Digital inequality in Mexico: an analysis of the reasons for non-access and non-use of the internet

La desigualdad digital en México: un análisis de las razones para el no acceso y el no uso de internet

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ABSTRACT

The objective of the article is to analyze the barriers to access and use of Information and Communications Technologies in rural and urban areas of Mexico. The data come from the National Survey on Availability and Use of Information Technologies in Households, 2018. The empirical analysis consists of explaining the non-access and non-use of the internet, conditioned on a set of demographic and socio-economic characteristics, through of multinomial logistic regressions. The results reflect the cost, age, low levels of education and lack of digital skills are related to non-connectivity and non-use of the internet in rural and urban contexts, although with different magnitudes. Hence, the need to implement public policies aimed at promoting access and fostering the efficient use of cyberspace in both contexts.

Keywords
Digital divide; rural; urban; non-users of internet

RESUMEN

El objetivo del artículo es analizar las barreras de acceso y uso de las tecnologías de la información y la comunicación en zonas rurales y urbanas de México. Los datos provienen de la Encuesta Nacional sobre Disponibilidad y Uso de Tecnologías de la Información en los Hogares 2018. El análisis empírico consiste en explicar el no acceso y el no uso del internet, condicionados a un conjunto de características demográficas y socioeconómicas, a través de regresiones logísticas multinomiales. Los resultados reflejan que el costo, la edad, los bajos niveles de escolaridad y la falta de habilidades se relacionan con la no conectividad y la no utilización de internet en contextos rurales y urbanos, aunque en diferente magnitud. De ahí la necesidad de implementar políticas públicas tendientes a promover el acceso y fomentar el uso eficiente del ciberespacio en ambos contextos.

Palabras clave
Brecha digital; rural; urbano; no usuarios de internet

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Introduction

Surveys on the digital gap[1] have formed a relevant research area over the past decades. The first works, such as those of Norris (2001), Selwyn (2004), Dewan & Riggins (2005) and Van Dijk (2006), are centered in the development of telecommunications infrastructure and access to information and communication technologies (ICTs). Access to Internet[2], which is the first level in the gap, is uneven among individuals with social, economic, and demographic characteristics, as this depends on variations such as age, gender, education, entry, ethnicity, and geographical location (Van Dijk, 2017; Van Deursen & Van Dijk, 2011).

As the network coverage increased –by a reduction in prices, due to the increase of competitors– surveys centered on the use of Internet,[3] where digital skills, motives and psychological attributes of users are relevant (Tirado-Morueta *et al.,* 2017; Blank & Grošelj, 2014; Zillien & Hargittai, 2009). Works on this second level of the gap have explored the type of activities online, as well as skills required for this purpose (Van Deursen *et al.,* 2017; Van Deursen & Van Dijk, 2014; Helsper & Eynon, 2013).

With respect to the use of Internet in rural Mexico, in 2018 barely 19% of homes are connected to fixed or mobile Internet; however, in the same results it was indicated that 41% of six-year old population and older used the network (INEGI, 2018). These figures reflect that, as compared to urban areas, dissemination of ICTs in the rural context is in the first development stage.

There is extensive literature analyzing the determinants of the digital gap in developing countries (Martínez-Domínguez & Mora-Rivera, 2020; Forenbacher *et al.,* 2019; Toudert, 2019; Gwaka *et al.,* 2018); but the works only of Barrantes & Cozzubo (2019), Izquierdo *et al.* (2015) and Correa (2014) examine the relationship of the reasons of no access and no use of Internet with socio-economic and demographic factors. The foregoing notwithstanding, given the fact that these surveys are of qualitative nature, or are based in small samples, they cannot be extrapolated to the total population to draw generalizations.

Before 2013, the telecommunications sector in Mexico was highly concentrated on a single company –America Movil, with its two affiliated companies: Telmex and Telcel– which brought high connection costs, weak regulation agents and low ICT service coverage (Ovando & Olivera, 2018; Ayala *et al.*, 2018). In addition to this low telecommunications development in rural areas, poverty and marginalization rates are high.

In the socio-economic aspect, data from the National Survey of Household Income and Expenditure of 2008 show that the three-month average current income in urban areas was twice as much as the rural areas (55,496 and 30,016 pesos, respectively)

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(INEGI, 2018). Regarding poverty, the National Council for the Evaluation of Social Development Policy (CONEVAL, by its acronym in Spanish) showed that 55.3% of rural residents lived in poverty in 2018 (CONEVAL, 2018). In conclusion, there are serious challenges for the rural sector to extend telecommunication services due to poverty, hilly terrain, low population density, unequal development among regional areas and high marginalization degrees of the rural and indigenous population.

Therefore, the objective of this survey is to identify the factors that limit access and use of Internet of rural and urban residents by means of an empirical analysis. Contributions of this work to the literature on the digital gap are as follows:

1) Research data come from a representative survey on the availability and use of ICTs in the Mexican household –National Survey on the Availability and Use of Information Technologies in Homes (ENDUTIH, by its acronym in Spanish) 2018– information that enables how to analyze demographic and socio-economic characteristics affecting access and use of ICTs by people.

2) The research context is different from the context taken again from previous surveys on the topic, because this is focused on rural and urban areas in a developing country, among which there is wide disparity of access to Internet.

3) The digital gap is approached as an additional inequality to economic, social and political inequalities.

Findings in this survey confirm that the digital gap poses a multifactorial and multidimensional problem requiring the coordinated effort of public policy (Martinez-Dominguez & Mora-Rivera, 2020; James, 2019; Gomez *et al.*, 2018). The results suggest that the provision of ITCs is fundamental to rural areas as well as to reduce service prices by means of a greater number of competitors, whereas in the urban area, keeping low prices is mostly important, as the service is unaffordable. On the demand side, training courses ought to be supplied for the development of digital skills that entail an efficient use of cyberspace both in urban and in rural areas.

This article is organized as follows: literature on the digital gap and on factors that determine access and use of ITCs is reviewed; data and methodology are analyzed; results and discussion are presented; and, lastly, conclusions are stated.

Reviewing literature on the digital gap

Digital gap literature discusses how demographic and socio-economic characteristics have an influence on the access and use of ICTs. Specifically, factors that determine household connectivity are identified (Martínez-Domínguez, 2018; Srinuan *et al.*, 2012),

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Internet uses (Nishijima *et al.,* 2017; Büchi *et al.,* 2016) and use types (Martínez-Domínguez & Mora-Rivera, 2020; Michailidis *et al.,* 2011; Goldfarb & Prince, 2008). The foregoing notwithstanding, works are scarce to examine no-access and no-use reasons of Internet in rural and urban areas, due to the lack of microeconomic data availability at that level of disaggregation.

Surveys on the use of Internet have taken place extensively in developed countries where access rates to ICTs are high. In this respect, Helsper & Reisdorf (2017) analyze the reasons of no Internet use in Switzerland and Great Britain, and find that non-users concentrate in the most vulnerable groups, therefore, interventions ought to focus on them, taking their local context into consideration. Likewise, Reisdorf *et al.* (2016) explore the attitudes and sentiments of middle-age British and Swedish non-users; their results show that the lack of interest in the use of ICTs is one of the main reasons to not use digital technologies.

In addition, Tsatsou (2012) examines the role of social culture in accessing Internet in Greece; his findings show that the lack of interest is one of the determining non-connectivity factors. In turn, Reisdorf & Grošelj (2017) go beyond a dichotomous categorization of use and nonuse; their results show that attitudes towards Internet determine belongingness to each category; therefore, its relevance is almost similar to other factors such as education and income. Generally speaking, Verdegem & Verhoest (2009) mention that no-access and nonuse of cyberspace may be explained by a combination of problems of access, lack of digital skills and negative attitudes towards ICTs; so it is necessary that differentiated strategies be applied to reduce the digital gap.

In the case of developing countries, Correa *et al.* (2018) analyzed Internet use by means of smartphones, and their results show that lack of digital skills is one of the reasons for use barriers. In Latin America, Internet use has been analyzed in several surveys (Martínez-Domínguez & Mora-Rivera, 2020; Nishijima *et al.,* 2017; Grazzi & Vergara, 2014), but a few have discussed the reasons of no-access and nonuse (Correa *et al.,* 2018; Galperin, 2017).

In accordance with surveys on the digital gap, there is a set of socio-economic factors limiting Internet access and use. In the economic aspect, there is a strong link between access to and fixed or mobile connection to Internet (Martínez-Domínguez, 2018; Dewan y Riggins, 2005). Regarding demographic variables, age is associated in a negative manner with the use of network; the surveys made by Tirado-Morieta *et al.* (2018) and Penard *et al.* (2015) confirm that old persons are less likely to adapt to new technologies, therefore, lack of digital skills and skills are the main obstacles for the individual use of Internet.

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Regarding gender, Martínez-Domínguez y Mora-Rivera (2020), Mariscal *et al.* (2019) y Correa *et al.* (2017) show that there are no significant differences of gender in the access to and use of Internet patterns. In spite of this, the kind of use shows that women mainly use Internet to maintain communication with household members and friends, and to search for information. The latter may be related with their role in the household, where they are in charge of taking care of children and older adults.

Likewise, the fact that there are children at home seems to foster connectivity and the use of cyberspace, because in this case the cost of the service and not the lack of interest is associated with the main reason to not use Internet. In this respect, Wang (2020) and Correa *et al.* (2015) point out the role of children in the acquisition of digital skills from older adults in the household, as it is them who convey such skills.

Human capital is essential to access and use Internet. A lower education level reduces the likelihood of connecting to and using the network (Puspitasari & Ishii, 2016; Grazzi & Vergara, 2014). By the same token, digital skills determine the use of ITCs; the surveys of Van Deursen *et al.* (2016) and Van Deursen & Van Dijk (2011) have developed and validated instruments to measure Internet use skills.

Data and methodology

Data used in this survey were taken from ENDUTIH 2018, carried out by the National Institute of Statistics and Geography (INEGI, by its acronym in Spanish). This specialized survey in ICTs was implemented in 2015, but only as of 2017 it is representative in the national, state, urban, rural and city environs. Information in the survey is collected through home visits, where a 12-year-old household member provides information on the access to and use of ICTs in the household and on the use by six-year-old children and older, as well as the reasons there would be to not adopting technologies.[4]

The sample contains information both at the household level and individuals whose age is between 12 and 65 years, who represent the population in the rural and urban areas in Mexico of this age range. ENDUTIH collected information on the availability and use of ICTs (computer, Internet, and mobile telephony), connection equipment, online activities, frequency of and use intensity, digital skills and the reasons preventing access to and use of these technologies.

Two variables of interest were considered for this survey. First off, the main reason why the household did not have Internet service available, and, secondly, the essential reason of persons to not use Internet. In order to identify homes with no access to Internet, the information of a question in the questionnaire was taken on

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whether there is fixed or mobile Internet connection, together with the reason for no connectivity. In turn, non-users were considered to be persons who answered they had not used Internet over the past three months, from whom the reasons for not using the network were taken again.
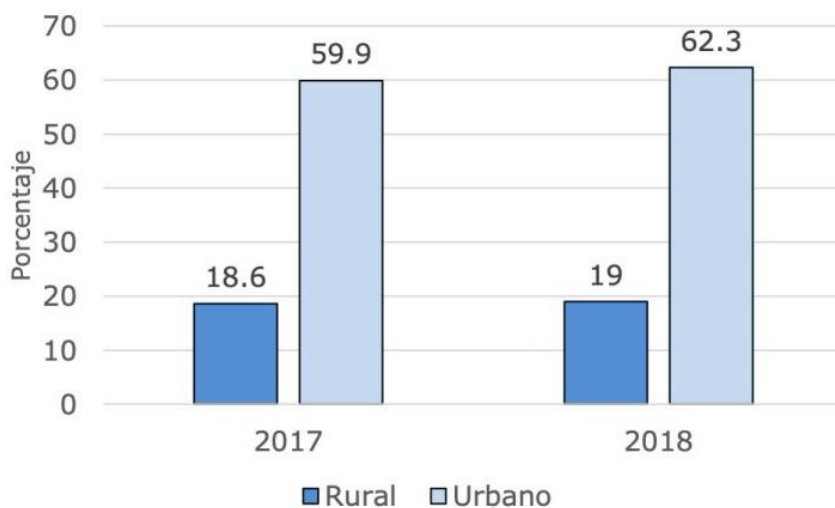
The analysis consisted in identifying the reason why people in Mexico do not have fixed or mobile residential connectivity and do not use Internet. The empirical strategy was based on Grošelj *et al.* (2019), Galperin (2017) and Reisdorf & Grošelj (2017), where a multinomial logistic regression was employed to examine the effect of different socio-economic factors on the probability of not adopting ICTs. Specifically, a multinomial model considers that, for each field, the likelihood that a non-subscriber or non-user refers to a reason (in respect to a category of reference) conditioned to a set of social, economic and demographic variables.

Multinomial regression is used to model a categorical dependent variable. These models predict the probabilities of an answer as a reason of odds with respect to a category of reference. In this sense, Agresti (2002) and Kline (2004) discuss that in large samples the significance levels (ρ values) are not enough to interpret the results, because it is possible to identify statistically significant effects whose magnitude is insignificant. Therefore, using the relative risk ratio is recommended associated with demographic, socio-economic and human capital of interest co-variables on the reasons for not subscribing and not using. On interpreting econometric estimates, if the relative risk ratio is greater than 1, the variable under investigation increases the probability, whereas, if the relative risk ratio is lower than 1, the probability is reduced as compared to the respective category of reference.

Results

In accordance with information from ENDUTIH 2018, half the homes in the country are connected to Internet; however, chart 1 shows that the coverage percentage in the rural sector barely is 19%, as compared to 62% in urban areas (INEGI, 2018). The foregoing is explained because supplying telecommunications to the rural sector is a challenge due to its geographical characteristics, to its hilly topography, to low population density and to isolation of towns.

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Chart 1. Access to Internet of households in the rural and urban setting

Source: developed by the author with data from ENDUTIH 2017 and 2018.

Chart 2. Internet users in the rural and urban setting
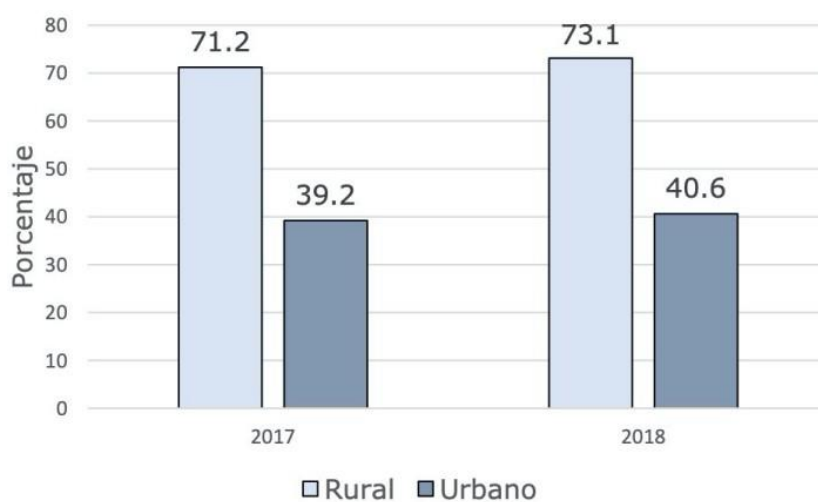
Source: developed by the author with data from ENDUTIH 2017 and 2018.

Network use rates are higher in urban areas as compared to rural areas (see chart 2). Internet users in the rural sector greatly depend on places such as school, workplace, cybercafé, libraries, among others. This is an evidence that using the network in public spaces has had an increase in the number of users in the rural context, in spite of the limited connection of households to cyberspace.

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Barriers to Internet access in urban and rural households in Mexico

Table 1 shows descriptive statistics of the main barriers for the lack of availability of Internet connection of Mexican urban and rural households. The results confirm that cost is the main barrier to access the service in both settings. Another limiting factor in the rural sector is the lack of infrastructure, because there is less telecommunications service coverage as compared to the urban setting.

Table 1. Main reasons for non-connectivity in rural and urban households in Mexico

Reason	Rural (%)	Urban (%)
Lack of financial resources	60.82	64.98
Lack of interest	13.36	26.29
Lack of digital skills	7.11	4.55
Lack of infrastructure	18.71	4.19
Total	100	100
Observed	15 763	25 168

Source: developed by the author with data from ENDUTIH data, 2018.

In the non-access model variables are included such as the wealth index, a proxy variable of access –built through the Principal Component Analysis (PCA)– and related variables with the characteristics of the house and ownership of lasting goods in the household (Filmer & Pritchett, 2011).[5]

In the regression the probability is estimated that non-subscribers quote one of the answer categories, related to the base category, such as the most relevant barrier to access. In accordance with descriptive results, the lack of economic resources is the most important limitation for urban and rural residential connectivity, therefore, cost is the variable of reference. For this reason, coefficients estimate how demographic and socio-economic factors affect the probability to quote lack of interest, lack of skills or lack of infrastructure in their village, in relation with the probability of mentioning cost as the essential limitation to network connection.

Table 2 shows the factors that determine non-connectivity at the rural and urban households in Mexico. There is a positive correlation between the wealth index (proxy of access) and the lack of interest, as a 1% increase in wealth is associated with a 1.16% increase in the rural setting and 1.23% in the urban setting who say they do not need it as the main reason to not subscribe (the effect is greater for the urban areas and lower for the rural areas). Likewise, a positive association is confirmed between age and digital competencies, given the fact that older adults are less prone to have them. Therefore, for each additional year of age, the probability to say that digital skills are a barrier to rural and urban connectivity is 2.4% and 5.1%, respectively.

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Table 2. Probability of stating the main reason of the lack of subscription (reason of relative risk), category of reference = high cost

	Lack of interest		Lack of skills		Lack of infrastructure	
	Rural	**Urban**	**Rural**	**Urban**	**Rural**	**Urban**
Female	0.783	0.856	0.986	0.663	0.871	0.784
	(-3.42)***	(-4.44)***	(-0.15)	(-5.56)***	(-2.23)**	(-3.13)***
Age	0.988	0.998	1.024	1.051	0.994	0.986
	(-4.34)***	(-1.14)	(6.39)***	(12.77)***	(-2.6)***	(-4.36)***
Elementary school	0.969	1.103	0.653	0.635	1.062	1.266
	(-0.31)	(1.22)	(-4.59)***	(-4.68)***	(0.65)	(1.10)
Middle school	0.890	1.199	0.375	0.351	1.262	1.609
	(-1.06)	(2.24)**	(-8.23)***	(-9.20)***	(2.38)**	(2.22)**
High school	1.447	1.660	0.293	0.277	1.742	2.387
	(2.88)***	(5.96)***	(-5.31)***	(-8.41)***	(4.81)***	(3.97)***
University and more	1.599	2.25	0.148	0.215	3.403	4.139
	(2.35)**	(8.49)***	(-2.63)***	(-5.78)***	(7.35)***	(6.17)***
Day laborer	0.852	0.862	0.970	1.133	0.885	0.731
	(-1.73)*	(-1.51)	(-0.28)	(0.88)	(-1.56)	(-1.42)
Employee	1.141	1.165	0.685	0.832	0.944	0.979
	(1.61)	(3.31)***	(-3.28)***	(-2.09)**	(-0.80)	(-0.20)
Workman	1.019	0.878	0.556	0.744	0.769	0.782
	(0.14)	(-1.63)	(-2.35)**	(-1.77)*	(-2.07)**	(-1.45)
Businessperson	3.556	3.032	0.794	1.248	3.760	2.765
	(5.13)***	(6.61)***	(-0.42)	(0.5)	(5.86)***	(3.30)***
Unpaid employment	0.864	1.904	2.027	1.301	1.468	0.0
	(-0.37)	(2.16)**	(2.23)**	(0.41)	(1.38)	(-0.02)
Self-employed	1.241	1.326	1.275	1.068	1.358	1.167
	(2.49)**	(5.36)***	(2.38)**	(0.71)	(4.12)***	(1.32)
Computer skills	1.092	1.056	0.828	0.714	1.081	1.042
	(4.22)***	(6.54)***	(-1.57)	(-3.6)***	(4.06)***	(2.62)***
Wealth index	1.158	1.228	0.874	0.932	1.067	1.097
	(10.30)***	(17.07)***	(-9.03)***	(-3.62)***	(5.61)***	(3.77)***
Children under 12 years old	0.422	0.413	0.222	0.151	0.827	1.045
	(-15.80)***	(-26.62)***	(-18.9)***	(-19.83)***	(-3.87)***	(0.61)
Constant	0.681	0.491	0.109	0.027	0.396	0.070
	(-1.98)**	(-5.69)***	(-8.74)***	(-13.72)***	(-5.39)***	(-9.10)***
Observed	15763	25168	15763	25168	15763	25168

Note: *significant at 10%; ** significant at 5%; ***significant at 1%.

Z statistic in parentheses.

Source: developed by the author.

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It has also been found that the education level has an influence on the reasons to not make a residential subscription, and it is not surprising that this has a more significant effect due to the lack of digital skills. For example, to rural and urban persons with college and postgraduate studies the probabilities are reduced to mention the lack of digital competencies (in relation with the category of reference without education) by 85.2% and 78.5%, respectively. These results validate previous findings on the need to see to the deficits of human capital related to ICTs, specially, vulnerable groups, such as older adult women and persons with limited formal education who reside in rural areas (Barrantes & Vargas, 2019; Barrantes & Cozzubo, 2019; Dolničar *et al.,* 2018). Availability of computer skills is positively correlated with the lack of interest, given that it is more likely that rural and urban residents with this type of competencies will not subscribe to the Internet services because they do not have the need to use it, by 9.2% and 5.6%, respectively.

A likely interpretation of the findings of gender is that due to persistency of traditional family roles, in Latin America, women value Internet residential access as an educational tool for children and, therefore, they are more prone than men to mention cost as the main Internet connection barrier. Likewise, presence of children less than 12 years of age reduces the probability to pointing out the lack of digital skills (related to cost) as the main reason to not subscribe at home (by 77.8% rural, and 84.9% urban). These results show that children may have a significant role in the conveyance of digital skills to adults in the home setting. The scale of this suggests the existence of a wide unfulfilled demand, requiring a more accessible connectivity to households with school-aged children.

Finally, it is more likely that urban and rural residents working as employees will not subscribe to the Internet service because of lack of interest, by 1.16% and 1.14%, respectively.

Barriers of individual use of Internet in the rural and urban sector in Mexico

Descriptive results with respect to individual use barriers are shown in table 3. This shows that, in the rural and urban areas, digital competencies are essential to use Internet in Mexico. It must be emphasized that the questionnaire of ENDUTIH did not include cost as an answer category for not using Internet by people.

The results reflect that in the rural area, the lack of digital skills and telecommunications infrastructure are the main reasons that explain that the network is not used. Insufficient ICTs infrastructure in the rural sector is explained as such spaces are not profitable for private companies because of the low population density and the distance from urban centers.

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Table 3. Main reasons for not using internet in urban and rural areas in Mexico

Reason	Rural (%)	Urban (%)
Lack of infrastructure	25.55	20.67
Lack of interest	12.45	23.11
Lack of digital skills	62	56.22
Total	100	100
Observed	9623	14724

Source: ENDUTIH data, 2018.

Table 4 shows results on determining factors regarding non-use of Internet in urban and rural areas. The model makes an estimate on the probability that non-users mention one of the answer categories as the main barrier of use, in relation with the base category, which is non-access or lack of infrastructure.

Table 4. Probability of stating the main reason of nonuse (reason of relative risk) category of reference = no access

	Lack of interest		Lack of skills	
	Rural	Urban	Rural	Urban
Female	1.016	0.921	1.292	1.060
	(0.17)	(-1.42)	(3.76)***	(1.12)
Age	1.024	1.037	1.058	1.073
	(7.89)***	(16.60)***	(25.10)***	(33.84)***
Elementary school	0.931	1.307	0.658	0.621
	(-0.42)	(1.90)**	(-3.70)***	(-4.52)***
Middle school	0.992	1.517	0.440	0.377
	(-0.04)	(2.94)***	(-7.03)***	(-9.11)***
High school	1.117	1.811	0.187	0.240
	(0.56)	(3.96)***	(-10.91)***	(-11.78)***
University and more	1.694	2.066	0.202	0.181
	(1.39)	(3.96)***	(-4.28)***	(-10.06)***
Day laborer	1.189	1.134	1.171	1.709
	(1.40)	(0.75)	(1.77)*	(3.9)***
Employee	1.223	1.104	0.804	0.981
	(1.88)*	(1.55)	(-2.68)***	(-0.32)
Workman	1.80	0.992	1.018	0.820
	(2.46)**	(-0.06)	(0.09)	(-1.65)*
Businessperson	2.146	1.633	1.079	1.664
	(1.51)	(1.21)	(0.17)	(1.33)
Unpaid employment	1.193	1.289	1.516	1.363
	(0.49)	(0.72)	(1.69)*	(0.98)
Self-employed	1.369	1.336	1.131	1.167
	(2.57)**	(3.54)***	(1.36)	(2.10)**

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Computer skills	0.872 (-2.21)**	0.996 (-0.12)	0.541 (-4.93)***	0.494 (-6.43)***
Wealth index	1.102 (5.11)***	1.125 (6.62)***	0.964 (-2.87)***	1.029 (1.88)*
Children under 12 years old	0.806 (-2.75)***	0.787 (-4.19)***	1.011 (0.20)	0.945 (-1.11)
Constant	0.224 (-6.22)***	0.171 (-9.56)***	0.356 (-5.99)***	0.229 (-9.56)***
Observed	9623	14724	9623	14724

Note: *significant at 10%; ** significant at 5%; ***significant at 1%. Z statistic in parentheses.
Source: developed by the author.

The wealth index is positively correlated with the lack of interest. Thus, a 1% increase in the wealth index is associated with an increase of 10.2% and 12.5%, in the rural and urban sectors, respectively, mentioning lack of interest as the main reason to not using Internet. Likewise, age is a barrier to using the network, where the effect scale is greater for digital skills than the lack of interest, because the older the age the increased probability to say that digital competencies comprise a non-use barrier, by 29.2% for the rural sector and 6% for the urban sector.

Regarding school education, to individuals with college and higher studies, as compared to those with no education, the likelihood to mentioning that digital skills is the main reason to not using Internet by 79.8% in rural areas and 81.9% in urban areas. Lastly, the presence of children in the household reduces the probability that rural and urban male residents show lack of interest as a non-use reason by 19.4% and 21.3%, respectively.

Discussion

The literature discussing the digital gap has had socio-economic and demographic driving factors identified, notwithstanding, there has been no further analysis in the manner these affect the barriers to access Internet, specifically, in underdeveloped countries such as Mexico, where the connectivity level of the rural sector is lagging as compared to the urban sector.

In the Mexico case, the cost and limited availability of Internet service still are key barriers to residential subscription in the rural sector; whereas the unaffordable service and the lack of interest explain the lack of connectivity in the urban household. This makes us state the need to implement differentiated public policies in said spaces; on the one hand, to foster connectivity by providing ICT infrastructure, and to provide high-speed Internet in rural areas and, on the other hand, to reduce the price of the service by means of greater competition, both in the rural and the urban areas.

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Factors on the supply side offer not only a partial explanation of digital inequality, therefore, it is important to show elements on the supply side for a comprehensive vision. Thus, the low human capital, related to the lack of digital skills is an access obstacle to the network in urban and rural areas in Mexico. An example of this is that the lack of digital skills is strongly associated with age, both in terms of subscription and in the use of cyberspace (Hargittai *et al.*, 2019).

With regards the kind of job, rural and urban residents employed as day laborers, as compared to those who do not work, have a greater possibility to not use Internet because of the lack of digital competencies. This is consistent with other surveys mentioning that people employed in the farming sector have the lowest education levels (Martínez-Domínguez y Mora-Rivera 2020; Martínez-Domínguez *et al.,* 2017).

The results emphasize the relevance of understanding how household dynamics has an impact on the access and use of ICTs, as Internet connection is considered to be a household asset, whereas the use is considered as an individual asset. As shown, with regards to the interest and skills, cost is the main barrier for adopting Internet where there are children less than twelve years of age in rural and urban homes. Families in both spaces are aware of the value of Internet for educational tasks of their children; however, affordability is the main reason that prevents greater connectivity to the network by households. In the case of Internet use, lack of digital skills is the most important limitation of cyberspace nonuse in the rural and urban settings. Hence, the need to design public programs to guarantee digital literacy for an efficient use of ICTs.

An initiative with effective results is the Ceibal Plan in Uruguay, which consisted in providing portable computers to students at public schools throughout the country (Rivoir, 2009). Likewise, in Argentina, the Connecting Equality Program distributed portable computers to every student and teacher at secondary education, special education schools, and at teacher preparation institutes of state governance in the 2010-2014 period, with the purpose of reducing digital, educational and social gaps throughout the country (Alderete & Fonchella, (2016). In Brazil, the One Computer per Student Program (PROUCA, by its acronym in Portuguese), beginning in 2009, gave computers for the teaching and learning process of boys and girls in less favorable socio-economic conditions (Echalar & Peixoto, 2017).

In Mexico, in the National Digital Strategy implemented in 2013, a Digital Inclusion and Literacy Program 1:1 was implemented, which consisted in delivering portable computers and tablets to elementary school students in some states in the country. Notwithstanding, in the comparison survey made by Garcia *et al.* (2016) on digital competencies of children who were exposed or not exposed to the 1:1 program, there were no significant differences between both groups. From the above it is inferred that more empirical surveys are needed to assess the impacts of this initiative (Islam & Grönlund, 2016).

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Conclusions

The purpose of this survey was to identify determinants of no access and no use of Internet in Mexico, based on information from ENDUTIH, 2018. The results of econometric estimates suggest that demographic, economic and human capital aspects worked as barriers to the adoption and use of the network, with differences in urban and rural contexts in the country.

Findings in the research show that the cost of the services is the main limiting factor to Internet connectivity at the rural and urban household. In addition, in both contexts, older people are more likely to not access and not use the cyberspace because of the lack of digital skills, which is related with education. On the contrary, children at home reduce the possibility of not adopting and not using Internet due to the lack of interest. From the above, it is concluded that digital inequality still is a challenge to Mexico, because of heterogeneity of demographic, socio-economic and contextual characteristics of the rural and urban areas. Additionally, it is considered, as a new topic, that the drivers of digital inequality are poorly understood; therefore, a more continual and deep analysis is required where qualitative and quantitative methodologies are included to understand digital inequality.

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[1]"This term refers to the gap existing among individuals, households, businesses and geographical areas at different socio-economic levels in respect to their opportunities of access to ICTs and the use of a wide range of activities" (OCDE, 2001, p. 5).

[2] By *access to Internet* refers to a fixed or mobile connection at home.

[3] *Internet use* means that people have used the network both within and outside the household.

[4] Concepts and methodology of ENDUTIH are consistent with the manual to measure access and use of ICTs by individuals and households (ITU, 2014).

[5] Some of the variable included in the index are: floor material, potable water, drainage, electric power, refrigerator, washing machine and automobile.

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