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E-commerce development in Mexico: an empirical research

Desarrollo del comercio electrónico en México: una investigación empírica

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Abstract

Globalization is experiencing a new stage in which the Internet, as a communication network between people worldwide, is modifying consumption patterns, giving rise to the emergence of the digital economy. In Mexico, the transactions of goods and services through informatic networks have grown over the years, becoming a source of economic growth. This study aims to answer the research question, which are the main variables that have affected the development of e-commerce in Mexico? Therefore, this research's primary objective is to analyze the variables that have had an effect on the development of e-commerce in Mexico for the period from 2007 to 2017. For the research, a PLS regression model was performed. The results obtained show that the variables that have had the most significant impact on e-commerce development in Mexico are R&D spending, urbanization rate, internet penetration, and a portion of internet users who made purchases through the Internet. Based on these variables, it is recommended to create policies that encourage the use of e-commerce within businesses and guarantee users' safety as well as the creation of adequate infrastructure.

Keywords: economic growth; e-business; e-commerce; digital economy; PLS regression model.

JEL Codes: C3

Resumen

La globalización está viviendo una nueva etapa en donde el Internet, como red de comunicación entre las personas a través del mundo, está modificando los patrones de consumo, dando pie a la aparición de la economía digital. En México, las transacciones de bienes y servicios mediante redes informáticas han ido creciendo con el paso de los años, convirtiéndose en fuente de crecimiento económico para el país. Este estudio tiene como objetivo responder la pregunta de investigación, ¿cuáles son las principales variables que han afectado el

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desarrollo del comercio electrónico en México? Por lo tanto, el objetivo principal de esta investigación es analizar las variables que han tenido un efecto en el desarrollo del comercio electrónico en México para el período 2007 a 2017. Para la investigación, se realizó un modelo de regresión MCP. Los resultados obtenidos muestran que las variables que han tenido el impacto más significativo en el nivel de desarrollo del comercio electrónico en México son el gasto en I+D, la tasa de urbanización, la penetración de Internet y la porción de usuarios de Internet que realizaron compras a través de este medio. Sobre la base de estas variables, se recomienda crear políticas que fomenten el uso del comercio electrónico en las empresas y garanticen la seguridad de los usuarios, así como la creación de una infraestructura adecuada.

Palabras clave: crecimiento económico; comercio electrónico; economía digital; modelo de regresión MCP; negocio electrónico.

Clasificación JEL: C3

1. Introduction

The emergence of digital technologies has come to change the way things are done. Nowadays, people communicate more easily with the use of social networks anywhere in the world. Many educational programs can be taken at any time of the day and in any place, people can work for a company from home, transactions of goods and services can be done online, among others, all through digital technologies and Internet connection. The use of digital technologies to collect, store, analyze, and share information is growing faster. As time passes, the Internet reaches more households, and there are more users with cell phones, computers, and other devices to connect to the network (Bank World, 2016).

With the adoption of new information and communication technologies (ICT), population and commerce are beneficed. On the one hand, the development of ICTs improve education, business opportunities, and jobs, having a positive impact on society (Ejiaku 2014). On the other hand, ICTs in commerce make commercial transactions more comfortable, faster, and less expensive (Terzi, 2011).

The changes that have caused ICT in the way of doing business are the emergence of electronic commerce or e-commerce. This new commerce model refers to the transactions of goods, services, and information through the Internet using computers, mobile devices, and other tools (Meng, 2017; OCDE, 2018; INEGI, 2018).

ICT and e-commerce cause an increase in competition between companies, which results in consumers having a more significant offer of products and services and better prices, which has a positive effect on the economies of both developed countries as in development (Panagariya, 2000; Terzi, 2011).

Unlike developed countries, Lawrence and Tar (2010) point out that developing countries still have certain limitations regarding the use of e-commerce such as limited access to the Internet, the lack of policies and infrastructure necessary for the use of the Internet, the lack of banking services, ignorance from users about the potential of e-commerce, user skills on ICT, the level of penetration of computers and telephones among the members of society, etc. However, in Mexico, e-commerce had had a high potential for growth since 2012 when sales by this mean represented 85.7 million pesos, while for the year 2016, they reached 329.8 million pesos (AIMX 2018c).

From the perspective of e-commerce as a source of economic growth for the country, this research aims to answer the research question, which are the main variables that have affected the development of e-commerce in Mexico? Therefore, this study's primary objective is to analyze the variables that have had an effect on the development of e-commerce in Mexico for a period from 2007 to 2017. It is expected that by knowing the variables that have affected e-commerce, tools that promote their development (adequate infrastructure and policies) and, therefore, the population's living standards can be proposed.

To carry out the study, a PLS regression model is performed using independent variables: internet penetration (IP), number of computers per households (NCPH), mobile phone penetration (MPP), real GDP per capita (GDP), urbanization rate (UR), R&D spending (RD), number of patent applications (NPA), per capita disposable income (PCDI), and a portion of internet users who made purchases (IUMP). The study carries out a time series analysis from 2007 to 2017.

This research is structured into five sections. Following the introduction, section 2 contains the theoretical and empirical review of the work related to e-commerce and its development. Section 3 presents the variables selected for the study, the data selection process, the hypotheses proposed for the investigation, and the PLS regression model's description to test the hypotheses. Section 4 provides the analysis and discussion of the results. Finally, section 5 presents the main conclusions and recommendations for future works.

2. Literature review

The industry related to ICTs is increasing their productivity, which allows them to grow faster than other sectors of the economy and contribute to the increase of productivity at a macroeconomic level (Schreyer 2000). Thus, companies can benefit from the telecommunications sector by including ICTs in their processes. ICTs refer to any technical means to access, store, transmit, and manipulate information such as computer hardware, the network, or its software (EUROSTAT 2018).

Changes in technologies can contribute to companies' competitiveness by forcing them to improve their strategies to improve their productivity and stay competitive (Terzi, 2011). One way to incorporate ICTs within the firm concerns the adoption of e-commerce. In a highly competitive environment, companies must create strategies that differentiate them from their competitors. E-commerce can function as a differentiating strategy (Lertwongsatien & Wongpinunwatana, 2014).

E-commerce is defined as transactions of goods, services, and information through the Internet using computers, mobile devices, and other tools (Meng, 2017; OCDE, 2018; INEGI, 2018). It should be noted that E-commerce covers other activities related to the value chain of companies, such as the promotion of products and services, billing, customer management, among others (Vaithianathan, 2010). The purchase and sale of goods and services also involve data transmission, funds, and information through electronic networks (Meng, 2017). E-commerce is usually classified as inter-organizational trade (B2B), within the organization, and from company to client (B2C) (Vaithianathan, 2010).

Within literature related to e-commerce, two aspects can be noted. On the one hand, the factors that influence companies' decision to adopt e-commerce are studied (Molla and Licker, 2005; Solaymani, Sohaili, and Yazdinejad, 2012; Van, Rowe, Truex, and Huynh, 2012; Lertwongsatien and Wongpinunwatana, 2014; among others). On the other hand, the variables that affect the development of e-commerce are studied (Wong, Yen, and Fang, 2004; Liu, 2013; Wang and Liu, 2015; Bhowmik, 2017; Ortiz, Gómez, and Rodríguez, 2019; among others). In this regard, this study aims to study the variables that affect the development of e-commerce.Wong, Yen, and Fang (2004) carried out a descriptive study of the variables that have affected the

development of e-commerce in China. The variables analyzed were several internet users, internet connection types, internet user distribution, and telephone users. They found that e-commerce in China has had a slow development due to some obstacles such as the lack of information from users about online purchases, uneven development in the economy, the importance of traditional businesses, and users' behavior and perceptions.

Liu (2013) performs empirical research analyzing the impact of e-commerce on economic growth in China through an econometric model. The development of e-commerce was used as an independent variable. The level of economic development of the country measured by GDP was used as a dependent variable. Investment, government purchases, consumption, and net exports indicators were used to measure the independent variable. The study concludes that e-commerce can influence economic growth.

Bhowmik (2017) conducted an econometric study on total retail sales from e-commerce in India. As independent variables used retail sales in e-commerce, the number of credit and debit cardholders, the percentage of internet users. As a dependent variable used the GDP growth rate. For the analysis, he applied the Granger causality tests (Granger 1969) and the Johansen cointegration test (Johansen 1988). Their results show that, although e-commerce in India is growing fast enough, the country needs to improve the infrastructure for this type of commerce, more electronic security, customs control, and other regulatory measures.

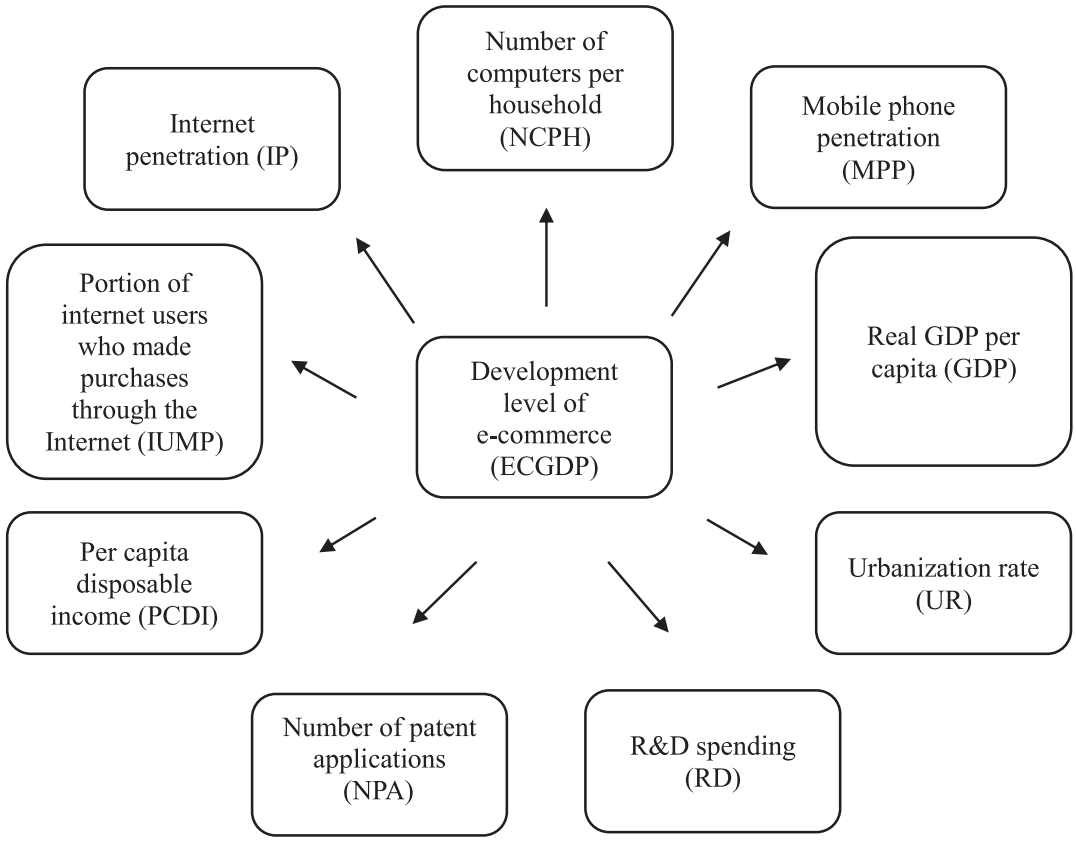
In Wang and Liu (2015), the factors that affect the development of e-commerce were studied using independent variables information infrastructure construction, urbanization level, living standards, economic level, human capital level, educational level, technology level, and price index. The level of development of e-commerce was used as an independent variable. The results of the study suggest that the factors that mostly affect the development of e-commerce in China are mobile phone penetration, the number of computers, per capita disposable income, real GDP per capita, knowledge index, and internet penetration; while the variables real GDP per capita, knowledge index and internet penetration have a less impact on the development of e-commerce.

Ortiz, Gómez, and Rodríguez (2019) investigated the variables that have impacted the development of electronic commerce in European countries. As a dependent variable, they used the development level of e-commerce. They used mobile phone penetration, R&D spending, and per capita disposable income as independent variables. For the analysis, they used an econometric model of panel data, obtaining that the independent variables have a positive and significant effect on the development of e-commerce.

Developing countries can currently benefit from e-commerce since they do not have to go through many of the stages of technological development that developing countries had to face (Panagariya, 2000). As time passes, Mexico is a developing country that has adopted new technologies; each year, the number of inhabitants who have a computer, a mobile phone, and internet access increases (INEGI, 2015).

Therefore, this study aims to get an insight into the main variables that have impacted the level of development of e-commerce in Mexico for the period from 2007 to 2017. For this research, the methodology proposed by Wang and Liu (2015) is followed. Consequently, the variables internet penetration (IP), number of computers per household (NCPH), mobile phone penetration (MPP), real GDP per capita (GDP), urbanization rate (UR), R&D spending (RD), number of patent applications (NPA), per capita disposable income (PCDI), and the portion of internet users who made purchases (IUMP) may have had a positive influence on the results related to the development of e-commerce. Based on the literature reviewed, Figure 1 shows the proposed model to analyze the relationships between e-commerce and the main variables believed to have affected their development level.

Figure 1 The relationship between the variables.



3. Methodology

Given that the object of this study is to answer the research question about which are the main variables that have affected the development of e-commerce in Mexico for the period from 2007 to 2017, the variables subject of the study, the data collection, the approach of the research hypothesis and the description of the regression model used for the analysis are presented below.

3.1 Variables and data collection

The methodology used by Wang and Liu (2015) has been used to establish the variables used in this analysis. It should be noted that an adaptation to this methodology has been made due to the differences between countries, since their study was developed for China, and the availability of the data. Thus, the development level of e-

commerce (ECGDP) is proposed as a dependent variable, and to measure it, the portion of e-commerce that corresponds to the gross domestic product (GDP) of Mexico is used. Internet penetration (IP), the number of computers per household (NCPH), mobile phone penetration (MPP), real GDP per capita (GDP), urbanization rate (UR), R&D spending (RD), the number of patent applications (NPA), per capita disposable income (PCDI), and the portion of internet users who made purchases (IUMP) are used as independent variables. Time series from 2007 to 2017 to collect the data were taken from the Asociación de internet.mx (AIMX), the World Bank (WB), and Instituto Nacional de Estadística y Geografía (INEGI). In table 1, the variables subject of study are presented and their definition, measurement, and source of reference.

Table 1 Variables and data collection.

Indicator	*Definition*	*Measurement*	*Source*
Dependent variable			
Development level of e-commerce (ECGDP)	It evaluates the growth of e-commerce over a period of time.	It represents the portion of e-commerce that corresponds to the gross domestic product (GDP) of Mexico.	AIMX (2018a), AIMX (2018b), and WB (2018).
Independent variables			
Internet penetration (IP)	It represents the portion of the population of an area that uses the Internet.	It refers to the proportion of the population of Mexico that uses the Internet.	WB (2018).
Number of computers per households (NCPH)	It refers to the number of computers that there are in the households of an area.	It is measured by the number of computers per household in Mexico.	INEGI (2015).
Mobile phone penetration (MPP)	It represents the average number of mobile phones there are in households in an area.	It refers to the average number of mobile phones per household in Mexico.	INEGI (2015).
Real GDP per capita (GDP)	It reflects the situation of a country's economic development. GDP is the sum of gross value added by all resident producers in an economy plus any product taxes and minus any subsidies not included in the value of the products (WB, 2018).	It is measured by the gross domestic product (GDP) in Mexico (current USD).	WB (2018).
Urbanization rate (UR)	It refers to the degree to which people join urban areas.	It is used to reflect the degree of population aggregating to the city in Mexico.	WB (2018).

R&D spending (RD)	It refers to Gross domestic expenditures on research and development (percent of GDP) (WB, 2018).	It is the measure as a percentage of GDP of research and development (R&D) spending in Mexico.	WB (2018).
Number of patent applications (NPA)	Patent applications are worldwide patent applications filed through the Patent Cooperation Treaty procedure (WB, 2018).	For its measurement, the total number of patent applications in Mexico is used.	WB (2018) and WIPO (2018).
Per capita disposable income (PCDI)	GNI per capita based on purchasing power parity (PPP) (WB, 2018).	For its measure, Per capita disposable income (PCDI) from Mexico is used.	WB (2018).
The portion of internet users who made purchases through the Internet (IUMP)	It represents the portion of internet users who purchased the Internet.	The portion of Internet users in Mexico who made an online purchase is used to measure this variable.	INEGI (2015).

3.2 *Hypotheses*

The following hypotheses were formulated to analyze the effect that independent variables have on the dependent variable, based on the literature review (Wang & Liu, 2015; Liu, 2013; Bhowmik, 2017):

H1: Everything else constant, the greater IP in Mexico, the higher the probability it positively affects ECGDP in this country ($\beta_1 > 0$).

H2: Everything else constant, the greater NCPH in Mexico, the higher the probability it positively affects ECGDP in this country ($\beta_2 > 0$).

H3: Everything else constant, the greater MPP in Mexico, the higher the probability it positively affects ECGDP in this country ($\beta_3 > 0$).

H4: Everything else constant, the greater GDP in Mexico, the higher the probability it positively affects ECGDP in this country ($\beta_4 > 0$).

H5: Everything else constant, the greater UR in Mexico, the higher the probability it positively affects ECGDP in this country ($\beta_5 > 0$).

H6: Everything else constant, the greater RD in Mexico, the higher the probability it positively affects ECGDP in this country ($\beta_6 > 0$).

H7: Everything else constant, the greater NPA in Mexico, the higher the probability it positively affects ECGDP in this country ($\beta_7 > 0$).

H8: Everything else constant, the greater PCDI in Mexico, the higher the probability it positively affects ECGDP in this country ($\beta_8 > 0$).

H9: Everything else constant, the greater IUMP in Mexico, the higher the probability it positively affects ECGDP in this country ($\beta_9 > 0$).

The proposed hypotheses were tested through a PLS regression analysis to know the independent variables' effect on the dependent variable.

3.3. PLS regression analysis

Multiple regression models are models in which the dependent variable depends on two or more explanatory or independent variables, that is to say, when more than two variables are used in a model (Gujarati and Porter, 2010). In this regard, to analyze the relationship between the dependent and the independent variables, a linear model represented by the following equation is constructed:

$$\text{ECGDP} = constant + \beta_1 IP_i + \beta_2 NCPH_i + \beta_3 MPP_i + \beta_4 GDP_i + \beta_5 UR_i + \beta_6 RD_i + \beta_7 \text{NPA}_i + \beta_8 PCDI_i + \beta_9 IUMP_i + \_u_i$$

Where ECGDP is the dependent variable; IP, NCPH, MPP, GDP, UR, RD, NPA, PCDI, and IUMP, the explanatory variables (or independent variables), u_i is the tern of stochastic perturbation, and $i-th$ observation.

The partial least squares model (PLS) was used to analyze the degree to which each of the independent variables affects the dependent variable. PLS model was called NIPALS (nonlinear iterative partial least squares) and arose with H. Wold in 1975. This model considers some deficiencies in the models, such as the multicollinearity of the indicators or the structural model's lack of specification. The scores of the latent variables are adjusted to the real values (Cassel et al. 2010).

As Haenlein and Kaplan (2004) and Cassel et al. (2010) show, PLS is mainly used in the following cases:

- When structural equation models (SEM) based on covariance cannot be used because the number of indicators per latent variable becomes too large.
- PLS are typically used in situations where the sample size is minimal.
- PLS can be used for models with reflexive, formative, or both indicators (Fornell and Bookstein, 1982).
- When the indicators show asymmetry or multicollinearity.
- When there is a wrong specification of the structural model.

The model proposed for the analysis meets the characteristics of the models in which PLS models are used, a small sample, and a large number of explanatory variables.

4. Results

Due to the sample size delimited by the availability of data and the number of variables used, for the analysis of the variables under study, a PLS regression model was applied using the statistical program SPSS, using time series data from 2007 to 2017.

The results of the PLS regression model are presented in three parts. In the first part, the degree to which the variables are linearly related is determined by the Pearson correlation. In the second, a multicollinearity diagnosis for independent variables is presented using the inflation factor of variance (VIF) since it is a condition that must be met to know if the regression model is adequate for the analysis. In the third part, the PLS regression model is run, and the regression coefficients of each of the dependent variables are estimated.

The Pearson correlation is used to determine the extent to which the variables are linearly related. Their values oscillate between -1 and 1. Where 1 is the total positive correlation, 0 means no correlation, and -1 is the total negative correlation. Table 2 shows the Person correlation coefficients between variables, where it can

be seen that most of the variables have a coefficient greater than 0.8 indicating a strong linear relationship between each pair of variables with a 1% and 5% level of statistical significance.

Table 2 Pearson correlation coefficients

		ECGDP	*IP*	*NC*	*MPP*	*GDP*	*UR*	*RD*	*NPA*	*PCDI*	*IUMP*
ECGDP	Pearson correlation	1	.969**	.988**	.959**	.966**	.950**	.812**	.813**	.875**	.755**
	Sig. (bilateral)		.000	.000	.000	.000	.000	.002	.002	.000	.007
IP	Pearson correlation	.969**	1	.991**	.990**	.961**	.988**	.837**	.922**	.940**	.605*
	Sig. (bilateral)	.000		.000	.000	.000	.000	.001	.000	.000	.049
NCPH	Pearson correlation	.988**	.991**	1	.986**	.969**	.984**	.849**	.885**	.924**	.692*
	Sig. (bilateral)	.000	.000		.000	.000	.000	.001	.000	.000	.018
MPP	Pearson correlation	.959**	.990**	.986**	1	.961**	.998**	.847**	.931**	.966**	.619*
	Sig. (bilateral)	.000	.000	.000		.000	.000	.001	.000	.000	.042
GDP	Pearson correlation	.966**	.961**	.969**	.961**	1	.955**	.717*	.863**	.940**	.681*
	Sig. (bilateral)	.000	.000	.000	.000		.000	.013	.001	.000	.021
UR	Pearson correlation	.950**	.988**	.984**	.998**	.955**	1	.852**	.942**	.968**	.603*
	Sig. (bilateral)	.000	.000	.000	.000	.000		.001	.000	.000	.050
RD	Pearson correlation	.812**	.837**	.849**	.847**	.717*	.852**	1	.757**	.750**	.528
	Sig. (bilateral)	.002	.001	.001	.001	.013	.001		.007	.008	.095
NPA	Pearson correlation	.813**	.922**	.885**	.931**	.863**	.942**	.757**	1	.954**	.388
	Sig. (bilateral)	.002	.000	.000	.000	.001	.000	.007		.000	.238
PCDI	Pearson correlation	.875**	.940**	.924**	.966**	.940**	.968**	.750**	.954**	1	.506
	Sig. (bilateral)	.000	.000	.000	.000	.000	.000	.008	.000		.112
IUMP	Pearson correlation	.755**	.605*	.692*	.619*	.681*	.603*	.528	.388	.506	1
	Sig. (bilateral)	.007	.049	.018	.042	.021	.050	.095	.238	.112	

** The correlation is significant at the 0.01 level (2 tails).

*. The correlation is significant at the 0.05 level (2 tails).

The variance inflation factor (VIF) is used to test multicollinearity between the independent variables. The term multicollinearity designates a linear relationship between some or all of the independent variables of a regression model, which may cause that the coefficients cannot be estimated with great precision or accuracy (Gujarati and Porter 2010).

The VIF shows how the presence of multicollinearity inflates the variance of an estimator. The higher the value of VIF_j , the greater the presence of collinearity in the variable X_j. As a practical rule, if the VIF of a variable is higher than 10, it is said that this variable is very collinear (Kleinbaum et al. 1988).

The VIF of the independent variables of the study is shown in Table 3, where it can be seen that the values of the factor surpass the value of 10 (except for the variable IUMP, which continues to be considered with collinearity), which indicates a high degree of collinearity between the variables. Being quite robust in this deficiency's presence, the PLS regression model is used for the regression analysis (Cassel et al. 2010).

Table 3 VIF of independent variables.

	IP	*NC*	*MPP*	*GDP*	*UR*	*RD*	*NPA*	*PDCI*	*IUMP*
IP	-	400.430	225.304	694.193	323.479	725.389	285.570	518.496	210.030
NCPH	503.784	-	763.928	699.927	552.854	659.024	812.968	888.135	477.140
MPP	569.466	1534.733	-	1650.452	424.438	1841.390	618.891	1095.870	1028.199
GDP	187.716	150.437	176.573	-	196.252	79.853	148.215	74.101	195.707
UR	699.027	949.600	362.881	1568.347	-	1578.177	630.604	1455.186	969.586
RD	19.465	14.057	19.550	7.924	19.598	-	18.100	17.152	18.910
NPA	37.001	83.726	31.726	71.019	37.811	87.395	-	50.793	69.567
PCDI	141.705	192.931	118.495	74.893	184.039	174.687	107.138	-	170.971
IUMP	3.724	6.725	7.213	12.833	7.956	12.495	9.520	11.092	-

Once the PLS regression model was run, the main component was determined. The main component has the greatest possible variance. For this model, the PLS component that serves as the main component is used to analyze the regression model. Therefore, the proportion of the cumulative variance of X is 86.8%, the proportion of the cumulative variance of Y (R^2) is 94%, and R^2 adjusted is 93.4% (see Table 4).

Table 4 Proportion of explained variance.

Statistics / Latent Factors	X Variance	Cumulative Variance	X Y Variance	Cumulative Variance (R^2)	Y Adjusted R^2
1	.868	.868	.940	.940	.934
2	.078	.947	.035	.975	.969
3	.010	.957	.022	.998	.997
4	.036	.993	.001	.998	.997
5	.005	.998	.000	.999	.997

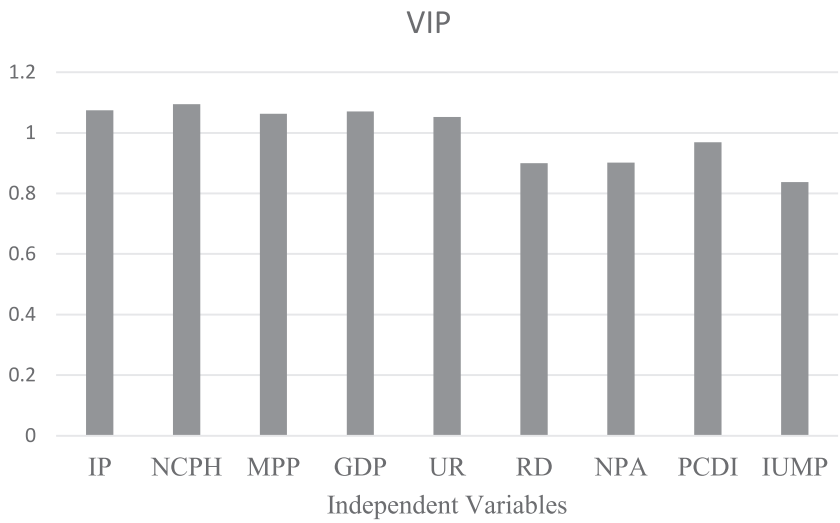
Coefficients of the independent variables indicate the effect that each of them has had on the development of e-commerce in Mexico. Table 5 shows that RD, UR, IP, and IUMP have had a more significant effect on e-commerce development. Furthermore, the symbol of the standardized coefficients usually indicates how the independent variables affect the dependent variable; its size indicates the degree to which the independent variables affect the dependent variable.

Table 5 Model results

Independent variables	Coefficient	Standardization Coefficient	VIP
(Constant)	-0.0697	-	-
IP	0.0197244	0.3580	1.0741
NCPH	6.5981E-10	0.3649	1.0947
MPP	2.991E-10	0.3543	1.0630
GDP	2.4168E-14	0.3569	1.0708
UR	0.06588929	0.3509	1.0527
RD	0.09240922	0.3000	0.9000
NPA	-5.144E-06	0.3005	0.9014
PCDI	-1.408E-06	0.3231	0.9694
IUMP	0.01013245	0.2791	0.8374

The Variable Importance for the Projection (VIP) identifies the explanatory variables that contribute in greater measure to the model. Table 5 and Graph 1 show the VIP values of each of the independent variables where: NCPH > IP > GDP > MPP > UR > PCDI > NPA > RD > IUMP. For this case, the NCPH, IP, GDP, MPP, and UR variables are the most important variables to explain the variable ECGDP.

Graph 1 Variable Importance for the Projection (VIP)



The previous results show that the PLS model for this study is significant at the 1% probability level and the proportion of cumulative X variance is above 86%, and adjusted R^2 is above 93%, which means that the variables that were identified as independents ones for this model are more effective with less interference.

5. Conclusions

This research aimed to study the main variables that have affected the development of e-commerce in Mexico, seeing the latter as a source of economic growth for the country. As a dependent variable, the development level of e-commerce (ECGDP) was selected. The independent variables for the study were: internet penetration (IP), the number of computers per household (NCPH), mobile phone penetration (MPP), real GDP per capita (GDP), urbanization rate (UR), R&D spending (RD), the number of patent applications (NPA), per capita disposable income (PCDI), and a portion of internet users who made purchases (IUMP). The data collection was done through different sources of reference such as Asociación de internet.mx (AIMX), the World Bank (WB), and Instituto Nacional de Estadística y Geografía (INEGI). Due to the availability of data, time series were built with a period from 2007 to 2017. For the data analysis, a partial least squares (PLS) regression model was carried out using the SPSS program. The results obtained show that the variables that have had the most significant impact on the level of e-commerce development are RD, UR, IP, and IUMP. It is recommended to create policies that encourage e-commerce in business, where both the consumer and the seller benefit from making transactions by electronic means. It is also recommended to create the necessary infrastructure to increase the number of inhabitants who access the Internet and access this tool. The article's limitations lie in the availability of information since it was not until after 2000 that records of ICT within businesses began to be recorded. For future research, extending the study to the other countries of North America and carrying out a comparative study between these countries is recommended.

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