it a loyalty rating above 8.

Popularity:



Again, McDonalds is chosen by many people because of its popularity. With most people giving it a popularity rating of more than 5 – this is not surprising as McDonalds is one of the most famous and popular fast-food place, globally. Burger King came in second – with a median value of 8 – i.e. more than 50% of customers go to Burger King because of the popularity of the brand name.

Running the Kruskal-Wallis test, the following results are obtained:

a. Familiarity

Statistics=132.368, p=0.000

b. Uniqueness

Statistics=61.239, p=0.000

c. Relevance

Statistics=25.852, p=0.000

d. Loyalty

Statistics=48.190, p=0.000

e. Popularity

Statistics=240.024, p=0.000

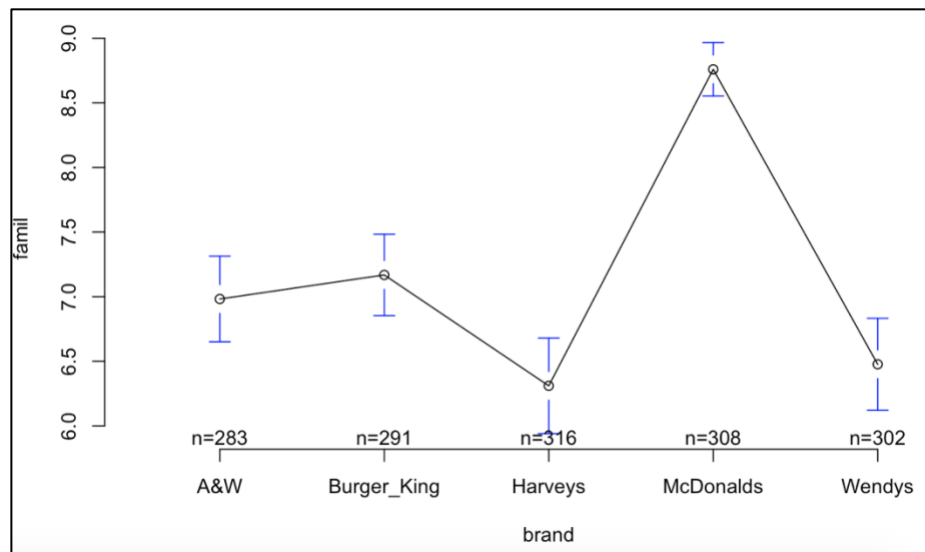
As the p-values for all factors are less than the significance value of 0.05, the null hypothesis can be rejected: The difference in the medians between every factor is statistically significant across at least one pair of brands.

Next a pair-wise analysis of variance is carried out to determine the pairs of brands which have statistically significant differences in values in the 5 factors.

a. Familiarity

group1	group2	meandiff	p-adj	lower	upper	reject
A&W	Burger_King	0.1861	0.9	-0.459	0.8311	False
A&W	Harveys	-0.6722	0.0307	-1.3046	-0.0398	True
A&W	McDonalds	1.7774	0.001	1.1412	2.4137	True
A&W	Wendys	-0.5055	0.1957	-1.1448	0.1338	False
Burger_King	Harveys	-0.8583	0.0018	-1.486	-0.2305	True
Burger_King	McDonalds	1.5914	0.001	0.9597	2.223	True
Burger_King	Wendys	-0.6916	0.0247	-1.3263	-0.0568	True
Harveys	McDonalds	2.4496	0.001	1.8309	3.0683	True
Harveys	Wendys	0.1667	0.9	-0.4551	0.7885	False
McDonalds	Wendys	-2.2829	0.001	-2.9087	-1.6572	True

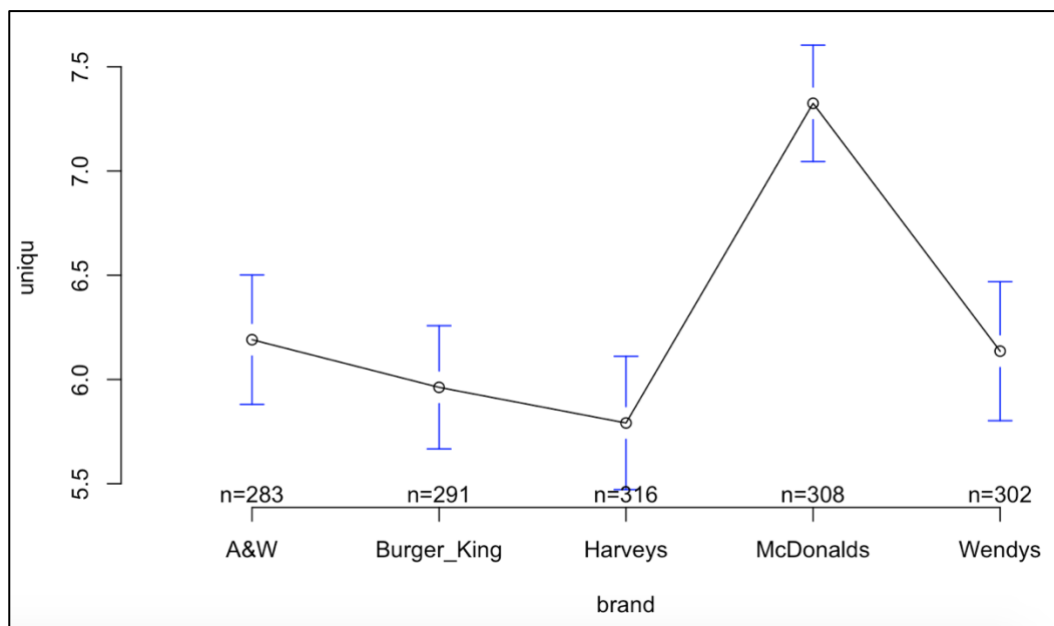
As seen from the pair-wise comparison and the interval plot below, when it comes to familiarity, most of the brands have significant differences in their means. Only those comparisons where the Null Hypothesis (H_0) can be rejected are considered. *McDonalds* on average has a higher rating of 1.78 compared to A&W, 1.59 compared to Burger King, and 2.28 compared to Wendys. Therefore, the pair-wise test shows a similar trend to the boxplots – that familiarity is an important reason for which customers choose to purchase at *McDonalds*. Out of all the brands, *Harveys* tends to have the lowest rating for familiarity.



b. Uniqueness

Multiple Comparison of Means - Tukey HSD, FWER=0.05						
group1	group2	meandiff	p-adj	lower	upper	reject
A&W	Burger_King	-0.2286	0.8332	-0.848	0.3908	False
A&W	Harveys	-0.3997	0.3762	-1.0068	0.2075	False
A&W	McDonalds	1.1339	0.001	0.523	1.7447	True
A&W	Wendys	-0.0551	0.9	-0.6688	0.5587	False
Burger_King	Harveys	-0.1711	0.9	-0.7738	0.4317	False
Burger_King	McDonalds	1.3625	0.001	0.756	1.969	True
Burger_King	Wendys	0.1736	0.9	-0.4358	0.783	False
Harveys	McDonalds	1.5335	0.001	0.9395	2.1276	True
Harveys	Wendys	0.3446	0.5108	-0.2524	0.9416	False
McDonalds	Wendys	-1.1889	0.001	-1.7897	-0.5881	True

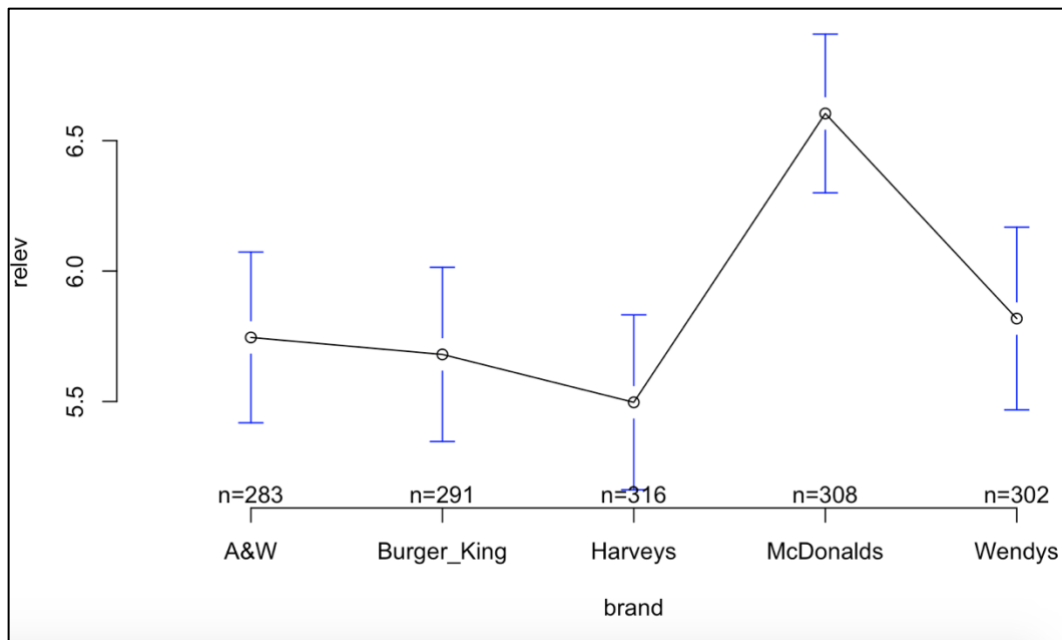
Only 4 of the pairs of brands above have a significant difference in their means. Again, McDonalds appears to have the highest means when it comes to uniqueness – many people purchase from this brand because they feel there is something unique about it, which cannot be offered by any other brand. In the above table, only those pairs which include McDonalds have a p-value below the significant value. As shown in the interval plot below, the range for McDonalds is very different to that of the other brands.



c. Relevance

Multiple Comparison of Means - Tukey HSD, FWER=0.05						
group1	group2	meandiff	p-adj	lower	upper	reject
A&W	Burger_King	-0.0652	0.9	-0.7287	0.5984	False
A&W	Harveys	-0.2487	0.8126	-0.8992	0.4017	False
A&W	McDonalds	0.8583	0.0032	0.2039	1.5128	True
A&W	Wendys	0.0723	0.9	-0.5852	0.7298	False
Burger_King	Harveys	-0.1836	0.9	-0.8293	0.4621	False
Burger_King	McDonalds	0.9235	0.001	0.2737	1.5732	True
Burger_King	Wendys	0.1375	0.9	-0.5154	0.7903	False
Harveys	McDonalds	1.1071	0.001	0.4707	1.7434	True
Harveys	Wendys	0.321	0.6274	-0.3185	0.9606	False
McDonalds	Wendys	-0.786	0.0078	-1.4296	-0.1424	True

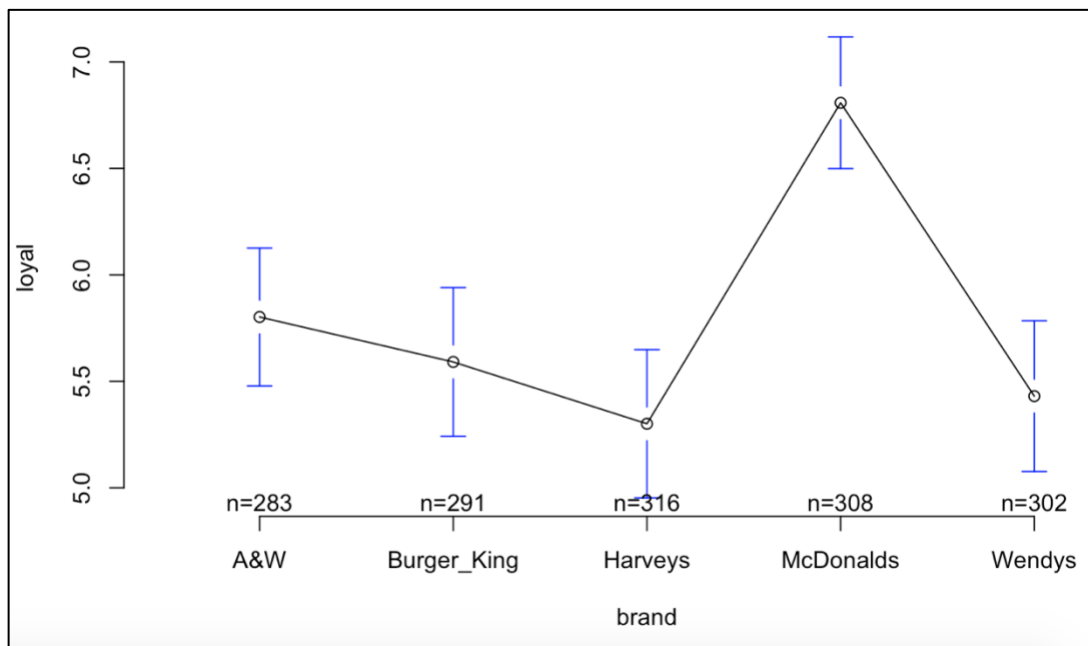
Relevance shows a similar trend to uniqueness – only McDonalds has a significantly different mean to the other groups in the ratings of relevance. It has an average rating of 0.92 above Burger King. All other brands have similar values – which is further reiterated by the interval plot below, with the ranges for 4 out of 5 brands being very close to one another.



d. Loyalty

Multiple Comparison of Means - Tukey HSD, FWER=0.05						
group1	group2	meandiff	p-adj	lower	upper	reject
A&W	Burger_King	-0.2111	0.9	-0.8892	0.4671	False
A&W	Harveys	-0.5015	0.2379	-1.1662	0.1633	False
A&W	McDonalds	1.0063	0.001	0.3375	1.6751	True
A&W	Wendys	-0.3717	0.5483	-1.0437	0.3003	False
Burger_King	Harveys	-0.2904	0.7232	-0.9504	0.3695	False
Burger_King	McDonalds	1.2174	0.001	0.5534	1.8814	True
Burger_King	Wendys	-0.1606	0.9	-0.8278	0.5066	False
Harveys	McDonalds	1.5078	0.001	0.8574	2.1582	True
Harveys	Wendys	0.1298	0.9	-0.5238	0.7835	False
McDonalds	Wendys	-1.378	0.001	-2.0357	-0.7202	True

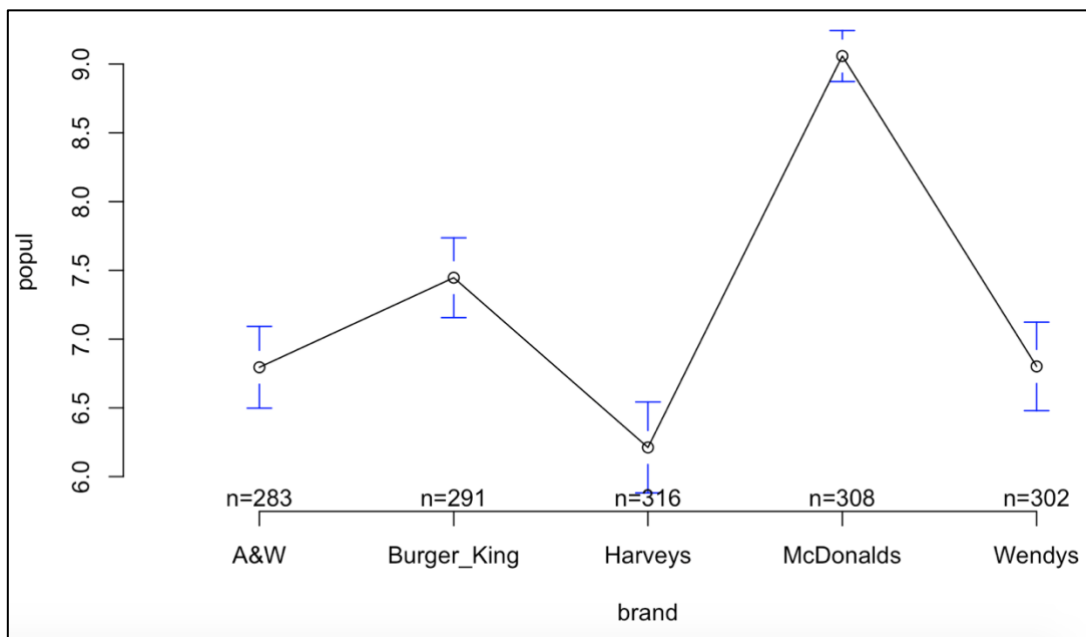
The average rating for McDonalds is significantly higher than all other brands – McDonalds has a lot of loyal customers. People are tending to visit McDonalds out of loyalty to the brand. There is an average difference in ratings of more than '1' compared to all other brands.



e. Popularity

Multiple Comparison of Means - Tukey HSD, FWER=0.05						
group1	group2	meandiff	p-adj	lower	upper	reject
A&W	Burger_King	0.6517	0.0191	0.0699	1.2334	True
A&W	Harveys	-0.583	0.0422	-1.1533	-0.0127	True
A&W	McDonalds	2.2634	0.001	1.6896	2.8372	True
A&W	Wendys	0.0063	0.9	-0.5702	0.5828	False
Burger_King	Harveys	-1.2347	0.001	-1.8008	-0.6686	True
Burger_King	McDonalds	1.6117	0.001	1.0421	2.1814	True
Burger_King	Wendys	-0.6454	0.018	-1.2178	-0.073	True
Harveys	McDonalds	2.8464	0.001	2.2885	3.4044	True
Harveys	Wendys	0.5893	0.0338	0.0286	1.15	True
McDonalds	Wendys	-2.2571	0.001	-2.8214	-1.6928	True

The differences in means of popularity ratings between all brands is significant – except that between A&W and Wendys, which can be concluded to have very similar means. As expected, Burger King and McDonalds have a higher popularity rating compared to A&W. However, on average, A&W is visited because it is considered popular *more* than Harveys. McDonalds has the highest average rating for popularity followed by Burger King. The third most popular is Wendy's followed by A&W and finally Harvey's – customers do not purchase from this brand because of its popularity.



Business Conclusions

In this multi-dimensional measurement of brand equity, there is one brand that clearly stands out when it comes to attracting users with its brand name – McDonald's. This brand has the highest average rating for all 5 measurements, and it can be concluded that McDonald's has a large pull due to its brand name. Other well-known brands such as Burger King and A&W also had reasonable ratings, while Harvey's and Wendy's, which are lesser known attracted less people due to their brand names. Therefore, McDonald's has been the most successful in creating an equity in their brand, and has a much stronger resistance to price changes, competitors in the market and other factors. Harvey's in particular needs to work on creating an equity in their brand so that it can earn the loyalty of more customers.

Question 3

Analyze a fast food brand to determine relationships between loyalty and the respondent profiles (e.g. age, region, income).

Business Issue

Loyalty to a brand is very powerful, and is very important for brands to make profits. The greater the loyalty, the more time and money customers invest in that brand, and these customers are less sensitive to any changes within the company (price, personnel and so on) as well as competitors in the market. Therefore, it is very useful for companies to analyze the demographics of their most loyal customers so that the company knows the type of people it needs to target to establish brand loyalty.

Statistical Questions

In order to determine whether the demographics of a person has an influence on the loyalty towards the **Wendy's** brand, and to determine the relationships, a Chi-square test of independence will be carried out – as the dependent variable *loyal* is not continuous. This can be used to determine whether the loyalty is dependent on certain demographic features.

Following this, a linear regression will be run on the dependent variable *loyal* with the various demographic variables as the independent variables. This way, it is possible to determine whether a certain demographic has an influence on the loyalty of a person towards a brand, and if so, how much of any influence it is. Using these results, a recommendation can be made to Ariel Research about the types of customers they should be targeting in order to increase brand loyalty.

Statistical Tests and Analysis

1. Test of independence

Null Hypothesis (H_0) : McDonald's brand loyalty and demographic values {gender, children, region} are independent.

Alternate Hypothesis (H_a) : McDonald's brand loyalty and demographic values {gender, children, region} are not independent.

a. Gender

Chi-square test results		
0	Pearson Chi-square (9.0) =	6.6283
1	p-value =	0.6758
2	Cramer's V =	0.1481

The chi-squared test above shows a p-value > 0.05 implying that the null hypothesis cannot be rejected for this demographic. Therefore, brand loyalty towards McDonalds is not dependent on the gender of a person.

b. Children

Chi-square test results		
0	Pearson Chi-square (9.0) =	9.1893
1	p-value =	0.4200
2	Cramer's V =	0.1744

Whether or not a person has children also does not affect the loyalty – those with children are just as loyal to the McDonalds brand as those without.

c. Income

Chi-square test results		
0	Pearson Chi-square (27.0) =	31.6125
1	p-value =	0.2467
2	Cramer's V =	0.1868

Loyalty also does not have a significant dependence on the income of a person – the amount a person earns does not have anything to do with their loyalty to Wendy'

d. Region

Chi-square test results	
0	Pearson Chi-square (27.0) = 67.4210
1	p-value = 0.0000
2	Cramer's V = 0.2728

The chi-square test of independence between region and loyalty shows a p-value < 0.05. Therefore, the value of loyalty is affected by at least on one of the regions.

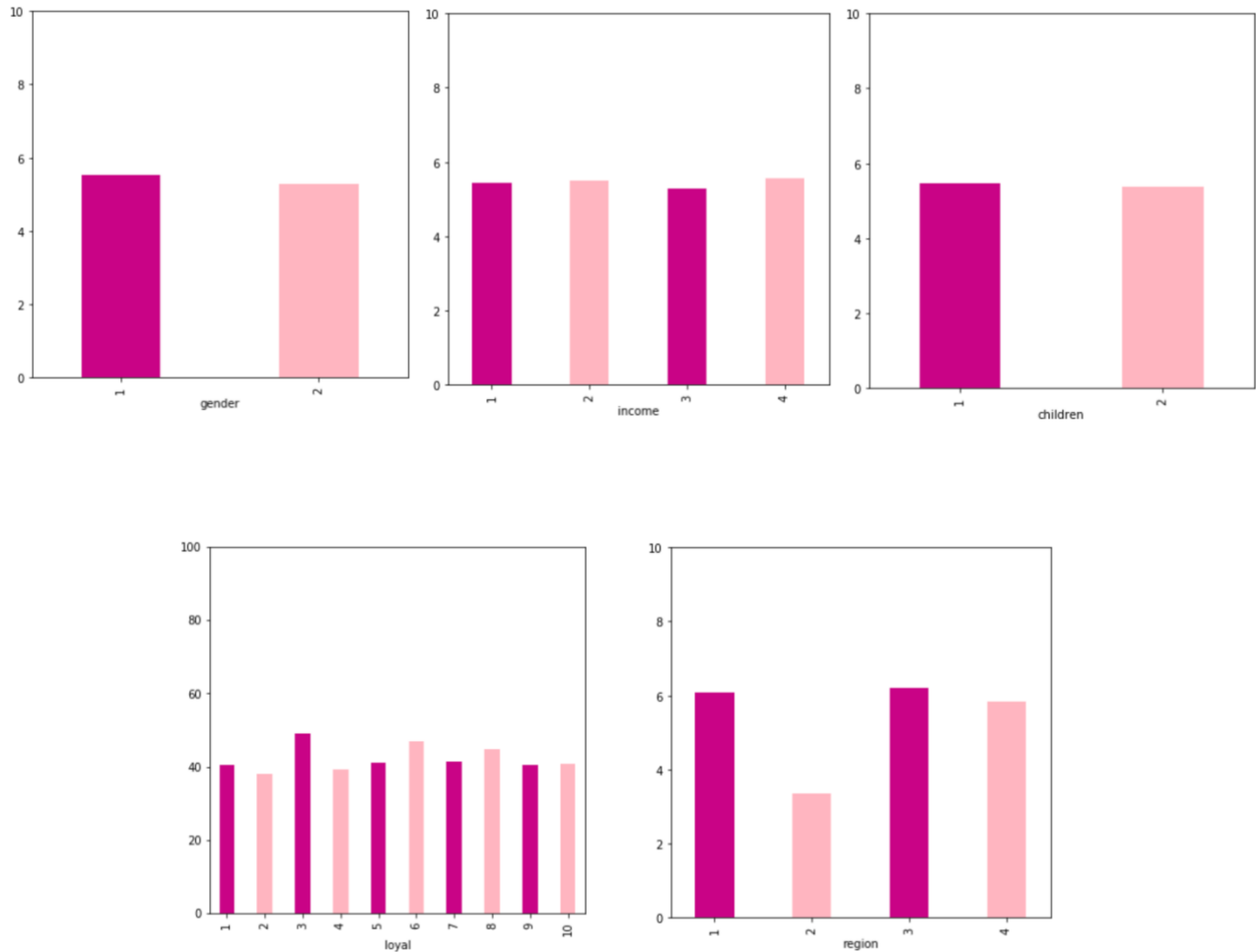
2. Correlations and Linear Regression

The correlations between the various demographics variables and brand loyalty is given in Appendix B. Running linear regression on *loyal* with the independent demographic variables mentioned above gives results as shown below. Only *region-2* has a p-value < 0.05. Therefore, loyalty is most affected by those living in this region. The coefficient is -2.75, implying that a person living in this region decreases the average loyalty towards the Wendy's brand by 2.75.

OLS Regression Results							
Dep. Variable:		loyal		R-squared:		0.140	
Model:		OLS		Adj. R-squared:		0.114	
Method:		Least Squares		F-statistic:		5.294	
Date:		Sun, 01 Mar 2020		Prob (F-statistic):		1.07e-06	
Time:		11:38:47		Log-Likelihood:		-749.64	
No. Observations:		302		AIC:		1519.	
Df Residuals:		292		BIC:		1556.	
Df Model:		9					
Covariance Type:		nonrobust					
		coef	std err	t	P> t	[0.025	0.975]
Intercept		6.2077	0.964	6.437	0.000	4.310	8.106
C(gender)[T.2]		-0.1266	0.352	-0.360	0.719	-0.819	0.566
C(children)[T.2]		-0.4007	0.373	-1.074	0.284	-1.135	0.333
C(income)[T.2]		-0.2387	0.513	-0.465	0.642	-1.248	0.771
C(income)[T.3]		-0.5075	0.493	-1.029	0.304	-1.478	0.463
C(income)[T.4]		-0.2467	0.545	-0.453	0.651	-1.319	0.826
C(region)[T.2]		-2.7587	0.674	-4.094	0.000	-4.085	-1.433
C(region)[T.3]		0.1532	0.632	0.242	0.809	-1.092	1.398
C(region)[T.4]		-0.3222	0.654	-0.493	0.622	-1.609	0.964
age		0.0102	0.017	0.602	0.547	-0.023	0.044

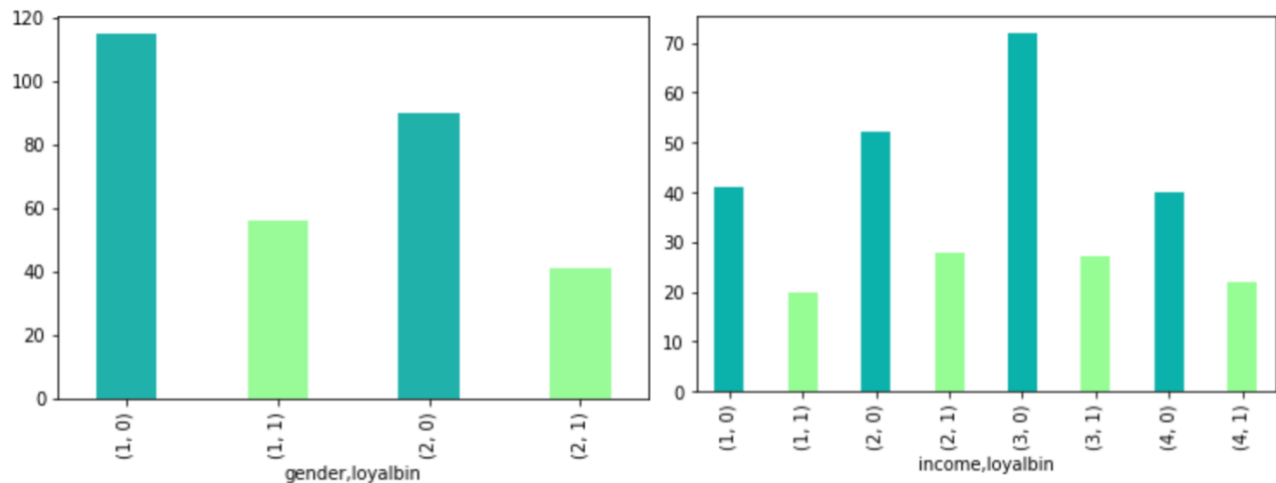
Age also has no significance in determining the value of loyalty, as seen from the p-value ($p=0.547$).

The graphs below show the average loyalty score for the different demographics, which align with the statistical analysis results above.

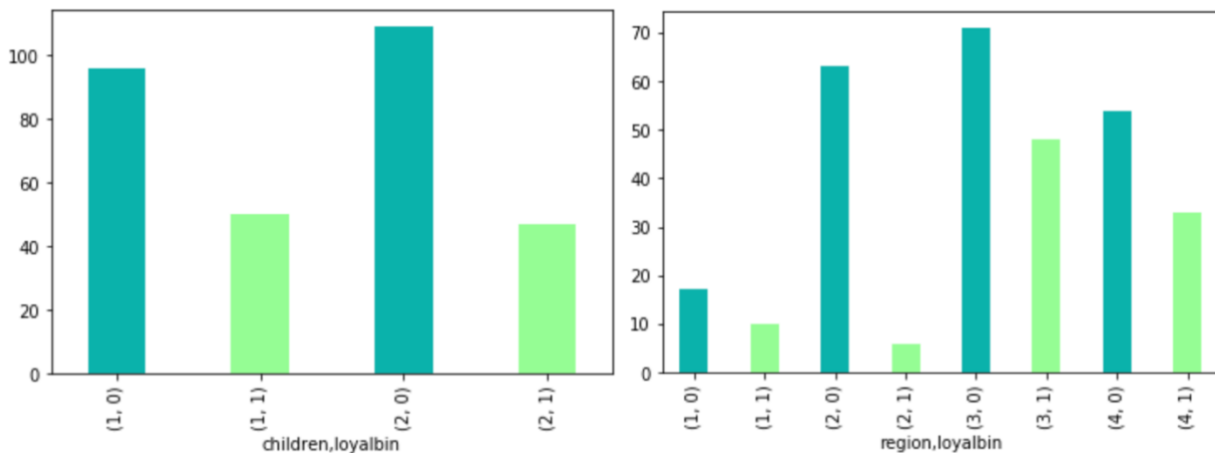


In the above graphs, there is not a lot of difference between the average loyalty and the different categories of demographics of the people in the data. Only region 2 (Quebec), as seen from the last plot has a significantly lower average loyalty towards Wendy's.

Further analysis of loyalty factor is done as the binary variable *loyalbin* to determine the demographics distribution. The results are as shown below.



The left graph above shows the count of each *gender* with each *loyalbin* (loyal, not loyal). As seen, the difference between the two is very similar for both males and females. However, with income, those in the income range 50k-74.9k tend to be less loyal rather than more loyal.



The difference between loyal and non-loyal customers is greater in those that do not have children. A larger proportion of those who do not have children tend to be less loyal to the Wendy's brand. This may be because children are more easily attracted to a brand, particularly when the marketing is aimed towards them. In the case of Wendy's, children may be a large part of the reason for brand loyalty. With respect to region, there is a large difference between loyal and non-loyal customers in region 2 – It has significantly larger number of people who are not loyal to Wendy's. This could possibly be explained by the presence of another leading brand present in the region.

Business Conclusions

In order to establish greater brand loyalty in customers, it will be useful for Wendy's to target people that have children. If children are attracted to a brand, it is more likely that their parents would continue to show loyalty to that particular brand. In addition to this, thorough research

should be done to determine the region in which a company should open their chains. For Wendy's, The Quebec region does not have a lot of loyal customers, which may be due to the presence of another leading brand, or because people in that region simply do not have fast-food loyalty. For both reasons, Wendy's may be better off by choosing another region that has the fast-food culture where it would be the largest brand of fast food.

Question 4

Ariel created binary variables for familiarity, uniqueness, relevance, loyalty, and popularity by splitting responses into "high" and "low". Why would they choose to do (or not to do) this? What information is gained/lost?

Ariel is likely to have converted the measurements to binary variables because they have a higher threshold for loyalty. It is possible that they believe that anyone with a brand loyalty of less than 8 can be easily swayed to switch to a different product from a different brand. If the data is split as "high" and "low", marketing strategies can be targeted at anyone who does not show a high degree of loyalty.

By doing this, Ariel loses information. In the "low" group, there are people who have given a rating of "1" as well as "7", and there is a significant difference in loyalty between these two numbers. The marketing strategies required to gain their loyalty may be completely different for someone who has absolutely no loyalty (rating=1), to someone who has some loyalty towards the brand (loyalty=7).

There is also a loss of demographic information when this is done. For example, a person who has rated a measure "7" may live in a region which has a McDonald's, but may not have a higher loyalty rating for a different reason. However, when analysis is done for this person amongst a large number of those that have given really low loyalty values due to the absence of a brand in their region, these small nuances may get lost, and it is not possible to determine the exact reasons why the person gave a rating of "7".

Therefore, a range of 1-7 is quite large to place in one group, and there may be large differences between those who have very little loyalty (rating=1) and those that have higher than average loyalty (rating = 6,7), and grouping them in such a way could lead to loss of information.

Question 5

Do you agree with Ariel's measure of brand equity? Why/why not?

When a linear regression is run on the *brand equity* variable, the results show that all 5 measures that are used to calculate the brand equity are significant. Additionally, it can be observed that the most weightage is given to *familiarity* and *loyalty* while measuring brand equity, and the least weightage is given to *popularity*.

I believe that *popularity* should not be given the least amount of importance in measuring brand equity. People are largely influenced by other people's opinions. When a person believes that a certain brand is popular, it entices them to purchase products from the brand. Word-of-mouth is a powerful way in which products are marketed, and *popularity* should be given a higher weighting than *uniqueness*. While *uniqueness* may be an important factor in determining brand equity, most people are looking for fast-food that fits their lifestyle needs, and are believed to good – which many times is measured by the *popularity* of the brand. I agree with *familiarity* being an important measure – particularly for those that have children. Children tend to get hooked to a single place once they start liking it, and for those with kids in particular, this would be an important factor.

OLS Regression Results						
Dep. Variable:		brand_equity		R-squared:		0.988
Model:		OLS		Adj. R-squared:		0.988
Method:		Least Squares		F-statistic:		2.494e+04
Date:		Sun, 01 Mar 2020		Prob (F-statistic):		0.00
Time:		20:14:21		Log-Likelihood:		144.83
No. Observations:		1500		AIC:		-277.7
Df Residuals:		1494		BIC:		-245.8
Df Model:		5				
Covariance Type:		nonrobust				
	coef	std err	t	P> t	[0.025	0.975]
Intercept	0.4704	0.017	27.291	0.000	0.437	0.504
famil	0.1851	0.003	63.081	0.000	0.179	0.191
uniqu	0.1566	0.003	53.367	0.000	0.151	0.162
relev	0.1572	0.003	50.506	0.000	0.151	0.163
loyal	0.1761	0.003	54.023	0.000	0.170	0.182
popul	0.1516	0.003	48.186	0.000	0.145	0.158
Omnibus:	1148.683		Durbin-Watson:		1.876	
Prob(Omnibus):	0.000		Jarque-Bera (JB):		54419.755	
Skew:	3.103		Prob(JB):		0.00	
Kurtosis:	31.848		Cond. No.		47.2	

Appendix A

famil	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0
brand										
A&W	15	15	13	12	34	24	15	52	21	82
Burger_King	16	11	12	10	32	15	31	47	41	76
Harveys	50	22	13	11	26	18	24	36	37	79
McDonalds	4	4	2	1	10	10	17	43	67	150
Wendys	41	13	12	15	24	25	26	44	31	71

uniqu	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0
brand										
A&W	18	14	19	18	51	26	29	44	29	35
Burger_King	18	16	22	23	48	34	35	44	24	27
Harveys	42	20	14	14	55	33	24	53	25	36
McDonalds	10	11	7	10	40	19	34	61	37	79
Wendys	36	17	12	15	45	22	34	44	30	47

relev	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0
brand										
A&W	31	17	21	13	51	32	33	33	16	36
Burger_King	38	18	19	20	41	32	31	34	24	34
Harveys	54	23	12	26	40	31	27	42	24	37
McDonalds	18	15	18	19	36	23	33	54	45	47
Wendys	44	23	12	17	45	26	23	38	23	51

loyal	1	2	3	4	5	6	7	8	9	10
brand										
A&W	25	25	11	18	59	27	31	33	16	38
Burger_King	47	21	20	13	34	23	32	49	18	34
Harveys	63	29	12	19	43	24	25	41	20	40
McDonalds	21	11	16	14	40	15	25	70	35	61
Wendys	58	24	12	13	46	26	26	35	22	40

popul	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0
brand										
A&W	9	13	11	18	42	26	36	38	39	51
Burger_King	16	3	5	11	30	16	39	50	43	78
Harveys	41	13	16	14	38	29	26	56	32	51
McDonalds	5	1	1	0	6	9	9	39	59	179
Wendys	32	6	8	13	28	23	40	57	30	65

Appendix B

