A Multinomial Logistics Model for Perceptions on Entrepreneurship

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Abstract: - In this paper we present a multinomial logistics regression to model the experts' perceptions about the Entrepreneurship Framework Conditions, using the most recently available data from GEM, i.e., NES 2013. The expert's type is described by a nominal variable with five categories, i.e.: "entrepreneur"; "investor, financer, banker"; "policy maker"; "business and support services provider"; and "educator, teacher, entrepreneurship researcher". The multinomial logistic regression model presented an overall percentage correctness of 54.1%. The results show that the odds of an experts being an "entrepreneur" over being an "educator, teacher, entrepreneurship researcher" increases with the increase in the perception of "the people working for government agencies are competent and effective in supporting new and growing firms". The same results were found for the odds of being "investor, financer, and banker" and "policy maker". Furthermore, the odds of being a "policy maker" over being an "educator, teacher, entrepreneurship researcher" increases with the increase of the perception of "the markets for business-to-business goods and services change dramatically from year to year". The same effect is observed for "business and support services provider". Additionally, the odds of being a "business and support services provider" also increases with the increase of "the anti-trust legislation is effective and well enforced".

Key-Words: - Entrepreneurial Framework Conditions, Global Entrepreneurship Monitor, Multinomial Logistics Regression

1 Introduction

One of the major drivers of economic growth is entrepreneurship [1]. There has been a growing interest in promoting entrepreneurial activity both on public and private initiatives [2], [3]. In an effort to fill the lack of comparable international data on entrepreneurship, the Global Entrepreneurship Monitor (GEM) began in 1999, as a joint project between Babson College (USA) and London Business School (UK). Since then GEM has been the source of comparable data across a large variety of countries on attitudes toward entrepreneurship, startup and established business activities, and aspirations of entrepreneurs for their businesses [3]. The data collected by GEM has presented a fast growth.

The number of countries included in the GEM data collection increase from 10 countries in 1999 to more than 100 countries in 2016. In fact, according to the 2016 GEM Global Report, GEM covers 69.2% of the world's population and 84.9% of the world's Gross Domestic Product (GDP). The two main sources of primary data of the GEM project are: (i) the Adult Population Survey (APS), which provides standardized data on entrepreneurial activities and attitudes within each country; and (ii) the National Expert Survey (NES), which investigates the national framework conditions for entrepreneurship by means of standardized questionnaires. Furthermore, GEM-based scientific publications have presented a large increase in a wider range of academic journals [3], in particular using APS.

By using empirical data, the GEM project aims for:

(a) assessing the level of entrepreneurial activity across countries,

(b) understanding how entrepreneurial activity varies over time, and

(c) understanding why some countries are more entrepreneurial than others.

Exploring the relationship between entrepreneurial activity and economic growth, and identify which public policies boost entrepreneurship is also one of the aims of GEM. According to the GEM methodology the Entrepreneurial Framework Conditions (EFCs) are conditions that enhance (or hinde) new business creation. Therefore,

entrepreneurship dynamics can be linked to conditions these conditions [6].

According to Bergmann, Mueller, & Schrettle [5], the data provided by GEM offers the possibility to pose research questions that could not have been addressed before. The data is available at the webpage of the GEM project.

For Álvarez, Urbano, & Amorós, 87% of the articles use APS data, while only 3% use the NES information, and 10% use both information sources[2]. It is clear that the information provided by NES is an untapped resource for future publications. Also, since NES individual level files are not commonly used for writing GEM reports, they are best indicated to carry out academic research. Additionally, 42% of the empirical studies use logit, probit and tobit models, 29% use multiple linear regression analysis associated with the macro level, 13% use panel data, and 16% use other techniques. Additionally, the dependent variables are mostly related to entrepreneurial activities in general (59%), indicators of entrepreneurial aspirations (14%), female entrepreneurship (10%), by studies that use dependent variables related to economic issues, especially growth and economic development (5%). Furthermore 5% of the research articles attempt to explain perceptions of opportunities and motivations to become an entrepreneur, while 7% use financial aspects as the dependent variable [2]. For further information on the statistical techniques used see [5].

Sánchez-Escobedo et al. analyzed the situation and development of research, using data from the GEM in the period from 1999 to 2015, in "entrepreneurship" from a gender perspective [8]. Global APS is used in 32.5% of the research papers publish in journals of entrepreneurship included in the Web of Science (WOS), while 37.5% use National APS, 20% use APS and NES and 10% use APS and secondary sources, such as, OECD, World Bank, US Census, Heritage Foundation, Encyclopedia Britannica, BBVA Foundation. In terms of the Statistical technique of analysis, 20% of the works use descriptive analysis, 52.50% use descriptive analyses and logistic regression, while the remaining use other techniques such as Panel data, ANOVA, MANOVA, Bootstrapping, Structural equations.

In this paper the 2013 NES data provided by GEM is analyzed and a multinomial logistics regression approach is followed with the objective of analyzing the effects of different type of entrepreneurship expert specialization on the perceptions about the Entrepreneurial Framework Conditions (EFCs).

2 Dataset and Model Estimation

The data used in the present work was collected from the GEM website and concerns the individual NES 2013 dataset. The NES survey collects data concerning the perceptions on entrepreneurship of experts in different countries. From survey to survey there are differences in terms of the variables considered. However, the country's Entrepreneurial Framework Conditions (EFCs), namely:

A - Financing for Entrepreneurs;
B - Governmental Policies;
C - Governmental Programs;
D - Entrepreneurial Education and Training;
E - R&D Transfer;
F - Commercial and Professional Infrastructure;
G - Internal Market Openness;
H - Physical and Services Infrastructure;
I - Social And Cultural Norms.

are the same from survey to survey.

In the present work, as response variable, the categorical variable SPE is used. This variable characterizes the expert type and was define using the dummy variables SPE1, SPE2, SPE3, SPE4 and SPE5 (for details see [6], [7]). The SPE variable has five categories: 1=entrepreneur; 2=investor, financer, banker; 3=policy maker; 4=business and support services provider; and 5=educator, teacher, entrepreneurship researcher.

As independent variables all NES variables included in the EFCs, from A1 to I05 are used, in a total of 52 variables. Following the common procedure adopted when working with real-world data, such as GEM data, the independent ordinal (likert like scale) NES variables are consider as continuous. See Table 7 for the variable description.

Since the observations are independent, the dependent variable SPE is measured at the nominal level with five mutually exclusive and exhaustive categories and since there is no multicollinearity (the Variance Inflation Factor is <3), a multinomial logistics regression approach is adequate for this analysis.

From a total of 2636 observations, 1227 are valid. The missing values correspond to the number of observations in the dataset where data are missing from the response variable or from any of the predictor variables. For the majority of these observations the experts are "Entrepreneur"; 14.3% are "Policy makers"; 12.7% are "Business and support services provider"; 10.2% are "Investor,

financer, banker"; and 9.1% are "Educator, teacher, entrepreneurship researcher" (see Table 1).

Table 1: Case Processing Summary

		N	Marginal Percentage
SPE	1= Entrepreneur	659	53.7%
	2= Investor, financer, banker	125	10.2%
	3= Policy maker	175	14.3%
	4= Business and support services provider	156	12.7%
	5= Educator, teacher, entrepreneurship researcher	112	9.1%
Valid		1227	100.0%
Missing		1409	
Total		2636	
Subpopulation		1225[a]	
a. The dependent variable has only one value observed in 1223 (99.8%) subpopulations.			

A backward stepwise method, implemented at IBM SPSS version 23, was used to estimate the multinomial logistic regression model, and chi-square for variables entry and removal, based on the likelihood ratio test, were considered. Table 2 presents model fitting information. By including the predictor variables, the "Final" model improves when compared to the "Intercept Only" model as can be seen by the Akaike Information Criterion (AIC), Bayesian Information Criterion (BIC) and log likelihood. The likelihood of the model is used to test of whether all predictors' regression coefficients in the model are simultaneously zero. From the Likelihood ratio Chi-Square statistic a p-value <0.0001 was obtain, therefore, at least one of the regression coefficients in the model is not equal to zero, i.e. the model is significant. Note that the degrees of freedom of the chi-square distribution is the number of predictors in the model.

Table 2: Model Fitting Information

	Model Fitting Criteria			Likelihood Ratio Tests		
Model	AIC	BIC	-2 Log Likelihood	Chi-Square	df	p-value
Intercept Only	3256.85	3277.30	3248.85			
Final	3207.93	3473.77	3103.93	144.92	48	0.000

Table 3 suggests that the model presented a good fit to the data since Pearson chi-square p-value is 0.374>0.05 and the Deviance chi-square statistic presents a p-value>0.05.

Table 3: Goodness-of-Fit and Pseudo R-Square

	Chi-Square	df	p-value
Pearson	4879.03	4848	0.374
Deviance	3101.16	4848	1.000

Cox and Snell	0.111
Nagelkerke	0.120
McFadden	0.045

The pseudo R-Square is presented in Table 3. Table 4 presents the Likelihood ratio tests and shows that from all the independent variables considered only the following are statistically significant, for a significant level of 10%:

A03 – "In my country, there are sufficient government subsidies available for new and growing firms";

A04 – "…, there is sufficient funding available from private individuals (other than founders) for new and growing firms";

B02 – "…, the support for new and growing firms is a high priority for policy at the national government level";

B05 – "…, the amount of taxes is NOT a burden for new and growing firms";

B06 – "…, taxes and other government regulations are applied to new and growing firms in a predictable and consistent way";

C03 – "…, there are an adequate number of government programs for new and growing businesses";

C04 – "…, the people working for government agencies are competent and effective in supporting new and growing firms";

E02 – "…, new and growing firms have just as much access to new research and technology as large, established firms";

E03– "…, new and growing firms can afford the latest technology";

G02– "…, the markets for business-to-business goods and services change dramatically from year to year";

G04 – "…, the new and growing firms can afford the cost of market entry";

G06 – "…, the anti-trust legislation is effective and well enforced".

Recall that the underlying null hypothesis is that the parameters of that variable are zero.

Table 4 also presents the overall effect of each variable.

The parameter estimates for the multinomial logistic regression model are depicted in Table 5. The

parameter estimates are relative to the reference category "Educator, teacher, entrepreneurship researcher". The significant coefficients to a 10% significance level are in bold, i.e., those for which the p-value of Wald test is <0.10.

Table 4: Likelihood Ratio Tests

	Model Fitting Criteria			Likelihood Ratio Tests		
Effect	AIC of Reduced Model	BIC of Reduced Model	-2 Log Likelihood of Reduced Model	Chi-Square	df	p-value
Intercept	3291.06	3536.46	3195.06	91.13	4	0.000
A03	3208.92	3454.32	3112.92	8.99	4	0.061
A04	3212.32	3457.71	3116.32	12.39	4	0.015
B02	3215.48	3460.87	3119.48	15.55	4	0.004
B05	3217.58	3462.97	3121.58	17.65	4	0.001
B06	3210.52	3455.91	3114.52	10.59	4	0.032
C03	3210.20	3455.59	3114.20	10.27	4	0.036
C04	3218.70	3464.09	3122.70	18.77	4	0.001
E02	3208.30	3453.69	3112.30	8.37	4	0.079
E03	3214.17	3459.56	3118.17	14.24	4	0.007
G02	3211.38	3456.77	3115.38	11.45	4	0.022
G04	3210.67	3456.06	3114.67	10.74	4	0.030
G06	3212.83	3458.22	3116.83	12.90	4	0.012

The estimation of a multinomial logistic model requires the computational of M-1 equations where M is the number of categories of the response variable. In this case, since the SPE has five categories, a total of four models are computed. Since the last category ("Educator, teacher, entrepreneurship researcher") was used as reference, the models are:

$$\begin{aligned}\log\left(\frac{P(SPE_i=m)}{P(SPE_i=5)}\right) &= \alpha_m + \beta_{m1}A03_i + \beta_{m2}A04_i + \beta_{m3}B02_i \\ &+ \beta_{m4}B05_i + \beta_{m5}B06_i + \beta_{m6}C03_i \\ &+ \beta_{m7}C04_i + \beta_{m8}E02_i + \beta_{m9}E03_i \\ &+ \beta_{m10}G02_i + \beta_{m11}G04_i + \beta_{m12}G06_i,\end{aligned} \quad (1)$$

where m=1,2,3,4. A total of four log odds were predicted relatively to the reference category.

For 1= "Entrepreneur" NES Experts the following interpretations can be done from Table 5:
• an increase of one unit of B05 is associated to a decrease of 0.174 in the relative log odds of being "Entrepreneur" versus "Educator, teacher, entrepreneurship researcher", while keeping the other variables constants.
• this inverse relation is also present in C03 and E03 with 0.219 and 0.388, respectively, in the relative log odds of being "Entrepreneur" versus "Educator, teacher, entrepreneurship researcher";
• on the other hand, for an increase of one unit of C04 there is an increase of 0.296 in the relative log odds of being "Entrepreneur" versus "Educator, teacher, entrepreneurship researcher";
• the odds of being a "Entrepreneur" over being a "Educator, teacher, entrepreneurship researcher" decreases in 16% with an increase of one unit in B05, 20% with an increase of one unit in C03, and 32% with an increase of one unit in E03;
• the odds of being a "Entrepreneur" over being a "Educator, teacher, entrepreneurship researcher" increases in 35% with an increase of one unit in C04.

For 2= "Investor, financer, banker" NES Experts, from Table 5:
• an increase of one unit of C03 is associated to a decrease of 0.257 in the relative log odds of being "Investor, financer, banker" versus "Educator, teacher, entrepreneurship researcher", while keeping the other variables constants.
• while, for an increase of one unit of C04 there is an increase of 0.348 in the relative log odds of being "Investor, financer, banker" versus "Educator, teacher, entrepreneurship researcher".

For 3= "Policy maker" NEs Experts, from Table 5:
• an increase of one unit of C03 (and E05) is associated to a decrease of 0.384 (and 0.501) in the relative log odds of being "Policy maker" maker versus "Educator, teacher, entrepreneurship researcher", while keeping the other variables constants.
• while, for an increase of one unit of C04 (and G02) there is an increase of 0.488 (and 0.214) in the relative log odds of being "Policy maker" versus "Educator, teacher, entrepreneurship researcher".

Finally for 4= "Business and support services provider" NEs Experts, from Table 5:
• an increase of one unit of E03 (and G04) is associated to a decrease of 0.285 (and 0.400) in the relative log odds of being "Business and support services provider" versus "Educator, teacher, entrepreneurship researcher", while keeping the other variables constant.
• while, for an increase of one unit of G04 (and G06) there is an increase of 0.277 (and 0.309) in the relative log odds of being "Business and support services provider" versus "Educator, teacher, entrepreneurship researcher".

Table 5: Parameter Estimates

SPE		B	Std. Error	Wald	df	p-value	Exp(B)	95% Confidence Interval for Exp(B)	
								Lower Bound	Upper Bound
1= Entrepreneur	Intercept	2.719	0.500	29.599	1	**0.000**			
	A03	-0.083	0.111	0.550	1	0.458	0.921	0.740	1.145
	A04	0.114	0.101	1.270	1	0.260	1.121	0.919	1.367
	B02	-0.121	0.102	1.427	1	0.232	0.886	0.726	1.081
	B05	**-0.174**	**0.095**	**3.373**	**1**	**0.066**	**0.840**	**0.698**	**1.012**
	B06	0.133	0.102	1.716	1	0.190	1.143	0.936	1.395
	C03	**-0.219**	**0.117**	**3.477**	**1**	**0.062**	**0.804**	**0.638**	**1.011**
	C04	**0.296**	**0.115**	**6.648**	**1**	**0.010**	**1.345**	**1.074**	**1.685**
	E02	0.161	0.118	1.863	1	0.172	1.175	0.932	1.481
	E03	**-0.388**	**0.119**	**10.607**	**1**	**0.001**	**0.679**	**0.537**	**0.857**
	G02	0.050	0.097	0.268	1	0.605	1.051	0.869	1.272
	G04	-0.201	0.122	2.703	1	**0.100**	0.818	0.643	1.039
	G06	0.039	0.104	0.140	1	0.708	1.040	0.848	1.276
2= Investor, financer, banker	Intercept	0.315	0.629	0.251	1	0.616			
	A03	0.083	0.142	0.342	1	0.559	1.086	0.823	1.433
	A04	-0.020	0.129	0.024	1	0.877	0.980	0.761	1.263
	B02	-0.109	0.129	0.719	1	0.396	0.897	0.697	1.154
	B05	0.194	0.119	2.647	1	0.104	1.214	0.961	1.532
	B06	-0.170	0.132	1.666	1	0.197	0.844	0.651	1.092
	C03	**-0.257**	**0.149**	**2.974**	**1**	**0.085**	**0.774**	**0.578**	**1.036**
	C04	**0.348**	**0.144**	**5.830**	**1**	**0.016**	**1.416**	**1.068**	**1.878**
	E02	-0.150	0.154	0.961	1	0.327	0.860	0.637	1.162
	E03	-0.250	0.154	2.645	1	0.104	0.779	0.577	1.053
	G02	0.047	0.122	0.147	1	0.702	1.048	0.825	1.332
	G04	-0.069	0.155	0.197	1	0.657	0.933	0.689	1.265
	G06	0.245	0.132	3.466	1	**0.063**	1.277	0.987	1.653
3= Policy maker	Intercept	-0.165	0.603	0.075	1	0.784			
	A03	0.141	0.132	1.146	1	0.284	1.152	0.889	1.491
	A04	-0.186	0.123	2.298	1	0.130	0.830	0.653	1.056
	B02	0.158	0.121	1.697	1	0.193	1.171	0.924	1.484
	B05	-0.077	0.113	0.470	1	0.493	0.926	0.742	1.154
	B06	0.094	0.120	0.617	1	0.432	1.099	0.869	1.390
	C03	**-0.384**	**0.141**	**7.438**	**1**	**0.006**	**0.681**	**0.517**	**0.898**
	C04	**0.488**	**0.136**	**12.901**	**1**	**0.000**	**1.630**	**1.248**	**2.127**
	E02	0.080	0.140	0.325	1	0.569	1.083	0.823	1.425
	E03	**-0.501**	**0.147**	**11.663**	**1**	**0.001**	**0.606**	**0.454**	**0.808**
	G02	**0.214**	**0.115**	**3.469**	**1**	**0.063**	**1.239**	**0.989**	**1.552**
	G04	-0.053	0.145	0.136	1	0.713	0.948	0.713	1.260
	G06	0.130	0.123	1.113	1	0.291	1.139	0.894	1.450
4= Business and support services provider	Intercept	0.106	0.618	0.029	1	0.864			
	A03	-0.146	0.135	1.175	1	0.278	0.864	0.663	1.125
	A04	0.009	0.123	0.005	1	0.942	1.009	0.793	1.284
	B02	0.107	0.122	0.766	1	0.381	1.113	0.876	1.414
	B05	-0.079	0.116	0.463	1	0.496	0.924	0.737	1.159
	B06	0.020	0.123	0.026	1	0.871	1.020	0.801	1.299
	C03	-0.064	0.142	0.204	1	0.651	00.938	0.710	1.239
	C04	0.084	0.139	0.367	1	0.544	1.088	0.829	1.427
	E02	0.148	0.141	1.103	1	0.294	1.159	0.880	1.527
	E03	**-0.285**	**0.145**	**3.863**	**1**	**0.049**	**0.752**	**0.565**	**0.999**
	G02	**0.277**	**0.118**	**5.568**	**1**	**0.018**	**1.320**	**1.048**	**1.661**
	G04	**-0.400**	**0.150**	**7.084**	**1**	**0.008**	**0.670**	**0.500**	**0.900**
	G06	**0.309**	**0.125**	**6.074**	**1**	**0.014**	**1.361**	**1.065**	**1.740**

Table 6: Classification

Observed	Predicted					
	1= Entrepreneur	**2=** Investor, financer, banker	**3=** Policy maker	**4=** Business and support services provider	**5=** Educator, teacher, entrepreneurship researcher	**Percent Correct**
1= Entrepreneur	**650**	1	3	2	3	**98.6%**
2= Investor, financer, banker	122	**1**	2	0	0	**0.8%**
3= Policy maker	166	0	**8**	1	0	**4.6%**
4= Business and support services provider	150	0	0	**4**	2	**2.6%**
5= Educator, teacher, entrepreneurship researcher	110	1	0	0	**1**	**0.9%**
Overall Percentage	**97.6%**	**0.2%**	**1.1%**	**0.6%**	**0.5%**	**54.1%**

Table 7: Variables description

	In my country,		In my country,
A01	there is sufficient equity funding available for new and growing firms	E02	new and growing firms have just as much access to new research and technology as large, established firms
A02	there is sufficient debt funding available for new and growing firms	E03	new and growing firms can afford the latest technology
A03	there are sufficient government subsidies available for new and growing firms	E04	there are adequate government subsidies for new and growing firms to acquire new technology
A04	there is sufficient funding available from private individuals (other than founders) for new and growing firms	E05	the science and technology base efficiently supports the creation of world-class new technology-based ventures in at least one area
A05	there is sufficient venture capitalist funding available for new and growing firms)	E06	there is good support available for engineers and scientists to have their ideas commercialized through new and growing firms
A06	there is sufficient funding available through initial public offerings (IPOs) for new and growing firms	F01	there are enough subcontractors, suppliers, and consultants to support new and growing firms
B01	Government policies (e g , public procurement) consistently favor new firms	F02	new and growing firms can afford the cost of using subcontractors, suppliers, and consultants
B02	the support for new and growing firms is a high priority for policy at the national government level	F03	it is easy for new and growing firms to get good subcontractors, suppliers, and consultants
B03	the support for new and growing firms is a high priority for policy at the local government level	F04	it is easy for new and growing firms to get good, professional legal and accounting services
B04	new firms can get most of the required permits and licenses in about a week	F05	it is easy for new and growing firms to get good banking services (checking accounts, foreign exchange transactions, letters of credit, and the like)
B05	the amount of taxes is NOT a burden for new and growing firms	G01	the markets for consumer goods and services change dramatically from year to year
B06	taxes and other government regulations are applied to new and growing firms in a predictable and consistent way	G02	the markets for business-to-business goods and services change dramatically from year to year
B07	coping with government bureaucracy, regulations, and licensing requirements it is not unduly difficult for new and growing firms	G03	new and growing firms can easily enter new markets
C01	a wide range of government assistance for new and growing firms can be obtained through contact with a single agency	G04	the new and growing firms can afford the cost of market entry
C02	science parks and business incubators provide effective support for new and growing firms	G05	new and growing firms can enter markets without being unfairly blocked by established firms
C03	there are an adequate number of government programs for new and growing businesses	G06	the anti-trust legislation is effective and well enforced
C04	the people working for government agencies are competent and effective in supporting new and growing firms	H01	the physical infrastructure (roads, utilities, communications, waste disposal) provides good support for new and growing firms

C05	almost anyone who needs help from a government program for a new or growing business can find what they need	H02	it is not too expensive for a new or growing firm to get good access to communications (phone, Internet, etc)
C06	Government programs aimed at supporting new and growing firms are effective	H03	a new or growing firm can get good access to communications (telephone, internet, etc) in about a week
D01	teaching in primary and secondary education encourages creativity, self-sufficiency, and personal initiative	H04	new and growing firms can afford the cost of basic utilities (gas, water, electricity, sewer)
D02	teaching in primary and secondary education provides adequate instruction in market economic principles	H05	new or growing firms can get good access to utilities (gas, water, electricity, sewer) in about a month
D03	teaching in primary and secondary education provides adequate attention to entrepreneurship and new firm creation	I01	the national culture is highly supportive of individual success achieved through own personal efforts
D04	Colleges and universities provide good and adequate preparation for starting up and growing new firms	I02	the national culture emphasizes self-sufficiency, autonomy, and personal initiative
D05	the level of business and management education provide good and adequate preparation for starting up and growing new firms	I03	the national culture encourages entrepreneurial risk-taking
D06	the vocational, professional, and continuing education systems provide good and adequate preparation for starting up and growing new firms	I04	the national culture encourages creativity and innovativeness
E01	new technology, science, and other knowledge are efficiently transferred from universities and public research centers to new and growing firms	I05	the national culture emphasizes the responsibility that the individual (rather than the collective) has in managing his or her own life

Considering

$$\begin{aligned} Z_{mi} = \alpha_m &+ \beta_{m1} A03_i + \beta_{m2} A04_i + \beta_{m3} B02_i \\ &+ \beta_{m4} B05_i + \beta_{m5} B06_i + \beta_{m6} C03_i \\ &+ \beta_{m7} C04_i + \beta_{m8} E02_i + \beta_{m9} E03_i \\ &+ \beta_{m10} G02_i + \beta_{m11} G04_i + \beta_{m12} G06_i, \end{aligned} \quad (2)$$

The probability of an experts being an m=1 "entrepreneur", 2 "investor, financer, banker", 3 "policy maker", 4 "business and support services provider",

$$P(SPE_i = m) = \frac{\exp(Z_{mi})}{1 + \sum_{k=1}^{4} \exp(Z_{ki})}, \quad (3)$$

and being 5 “educator, teacher, entrepreneurship researcher”

$$P(SPE_i = 5) = \frac{\exp(Z_{mi})}{1 + \sum_{k=1}^{4} \exp(Z_{ki})}, \quad (4)$$

Table 6 shows the classification results obtained used the multinomial logit regression model. The overall percentage correct is 54.1%. The model was able to predict correctly 650 (or 98.6%) of “1= Entrepreneur”, eight (4.6%) “3= Policy maker”, four (2.6%) 4= Business and support services provider, and only one “2= Investor, financer, banker” and “5= Educator, teacher, entrepreneurship researcher”, corresponding to 0.8% and 0.9%, respectively.

3 Conclusions

A multinomial logistics regression model for analyzing the different type of entrepreneurship expert specialization on the perceptions about the Entrepreneurial Framework Conditions (EFCs) is made using 2013 individual NES data provided by GEM.

The type of expert was described by a nominal variable with five categories: 1= “entrepreneur”; 2= “investor, financer, banker”; 3=”policy maker”; 4= “business and support services provider”; and 5= “educator, teacher, entrepreneurship researcher”.

Using the last category as the reference, the results show that:

(a) an increase of one B05 “the amount of taxes is NOT a burden for new and growing firms”, C03 “there are an adequate number of government programs for new and growing businesses” and E03 “new and growing firms can afford the latest technology” yields a decrease in the relative log odds of being “entrepreneur” when compared to “educator, teacher, entrepreneurship researcher” while C04 “the people working for government agencies are competent and effective in supporting

new and growing firms" yields a significant increase;"
(b) an increase of one unit of C03 "there are an adequate number of government programs for new and growing businesses" is associated to a decrease in the relative log odds of being "investor, financer, banker" versus "educator, teacher, entrepreneurship researcher", while, for an increase of one unit of C04 "the people working for government agencies are competent and effective in supporting new and growing firms" there is an increase;
(c) an increase of one unit of C03 "there are an adequate number of government programs for new and growing businesses" and E05 "the science and technology base efficiently supports the creation of world-class new technology-based ventures in at least one area" is associated to a decrease in the relative log odds of being "policy maker" versus "educator, teacher, entrepreneurship researcher", while, for an increase of one unit of C04 "the people working for government agencies are competent and effective in supporting new and growing firms" and G02 "the markets for business-to-business goods and services change dramatically from year to year" there is an increase;
(d) an increase of one unit of E03 "new and growing firms can afford the latest technology" and G04 "the new and growing firms can afford the cost of market entry" is associated to a decrease in the relative log odds of being "business and support services provider" versus "educator, teacher, entrepreneurship researcher", while, for an increase of one unit of G04 "the new and growing firms can afford the cost of market entry" and G06 "the anti-trust legislation is effective and well enforced" there is an increase.
The odds of an experts being an "entrepreneur" over being an "educator, teacher, entrepreneurship researcher" increases with the increase in the perception of "the people working for government agencies are competent and effective in supporting new and growing firms". The same occurs for the odds of being "investor, financer, banker" and "policy maker". The odds of being a "policy maker" over being an "educator, teacher, entrepreneurship researcher" increases with the increase of the perception of "the markets for business-to-business goods and services change dramatically from year to year". The same effect is observed for "business and support services provider". The odds of being a "business and support services provider" also increases with the increase of "the anti-trust legislation is effective and well enforced".

In terms of the correctness of the classification, the multinomial logit regression model presented displays an overall percentage correctness of 54.1%.

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