2023 Spanish Stata Conference
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#SOMOS2030

THE INE HOUSEHOLD BUDGET SURVEY AND ITS USE TO STUDY THE DIGITAL ACCESS DIVIDE. A CASE STUDY IN STATA

Why do we consume as we do? The case of ICT spending in the Spanish Market.

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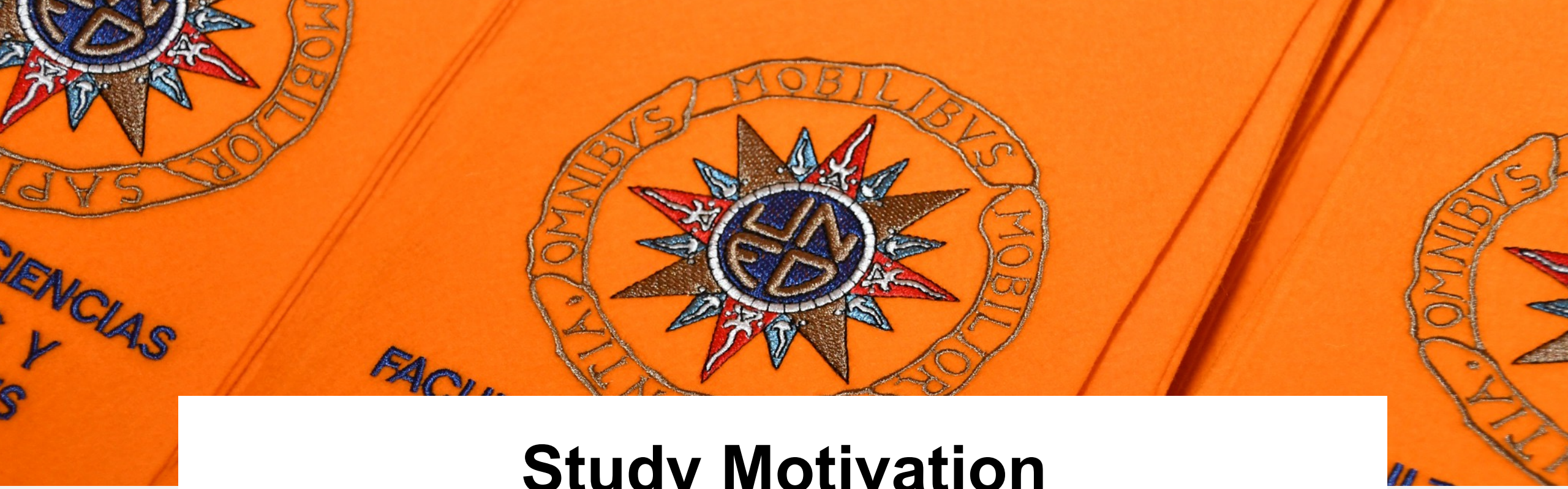


Study Motivation

ICT investment and Digital Divide

- The role of ICT investment and adoption in economic and sustainable growth
- From the behavioral economics perspective,
- how do external social and psychological factors affect our consumption?
- Digital divide analysis, already included in the Sustainable Development Goals designed by United Nations (UN)

This study pursue the impact analysis of the economic shocks on the evolution of ICT spending in the context of Spanish households. Therefore, the relationship with the household profiles available results in synergies or digital divides.

Data Maganement, STATA experience

ICT investment and Digital Divide

- The data have been collected from a survey conducted by the National Statistics Institute (INE):
  - Data from the Household Budget Survey (HBS) until 2020 (INE, 2020) and,
  - Survey on the Equipment and Use of Information and Communication Technologies in Households until 2022 (INE, 2022)

These surveys are carried out annually and constitute a panel of data since 2006 and 2002 respectively.

Variables of Interest

Variable		Values
ICTEX	Total Expenditure on ICT	Logarithmic value of a continuous variable
DEVEX	Total Expenditure on ICT devices	Logarithmic value of a continuous variable
SEVEX	Total Expenditure on ICT services	Logarithmic value of a continuous variable
MALE	Male	Male = 1, otherwise = 0
AGE	Age	Age of all individuals
FORM	Formation	Cannot read or write or attended school for less than 5 years.= 1; Have completed primary education = 2; Certificates of Primary, ESO, EGB = 3; Bachillerato, BUP, COU = 4; FPII and equivalents = 5, Degree of 240 ECTS = 6; Degree of more than 240 ECTS, Master's Degree = 7; University doctorate = 8.
INCO	Income	Income deciles
HAUS	Adults living at the household	Number of adults living at the households, between 1 and 6
SON	Number of children at the household	Number of children living at the households, between 1 and 8
WORK	Laboral Status	Working = 1, otherwise = 0
DENS	Density	Dispersed area = 1; Intermediate zone =2; Densely populated area = 3

Main Procedures, STATA

- Setting up the HBS database:
  - Three files EPFexpenditures, EPFHousehold, EPFHouseholdmembers.
  - Files link

```
*Para cada uno de los años del 2006 al 2020 hacemos los siguientes pasos:
*2.- Abrimos el fichero de hogares
clear
use "/Users/aurorarr/Desktop/EPF/Montar la base de datos EPF/1.-DatosEPF/EPFhogar_2015.dta"
*3.- Se borran aquellas variables que en principio no necesitamos, para aligerar el fichero
*4.- Guardamos el fichero modificado
save "/Users/aurorarr/Desktop/EPF/Montar la base de datos EPF/3.-ficheros wide/EPFhogar_2015_Mod.dta", replace
clear
*5.- Abrimos el fichero de gastos
use "/Users/aurorarr/Desktop/EPF/Montar la base de datos EPF/1.-DatosEPF/EPFgastos_2015.dta"
*6.- Se borran las variables que no necesitamos
*************************************************************************
**************OJO hasta 2016 en Minusculas*******************************
*7.- A partir del año 2016 los codigos comienzan con 0, se quita el 0
*8.- Se mezcla el fichero de gastos con el de hogares mediante la variable numero
merge m:1 anoenc numero using "/Users/aurorarr/Desktop/EPF/Montar la base de datos EPF/3.-ficheros wide/EPFhogar_2015_Mod.dta"
*9.- Se guarda el fichero conjunto
save "/Users/aurorarr/Desktop/EPF/Montar la base de datos EPF/3.-ficheros wide/EPFhogarygastos_2015", replace
*10.- Se cambia la forma del fichero para los valores de código
reshape wide gasto q, i(numero anoenc) j(codigo)
*11.- Se guarda el fichero resultante que será el que luego se una al resto de años
save "/Users/aurorarr/Desktop/EPF/Montar la base de datos EPF/3.-ficheros wide/EPFhogarygastos_2015_W.dta", replace
clear
*************************************************************************
*Repetir para el resto de años
*************************************************************************
*12.- Se unen todos los ficheros conjuntos creados en uno
use "/Users/aurorarr/Desktop/EPF/Montar la base de datos EPF/3.-ficheros wide/EPFhogarygastos_2006_W.dta"
append using "/Users/aurorarr/Desktop/EPF/Montar la base de datos EPF/3.-ficheros wide/EPFhogarygastos_2007_W.dta"
```

Main Procedures, STATA (II)

Working with the data as panel data

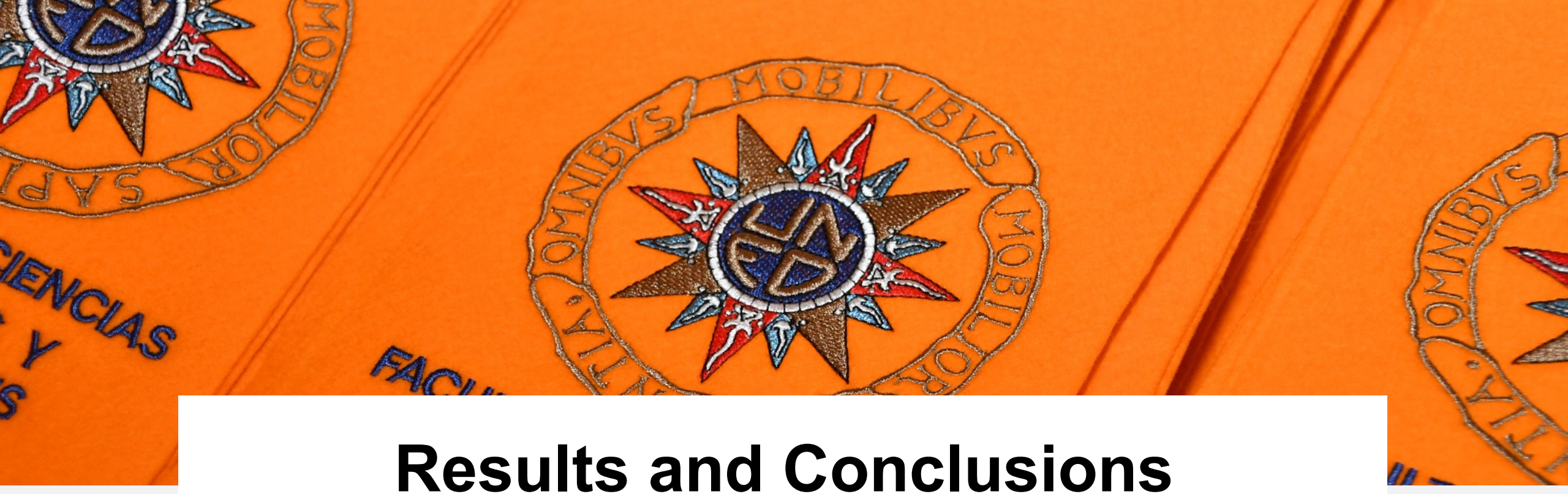
```
*2.-Creacion panel
*con nuestra base de datos ya montada
use "/Users/aurorarr/Desktop/creacion panel/19.-EPF2006-2020limpioybisemanas.dta"

xtset identif anoenc, yearly

xtbalance, range(2006 2020) miss(ecivilsp edadsp estudiossp estudredsp disposiov desem derenta
comitot cajena ccaa gserv gsedurad gocsoov sexosp sitprof sitsoci superf tamano tamanu g8 g9)

xtdescribe

save "/Users/aurorarr/Desktop/creacion panel/1.-panelyearly.dta", replace

*con la base de datos montada

clear
use "/Users/aurorarr/Desktop/creacion panel/panel 2006-2020.dta"

xtset identif anoenc, yearly

xtbalance, range(2006 2020) miss(ecivilsp edadsp estudiossp estudredsp disposiov desem derenta
comitot cajena ccaa gserv gsedurad gocsoov sexosp sitprof sitsoci superf tamano tamanu g8 g9)

xtdescribe

save "/Users/aurorarr/Desktop/creacion panel/1.-panelyearly.dta", replace
log close
```

Aggregated Model

$$TEI_i = \beta_0 + \beta_j X_{ji} + v_i \quad (1)$$

Fixed-Effects Model. $\left(y_j - \bar{y}_i\right) = \left(x_j - \bar{x}_i\right)\beta + e_j - \bar{e}_i \qquad (2)$

Random effects model $\left(y_j - \theta\bar{y}_i\right) = \mu(1-\theta) + \left(x_j - \theta\bar{x}_i\right)\beta + v_j(1-\theta) \quad (3)$



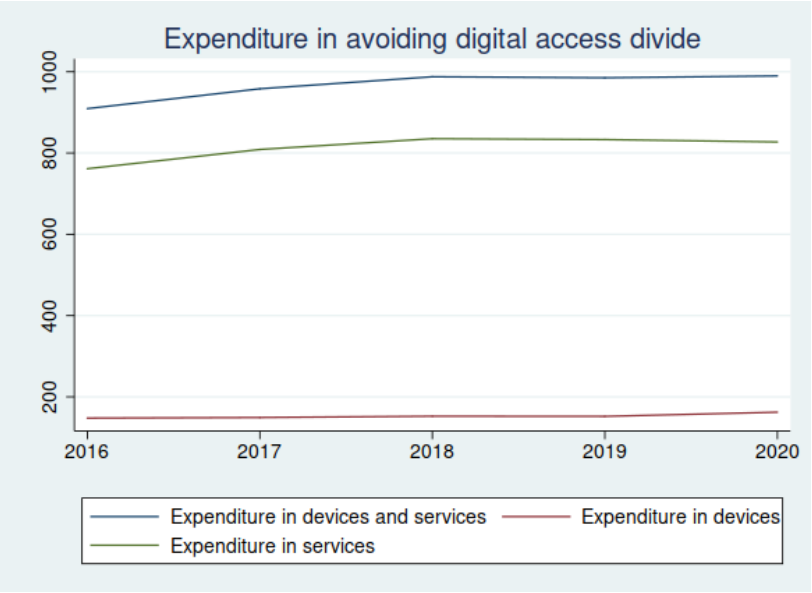
Results and Conclusions

ICT investment and Digital Divide

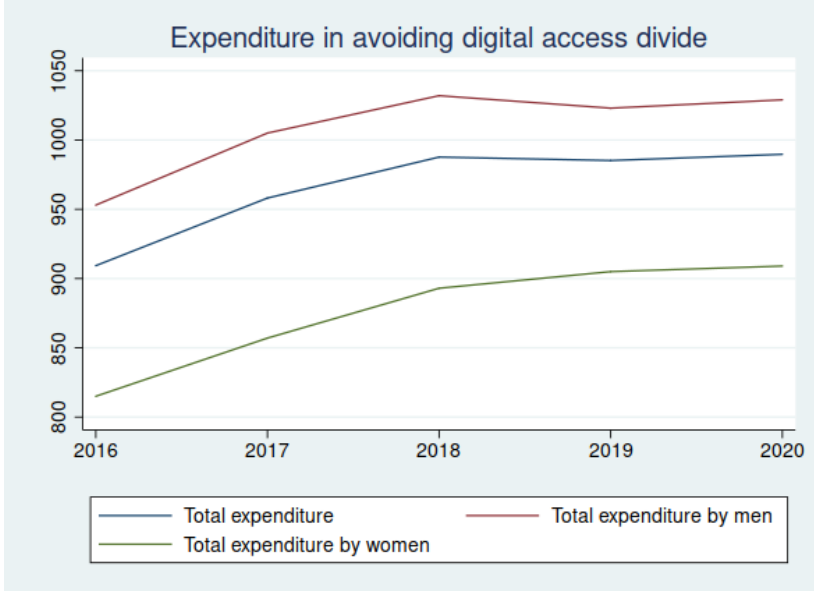
Main Statistics

VARIABLE		MEAN	STD. DEV.	MIN	MAX	OBS
ICTEX	OVERALL	961.7214	731.3206	0	17603.18	N = 77444
	BETWEEN		678.3828	0	12838.46	n = 43366
	WITHIN		288.1895	-7335869	9259312	T-bar = 1.785
DEVEX	OVERALL	151.5184	337.5029	0	8335589	N = 77444
	BETWEEN		277.5658	0	4239.12	n = 43366
	WITHIN		199.7617	-3944951	4247987	T-bar = 1.785
SEVEX	OVERALL	850.203	572.5205	0	15392.88	N = 77444
	BETWEEN		540.5337	0	11184	n = 43366
	WITHIN		199.9372	-6382236	8002642	T-bar = 1.785
MALE	OVERALL	.677	.4674475	0	1	N = 77444
	BETWEEN		.4583627	0	1	n = 43366
	WITHIN		.0960528	.1774702	1.17747	T-bar = 1.785
AGE	OVERALL	56.38	14.70567	18	85	N = 77444
	BETWEEN		14.62849	18	85	n = 43366
	WITHIN		1.549428	26.88703	85.88703	T-bar=1.785
FORM	OVERALL	3.991	1.727968	1	8	N = 77444
	BETWEEN		1.714431	1	8	n = 43366
	WITHIN		.2123165	.9911032	6.991103	T-bar = 1.785
INCO	OVERALL	5.723	2.83633	1	10	N = 77444
	BETWEEN		2.751547	1	10	n = 43366
	WITHIN		.7352007	1.223426	10.22343	T-bar = 1.785
HAUS	OVERALL	2.634	1.200671	1	6	N = 77444
	BETWEEN		1.187755	1	6	n = 43366
	WITHIN		.189142	.134084	5.134084	T-bar = 1.785
SON	OVERALL	.397	.7310488	0	8	N = 77444
	BETWEEN		.723249	0	7.5	n = 43366
	WITHIN		.1198558	-1.120952	1.879048	T-bar = 1.785
WORK	OVERALL	.578	.4942819	0	1	N = 77444
	BETWEEN		.482224	0	1	n = 43366
	WITHIN		.1155219	.0754222	1.075422	T-bar = 1.785
DENS	OVERALL	2.1737	.8500215	1	3	N = 77444
	BETWEEN		.8510213	1	3	n = 43366
	WITHIN		0	2.1737	2.1737	T-bar = 1.785

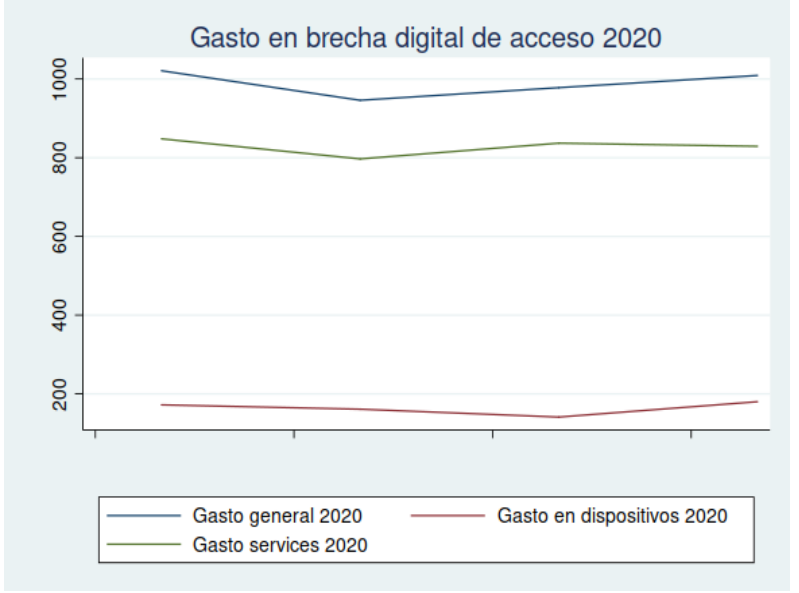
Expenditure in ICT by time



Evolution of the different ICT expenditures

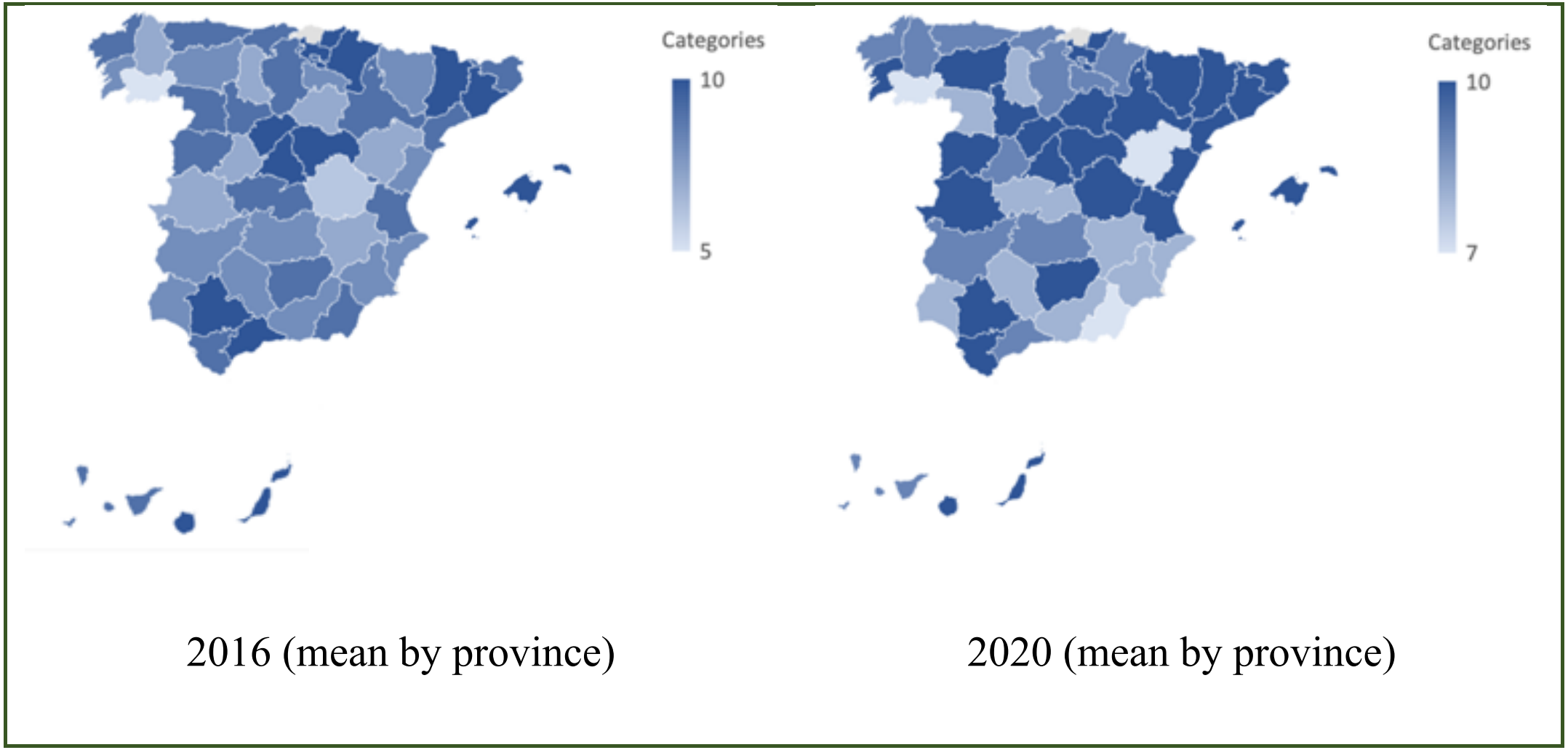


Evolution of ICT spending and its difference between men and women



ICT spending month by month during 2020, to graphically observe the effect of the COVID pandemic

Expenditure in ICT by time



2016 (mean by province)

2020 (mean by province)

Panel data model

	ICT expenditure		
	Total expenditure	Expenditure services	Expenditure devices
MALE	.1461 (.022)	.022 (.0228)	.146 (.146)
AGE	.021 (.001)	.002 (.002)	.021** (0.10)
FORM	.078 (.071)	.002 (.010)	.0783 (.062)
INCO	.031*** (.003)	.013*** (.003)	.031 (.019)
HAUS	-.171*** (.014)	.073*** (.012)	-.172 (.075)
SON	.115*** (.020)	-.028* (.016)	.115** (.092)
WORK	.089 (0.020)	.010 (.018)	.089 (.120)
Constant	3.234*** (.120)	6.162*** (.126)	3.234 (.705)
N	70450	69250	34985
Obs	40490	39939	25914
Rsq-within	0.0054	0.0039	0.0014
Rsq-Between	0.1471	0.0930	0.0002
Rsq-Overall	0.1323	0.0905	0.0002
F	0.000	0.000	0.097

Cross Section Modelling of ICT expenditure in digital access divide 2017 - 2020

	ICT expenditure				
	2016	**2017**	**2018**	**2019**	**2020**
AGE	-.009*** (.001)	.006*** (.001)	-.005*** (.001)	-.003*** (.001)	-.003*** (.001)
FORM	.056*** (.005)	.053*** (.004)	.045*** (.005)	.052*** (.004)	.055*** (.006)
INCO	.085*** (.003)	.081*** (.003)	.081*** (.003)	.081*** (.003)	.072*** (.004)
DENS	.054*** (.008)	.050*** (.008)	.047*** (.008)	.043*** (.008)	.061*** (.010)
HAUS	.162*** (.008)	.174*** (.008)	.164*** (.007)	.156*** (.007)	.155*** (.011)
SON	-.181*** (.011)	-.192*** (.011)	-.205*** (.011)	-.192*** (.011)	-.177*** (.016)
WORK	.128*** (.0.19)	.142*** (.018)	.127*** (.019)	.105*** (.019)	.105*** (.025)
Constant	5.811*** (.059)	5.781*** (.053)	5.805*** (.057)	5.696*** (.059)	5.701** (.077)
N	16447	16461	15627	14669	7217
Pseudo-R^2	0.2075	0.2090	0.201	0.1904	0.2233
F	0.000	0.000	0.000	0.000	0.000

Some results

- There is less of a relationship between population profiles and IT expenditure. Age has less and less influence over time, as do children per household, employment status, income and household size.
- Digital skills also influence the purchase of services to be able to use them. You don't buy something you can't use.
- The population density variable shows a positive trend, living in cities is increasingly related to ICT expenditure.

To understand how ICT is used and which services are most popular: Household TICs survey, to analyze market penetration of e-services

Evolution of the consumption of e-services

		2019	2020	2021	2022
COMPUTER	0	27.95	32.80	29.53	29.67
	1	72.05	67.20	70.47	70.33
INTERNET DAILY	0	4.36	3.60	4.67	5.00
	1	95.64	96.4	95.33	95.00
e-COMMERCE	0	36.82	35.42	30.07	31.8
	1	63.18	64.58	69.93	68.2
e-LEARN	0	63.18	58.20	73.82	58.05
	1	36.82	41.80	26.18	41.95
e-HEALTH	0	35.42	23.88	48.92	21.87
	1	64.58	76.12	51.08	78.03
e-GOVERNMENT	0	38.54	36.87	32.11	44.96
	1	61.46	63.13	67.89	55.04
e-BANK	0	41.36	36.35	32.23	29.17
	1	58.61	63.65	67.77	70.83

Internet or computer use has not changed at all with the pandemic, but habits have changed

Some results

- The number of users of all services has increased since 2020, implying a narrowing of the digital divide and the creation of new markets.

- The market that has benefited the most is online banking, with 15% more of the Spanish population adopting and maintaining e-banking since 2019. The other major beneficiary is e-health, with online health services now used by 80% of the population.

- E-commerce and e-learning services have reached 5% more of the Spanish population, as has e-government, which has seen a sharp drop in users over the past year.

- This means that, in general, although the Covid-19 crisis seems to have meant a reduction in ICT spending in 2020, it has also meant an intensification in the use of ICT, and that digital inequality must be explained not only in terms of spending, but also in terms of usage and equipment.

Conclusions

- In Spain with current territorial structuring, ICT penetrates mainly in the best-connected áreas.
- Income and education have a positive impact on reducing the digital access gap and thus on reducing the inequality it generates.
- The COVIC pandemic has not had an impact on ICT spending and has not influenced the growth of the digital divide in Access.
- The public sector and companies, some because of their social work and others because of the need to implement their corporate social responsibility proposal, must get involved in improving or implementing digital literacy in society and among their employees, with a particular focus on vulnerable groups.
- Finally, in order to analyze digital inequality, it is not enough to study it from the point of view of expenditure, but it is also essential to study it from the point of view of use and of owned equipment.

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Thank you so much for your attention!!!!!!

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