The Impact of Exchange Characteristics on Customer Profitability: A Case Study of a Ceramic Tile Manufacturing Company

Salah Eddine Kout[1]

Abstract
This study was conducted in a ceramic tile production company to test the impact of a set of exchange characteristics on customer profitability. After developing hypotheses based on previous studies, we prepared the company's sales database, which includes 160 customers and 5,245 purchases, in order to calculate customer profitability and the exchange characteristics offered by the database. The results showed that both cross-buying and the amount of the first purchase positively impact customer profitability, while no effect of focused buying on customer profitability has been proven.
This study provides important implications for managers and academic researchers, allowing them to understand the drivers of current customer profitability and provide insight into future customer profitability.

Keywords: Customer profitability; Exchange characteristics.

JEL Classifications: M30; M31

DOI: 10.24818/REJ/2025/91/03

1. Introduction

Companies have shifted from the traditional concept of marketing (transactional marketing) to a new concept that focusses on the customer (relationship marketing) due to market changes, including product diversity and short life cycles, as well as an increase in customer expectations (Hoekstra & Huizingh, 1999). Instead of focusing on the product, the core principle of the relationship marketing strategy is that businesses do not have to treat all customers equally because many of them are expensive, time-consuming, and do not yield significant profits over the long term. As a result, it is generally wise for the company to stop pursuing low-value customers and concentrate on high-value ones (Zeithaml et al., 2001).

In order to acquire, develop and retain profitable (right) customers, customer profitability is used to segment customers based on their profitability, allowing companies to allocate marketing resources according to the profitability of the

[1] Laboratory of Studies of Economic Diversification Strategies to Achieve Sustainable Development, University of Mila, Algeria, s.kout@centre-univ-mila.dz
ORCID ID: 0009-0008-3573-4414

customer or market segment, which creates more profits for the company (Mulhern, 1999).

Pfeifer et al. (2005) define customer profitability as:
"The difference between the revenues earned from and the costs associated with the customer relationship during a specified period" (p. 7).

According to them, customer profitability is an accounting summary of events from the past and present (unlike customer lifetime value, which is a forward-looking measure), aiming to identify and capitalise on differences between customers.

According to Van Raaij (2005), two kinds of insights are produced by customer profitability analysis (CPA): the level of profitability for each individual customer and the profitability distribution across customers within the customer base. These two categories of data make it possible to conduct innovative analysis pertaining to risk, strategic positioning, and costs and revenues.

It is important to note that there are many factors that potentially affect customer profitability, including exchange characteristics such as cross-buying, concentrated buying, and the amount of the first purchase. Companies are required to identify these factors, which contribute to determining the nature of their relationship with their customers. Knowing these factors gives the company the ability to influence customer behaviour in order to maximise its profitability over the longest possible period. On the other hand, these factors can be used as indicators of the customer's future profitability.

Thus, we find ourselves faced with the following question:

- **Do exchange characteristics affect customer profitability?**

To answer the main question, we formulated the following main hypothesis:

- **There are a set of exchange characteristics, namely: cross-buying, focused buying, and the amount of the first purchase, which affect customer profitability.**

We will test the validity of this hypothesis by developing a set of sub-hypotheses related to the characteristics of exchange and that by conducting a study in an Algerian ceramic tile production company whose name we have withheld for reasons related to data confidentiality.

2. Methodology

In this section, we will develop hypotheses based on previous studies and theoretical literature and then prepare the study data.

2.1 Hypothesis development

a. Cross-buying and customer profitability

Cross-buying refers to the diversity of a customer's purchases from a company. Customers who purchase different types of products have a greater chance of continuing to deal with the organization. In contrast, Reinartz et al. (2008) concluded that cross-buying is a result of behavioural loyalty (which is a translation of customer profitability) and not a cause of it. They also point out that cross-buying does not succeed until the relationship with the customer is developed. Kumar et al. (2008) point out that the company's marketing efforts depend on the customer's lifetime value (future customer profitability), which is affected by cross-buying. Venkatesan and Kumar (2004) also concluded that cross-buying positively affects customer repeat purchases (which is one of the main drivers of customer profitability). In a similar result, Ekinci et al. (2014) concluded that some product-related variables, such as product assortment diversity, directly increase customer value. This is the same result reached by Reinartz and Kumar (2003). Accordingly, we explain the relationship between cross-buying and customer profitability through the following hypothesis:

H1: There is a statistically significant positive effect of cross-buying on customer profitability.

b. Focused buying and customer profitability

Focused buying (or depth of buying) in a category refers to the total number of orders placed in that category, i.e., it expresses the category of purchases with the highest percentage compared to other categories Kumar et al. (2008). Reinartz and Kumar (2003) found a negative relationship between focused buying and customer lifetime value. A high rate of focused buying is usually associated with a small number of product categories that the customer buys from the company. If the customer's cross-buying behaviour is associated with buying one type or category among the different products, then the concentration of his purchases equals 100%. Despite this, the customer can buy multiple categories and have a very high concentration of his purchases in one category. However, we favor the first belief that links the diversity of the customer's purchases to a low concentration of his purchases. Since we assumed in the previous hypothesis that the effect is positive between cross-buying and customer profitability, we will assume a negative effect

of focused buying on the customer profitability, we explain the relationship between focused buying and customer profitability through the following hypothesis:
H2: There is a statistically significant negative effect of focused buying on customer profitability.

c. The amount of the first purchase and customer profitability
The amount of the first purchase refers to the monetary value that the customer spent during the first purchase he made with the company. Given the importance of this dimension, Miguéis et al. (2012) included it with the variables of the RFM model in order to develop two models to predict partial customer churn, where the amount of the first purchase was used as an indicator of the state of trust and demand maturity between the customer and the company. Voigt and Hinz (2016) concluded in their study that customers who spent a large amount on the initial purchase have a higher future profitability. It can be said that the customer who spends a large amount in his first purchase with the company has a greater chance of advancing on the loyalty pyramid compared to customers who spend small amounts. It is an indicator of his ability to pay and his willingness to enter into a long-term relationship with the company and make more purchases in the future. Therefore, marketing managers can invest in him and increase his share of wallet, accordingly we explain the relationship between the amount of the first purchase and the customer profitability through the following hypothesis:
H3: There is a statistically significant positive effect of the amount of the first purchase on customer profitability.

2.2 Data preparation

The company's sales data was obtained by downloading it from its resource planning software in Excel format. The database includes 160 customers, including 24 retailers, 70 wholesalers, 56 construction companies, and 10 customers purchasing for personal use. It should also be noted that among the company's customers, there are 11 external customers and 149 internal (local) customers. These customers made a total of 5 245 purchases during the period from January 8, 2020, to June 30, 2023, a period of three and a half years, with an average of more than 4 purchases per customer.

At this stage, we will calculate the profitability of each customer and extract the potential factors. The following table shows how to extract each variable.

Table 1. Operational definitions of variables

Variable (type)	Dimensions	Operational definition (calculation method)
Exchange characteristics (independent variable)	Cross-buying	The number of product types purchased by the customer during the accounting period (expressed as the number of tile size types).
	Focused buying	The monetary value of the type of product (tile size) most purchased by the customer to the total cash flow of the customer, expressed as a percentage.
	The amount of the first purchase	The cash amount spent by the customer on his first purchase with the company.
Customer profitability (dependent variable)	Monetary	The total amount of money (in Algerian dinars) spent by the customer during the calculated period.

Source: Prepared by researcher

It is worth noting that the dimensions were calculated according to the operational definitions shown in the previous table, relying on Excel software. The following table shows a sample of the company's sales database after preparing the data (calculating the study variables).

Table 2. A sample of the company's sales database

Customer code	Cross-buying	Focused buying	The amount of the first purchase	Customer profitability (DZD)
0001	01	100%	62 346.24	62 346.24
0002	01	100%	192 192.00	192 192.00
0003	01	100%	609 638.40	609 638.40
0004	01	100%	705 024.00	1 754 784.00
0005	06	63%	287 094.00	2 420 774.83
0006	01	100%	1 026 432.00	11 794 972.72
….	….	….	….	….
….	….	….	….	….
0160	02	59%	983 679.84	983 679.84
Total	**-**	**-**	**-**	**4 133 757 831.77**
Average	**2.79**	**75%**	**708 512.28**	**25 835 986.45**

Source: Prepared by researcher based on the company's database

Taking customer No. 04 as an example, we note that his purchases are concentrated 100% on one type, and he spent an amount of 705 024.00 DZD on his first purchase, and this amount is equal to his profitability, which means that he only bought once from the company.

3 Results

After completing the data preparation process, we upload the database to the Statistical Package for Statistics (SPSS) program in order to explore relationships and test hypotheses. Accordingly, we explain the relationship between the variables as follows:

3.1 Correlation coefficient results

The following table presents the descriptive statistics.

Table 3. Descriptive statistics

Variables	Mean	Std. Deviation
Cross-buying	2.79	1.74
Focused buying	0.75	0.22
The amount of the first purchase	708 512.27	474 506.96
Customer profitability	25 835 986.45	75 326 628.74

Source: SPSS outputs

The table shows that the average number of items purchased by a customer is approximately 3, with a standard deviation of 1.74. The average concentration of customer purchases is 75%, with a standard deviation of 22%. While the average customer profit margin is 25 835 986.45 DZD, with a standard deviation of 75 326 628.74 DZD, which is very high.

Before choosing the appropriate correlation coefficient, we will perform a normality test on the data

The results are shown in the following table.

Table 4. Normal distribution test

Kolmogorov–Smirnov test	
Variables	**Statistical significance level**
Exchange characteristics	0.000

	Kolmogorov–Smirnov test
Cross-buying	0.000
Focused buying	0.000
The amount of the first purchase	0.001

Source: SPSS outputs

The results of the Kolmogorov-Smirnov test show that all variables have a significance level less than 0.05, and therefore they do not follow a normal distribution.

Since the data do not follow a normal distribution, we will use Spearman's correlation coefficient, which is a non-parametric alternative to Pearson's correlation coefficient.

The following table shows the results of the Spearman's correlation coefficient between the study variables.

Table 5. Spearman's correlation coefficient results

Exchange characteristics	Spearman's correlation coefficient with customer profitability	Statistical significance level
Cross-buying	0.666**	0.000
Focused buying	-0.597**	0.000
The amount of the first purchase	0.631**	0.000

** Correlation is significant at the 0.01 level (2-tailed)

Source: SPSS outputs

We note that all exchange characteristics have a significance level less than 0.01. Cross-buying has a positive correlation with customer profitability (0.666), meaning that the more diverse the customer's purchases are, the higher his profitability. The same applies to the amount of the first purchase (0.631), the higher it is, the higher the customer's profitability. In contrast, focused buying has a negative correlation with customer profitability (-0.597), meaning that the more the customer's purchases are concentrated in limited types of products, the lower his profitability.

3.2 Hypothesis testing results

To test the hypotheses, we will perform multiple linear regression, but before that, the following assumptions must be verified:

- Linearity between the dependent variable and the independent variables
- The residuals are distributed normally with an arithmetic mean of zero.
- No perfect multicollinearity.

To verify the linearity assumption, we will examine the following scatter plots:

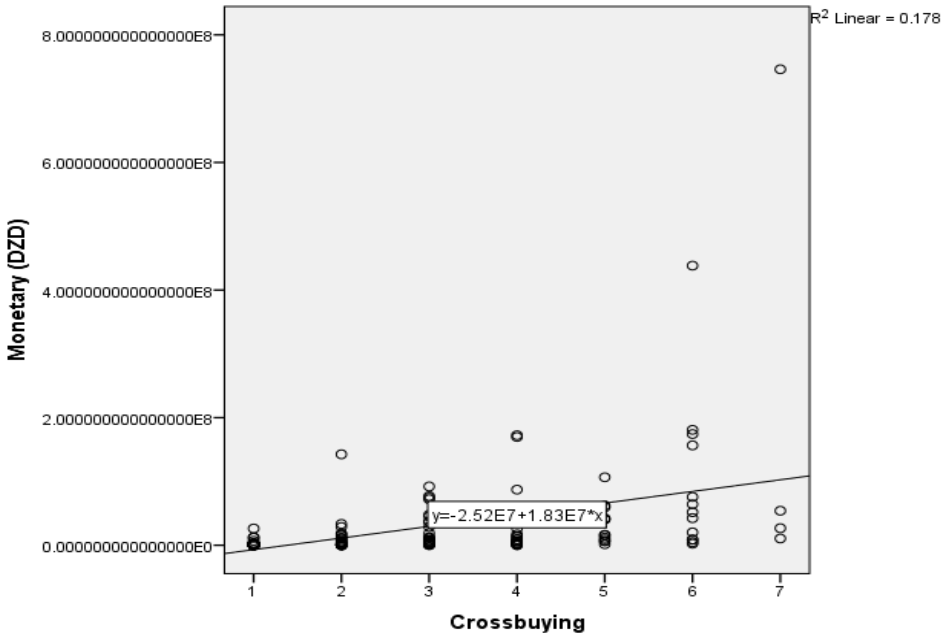

Figure 1. Scatterplot of relationship between cross-buying and customer profitability

Source: SPSS outputs

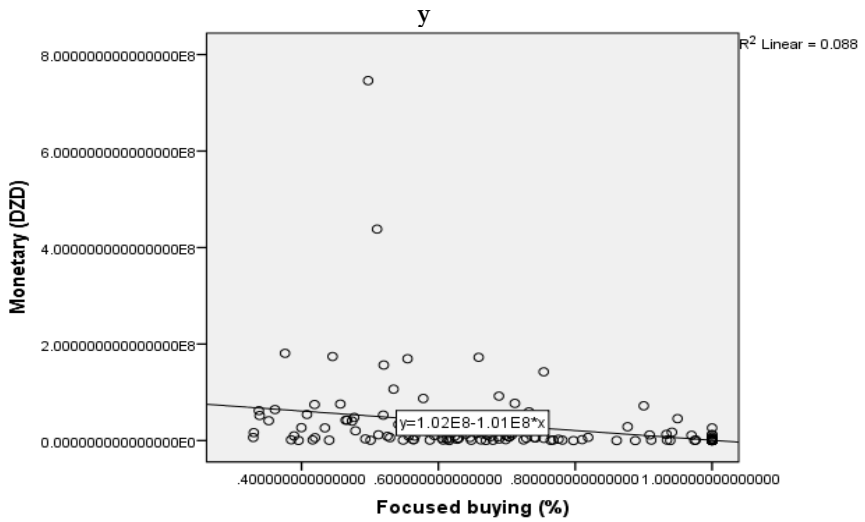

Figure 2. Scatterplot of relationship between focused buying and customer profitabilit
Source: SPSS outputs

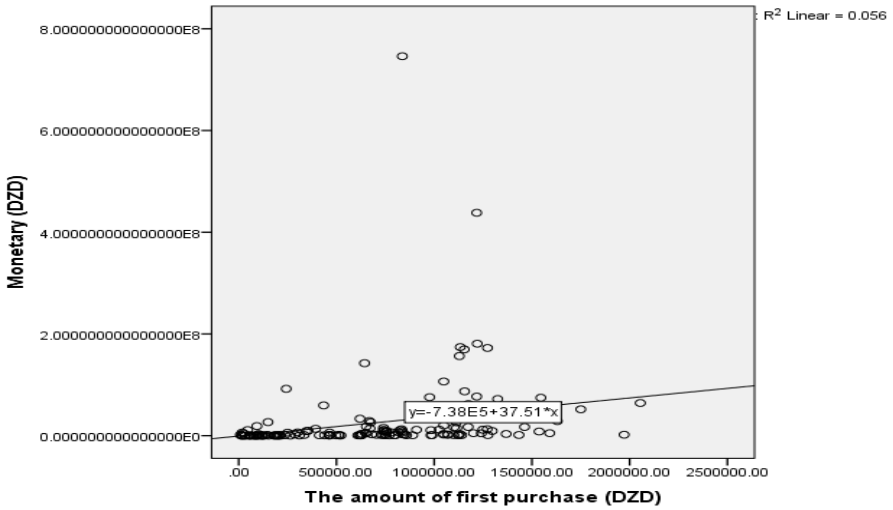

Figure 3. Scatterplot of relationship between the amount of the first purchase and customer profitability
Source: SPSS outputs

From the three figures, we can see that there is no strong evidence for the availability of the linearity assumption.

To confirm that the linearity assumption is not met, we will look at the distribution of the residuals as shown in the following two figures.

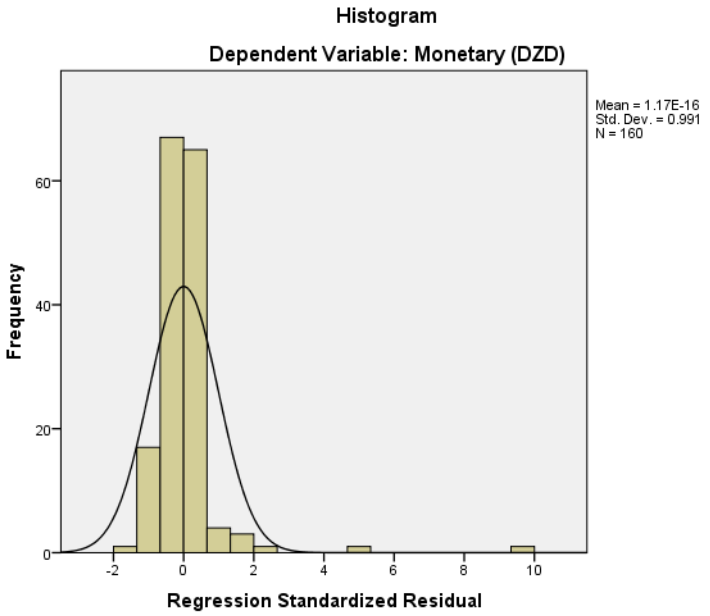

Figure 4. Histogram of regression standardized residuals
Source: SPSS outputs

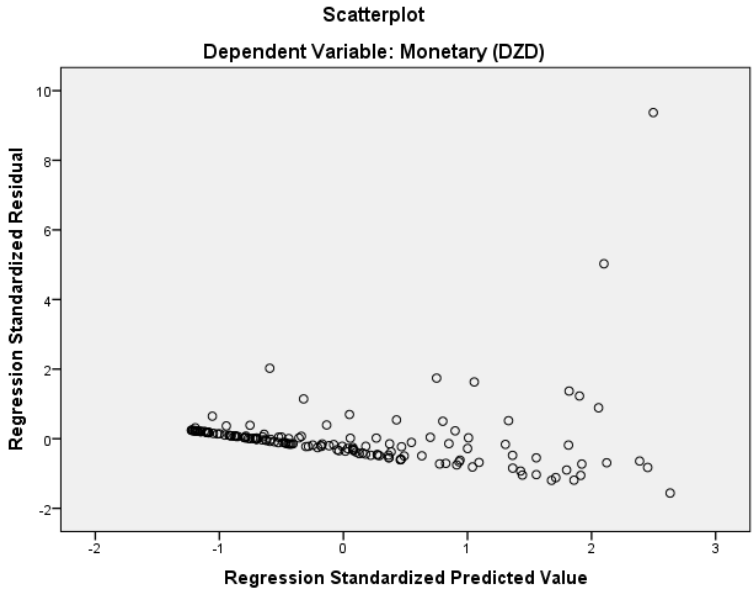

Figure 5. Scatterplot of regression standardized residuals
Source: SPSS outputs

From figure 4, we can observe that the histogram is positively skewed (right skewed), which is confirmed by Cook's distance (CD), where there are two outliers with CD greater than 0.1 (0.236 and 1.409). Therefore, the assumption of normal distribution of the residuals is not met.

Through the scatterplot (figure 5), we observe that the spread of the points expands in a fan-like shape, and this indicates the presence of heteroscedasticity.

Regarding multicollinearity, it can be verified using the variance inflation factor (VIF) as shown in the following table.

Table 6. Variance inflation factor results

Variables	**VIF**
Cross-buying	3.116
Focused buying	3.250
The amount of the first purchase	1.129

Source: SPSS outputs

Variance inflation factor results show a moderate correlation between cross-buying (VIF = 3.116) and focused buying (VIF = 3.250) which is an acceptable level given that the VIF values for the three independent variables are less than 5, thus confirming the assumption of non-multicollinearity.

Although there is no strong correlation between the independent variables, the absence of linearity and the presence of heteroscedasticity reduce the reliability of the results of linear regression results. Therefore, log transformation (Log10) will be used for the dependent variable to reduce positive skew, stabilise variance, and make data more normally distributed.

The following figure illustrates the distribution of the residuals of the transformed dependent variable.

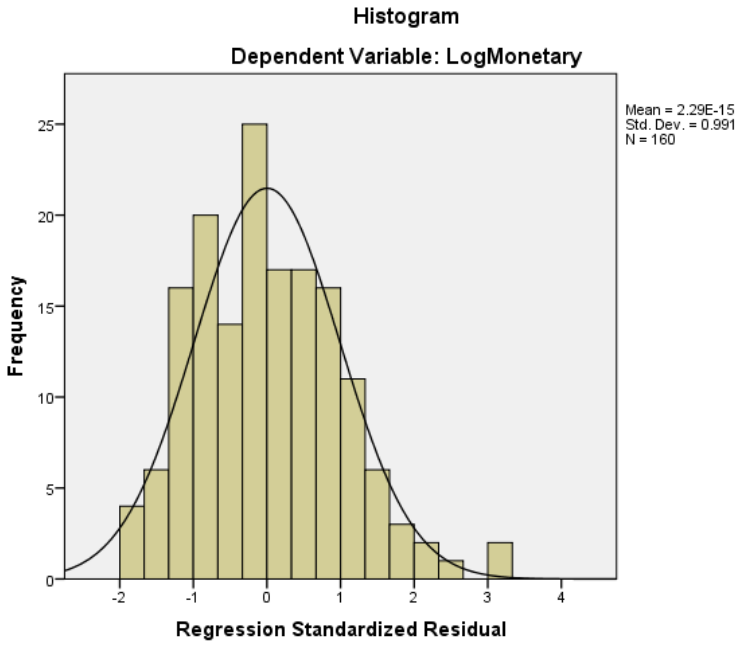

Figure 6. Histogram of regression standardized residuals (transformed variable)
Source: SPSS outputs

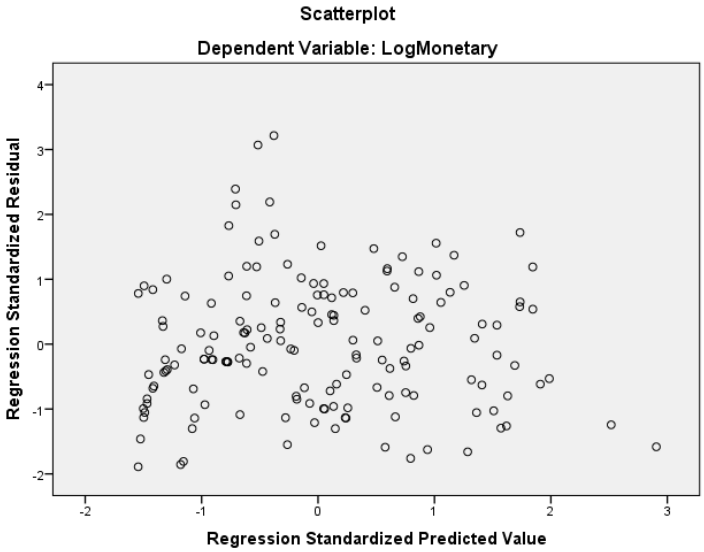

Figure 7. Scatterplot of regression standardized residuals (transformed variable)
Source: SPSS outputs

From Figure 6, we can see that there is very little skewness, as the residuals of the transformed dependent variable are normally distributed with an arithmetic mean of zero.

Through the scatterplot (figure 7), we observe that the points are spread randomly with zero centring, and that confirms the assumption of linearity. Also, the spread of points appears consistent across the entire range of predicted values, and that supports the assumption of homoscedasticity. We conclude that the linear regression results are trustworthy.

Below we will present the results of the multiple linear regression model between the independent variables and the transformed dependent variable.

The following table represents model summary results.

Table 7. Model summary

Model	R	R square	Adjusted R square	Std. error of the estimate
1	0.791	0.626	0.619	0.59043

Source: SPSS outputs

The results show that the R-squared value is 0.626; this means that the three predictor variables together (cross-buying, focused buying, and the amount of the first purchase) explain 62.6% of the variance in the dependent variable (customer profitability). This indicates a strong fit for the model.

The following table represents statistical significance.

Table 8. ANOVA

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	91.088	3	30.363	87.098	0.000
Residual	54.382	156	.349		
Total	145.470	159			

Source: SPSS outputs

The significance value (Sig) for the overall model is less than 0.05; we can conclude that the regression model as a whole is statistically significant.

The following table shows coefficient results.

Table 9. Coefficients

Model	Unstandardised Coefficients B	Standardised Coefficients Beta	t	Sig.
(Constant)	5.055		12.012	0.000
Cross-buying	0.284	0.517	5.981	0.000
Focused buying	0.018	0.004	0.047	0.962
The amount of first purchase	9.626E-7	0.478	9.183	0.000

Source: SPSS outputs

Since the variables differ from each other in terms of scale (for example, focused buying in the form of a percentage and profitability in Algerian dinars), the values of the standardized beta coefficients will be considered.

a. Cross-buying and customer profitability

We will test the first hypothesis which says:

H1: There is a statistically significant positive effect of cross-buying on customer profitability.

The results show that the significance level is less than 0.05, with the standardised coefficient beta equal to 0.517, and therefore we rule that the first hypothesis (H1), which states that there is a statistically significant positive effect of cross-buying on customer profitability, is valid.

b. Focused buying and customer profitability

We will test the second hypothesis which says:

H2: There is a statistically significant negative effect of focused buying on customer profitability.

The results show that the significance level is more than 0.05, with the standardised coefficient beta very close to 0.000, and therefore we rule that the second hypothesis (H2), which states that there is a statistically significant negative effect of focused buying on customer profitability, is not valid.

c. The amount of the first purchase and customer profitability

We will test the third hypothesis which says:

H3: There is a statistically significant positive effect of the amount of the first purchase on customer profitability.

The results show that the significance level is less than 0.05, with the standardised coefficient beta equal to 0.478, and therefore we rule that the third hypothesis (H3), which states that there is a statistically significant positive effect of the amount of the first purchase on customer profitability, is valid.

4. Discussion

The results showed that cross-buying positively affects customer profitability, and this result was reached by many previous studies (Reinartz & Kumar, 2003; Venkatesan & Kumar, 2004; Ekinci et al., 2014). Cross-buying is the result of a cross-selling strategy that aims to motivate the customer to diversify his purchase portfolio. Therefore, the customer who buys different types (sizes) of products has greater chances of buying, because he is able to compensate for certain types that may not be available during the order from the company with other types, unlike the customer who buys only specific types.

The study did not show any effect of focused buying on customer profitability, which contradicts the findings of Reinartz & Kumar (2003). This finding warrants further investigation, especially since high focused buying is usually associated with a small number of product types that the customer buys. The company's provision of various types is linked to its production capacity and the number of production lines. Therefore, most companies cannot provide all types of products to the customer at the same time, as in the periods in which the product in which the customer's purchases are concentrated disappears from the market, the level of his spending decreases, which negatively impacts his profitability.

As for the amount of the first purchase, the results also showed that it positively affects the customer's profitability, which is the same as what Voigt and Hinz (2016) concluded. The customer who spends a large amount in the first purchase is a customer who has the ability to pay and is ready to enter into a long relationship with the company.

The study demonstrated that exchange characteristics represented by cross-buying and the amount of the first purchase positively affect customer profitability. These results are consistent with the study's hypotheses and theoretical and experimental logic. While no effect of focused buying on customer profitability has been proven, this warrants further investigation.

Marketing managers and academic researchers can rely on the results of this study to better understand customer behaviour and adopt cross-selling strategies to maximise customer profitability.

Since this study relies on the information provided by the company's database, future studies can be conducted on more diverse databases and in other economic sectors.

5. Conclusion

With increasing market competition, customer acquisition strategies alone are no longer sufficient. Adopting relationship marketing concepts has become essential, enabling companies to implement customer relationship management programmes to maximise profitability and retain customers for as long as possible. This necessitates understanding the factors that control customer profitability and how to leverage them to maximise it. Among these factors are exchange characteristics, such as cross-buying and the amount a customer spends on their first purchase, both of which positively impact customer profitability.

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