A note on the relative productivity drivers of economists: A probit/logit approach for six European countries

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Abstract

We examine the drivers of research performance of 1431 economists from six European countries. Data from the Scopus database are collected. We compare the relative performance of economists from three northern European countries: Belgium, Denmark, and Germany with three from the south: Greece, Italy, and Portugal. Relative performance is measured as the deviation from the country average in both citations and papers. The dependent variables take the value of 1 if the productivity of the researcher is above the country average and 0 if it is below. Probit/logit analysis is employed and marginal effects are estimated to examine the significance of factors like the country of their Ph.D. studies, gender, and inbreeding at the national level. A US Ph.D. or a German Ph.D. affects negatively the relative productivity of German economists. Inbreeding at the national level (locally trained economists) reduces productivity among Greek, Italian and Portuguese economists. Gender is significant in the case of Denmark, Germany, and Italy. It does not affect productivity in Belgium, Greece, and Portugal.

Keywords: Economics, ranking, probit, logit, inbreeding, PhD

JEL Classification: A11, A12, D63,

1. Introduction

Economists talk frequently about productivity. They refer to the productivity of the economy in most of the cases. This paper examines the productivity of the economists themselves. There has been an increased interest on the drivers of productivity among scientists and economists in particular. Among them, the country of the PhD studies, gender, north vs south Europe, and inbreeding (at the departmental or national level) has been suggested. Most of the studies employ absolute measures of productivity. We deviate from this tradition and examine relative productivity. Relative is defined in terms of deviations from the mean productivity of each country. The latter is measured as papers per faculty (per year) and citations per faculty (per year). We employ a dataset that consists of 1431 economists from six countries. The north of Europe is represented by Belgium, Denmark, and Germany whereas the south by Greece, Italy and Portugal.

The rest of the paper is organised as follows: section 2 provides a brief summary of the literature on the subject, the data are discussed in section 3, probit/logit models are presented in section 4. Section 5 has the results and the last one concludes.

2. Literature review

The literature on the factors that affect an economists' productivity has expanded in the last decade. Two strands are of interest for this study. One strand focuses on the countries and the determinants of economists productivity in specific countries. Çokgezen (2006) examines the productivity differentials for economists based in Turkey between private and state universities. Ben-David (2010) considers the case

of Israel and how high and low-rank academic positions co-vary with productivity. Additionally, Guimaraes, (2001) and Katranidis et al (2014, 2017) examined differences in academic performance taken into account the country where the doctoral studies have been completed in the case of Portugal and Greece respectively. Using survey data, Kalaitzidakis et al (2004) provide evidence that the European economics departments that have links with institutions in North-America are more productive in terms of research output. More recently, Bauwens et al (2011) underline English proficiency as an important factor that leads to higher productivity amongst economists[1].

3. Data

Our dataset stems from the Scopus database and from the websites of the corresponding Departments. The data were collected for 1431 economists that were employed in Belgium (125 economists), Denmark (82), Germany (543), Greece (82), Italy (504) and Portugal (95). The number of observations (economists) for each country reflects 25% of the RePEc registered economists in each country[2]. The characteristics that we considered for each economist includes number of papers, number of citations, whether their PhD studies took place in the US or the country they work (inbreeding at the national level: for instance, when a researcher got her/his PhD from Greece and works in a Greek University), gender and the real research age (number of years since obtaining their PhD)[3]. Figure 1 presents the %

[1] There is also a rich literature not discussed here that can be found in Hamermesh (2013).
[2] More on the data and their collection can be found in Katranidis et al (2017).
[3] A variable that is of interest is also the tenured/no tenured researcher. This is discussed in Oster and Hamermesh (1998) among others. We leave this for future research and would like to thank a referee for raising this point.

of PhD origin per country.

Two aspects of our analysis need to be discussed further. First, the literature that focuses on comparing the productivity of economists in more than one country employs absolute measures of productivity: papers per faculty per year or citations per faculty per year. We deviate from the literature and employ relative measures of productivity (rather than absolute). We calculate the average productivity in each country and then we calculate the difference between each researcher and the country average[4]. If the difference in the productivity of the researcher is above 0 (more productive than the country average) then she/he gets the value of 1. If it below the country average then 0. Given that the dependent variable is binary, we employ probit and logit models to investigate the drivers of relative productivity among economists in six European countries. This is also in contrast to the literature that employs OLS regressions to model average response to specific characteristics. The second characteristic refers to academic inbreeding. The latter refers to the practice where a University/Department is hiring its own PhD graduates. The evidence demonstrates that this practice is affecting negatively scholarly output (see, for instance, Horta et al 2010 and Inanc and Tuncer 2011). In this study, we will consider inbreeding at a higher level i.e., inbreeding at the national level (for instance a researcher got her PhD from Portugal and works in a Portuguese University). Scientific human capital would, in this respect, reflect the quality of human and social capital in the country. Goudard and Lubrano (2014) introduce a model where social capital complements scientific human capital. We will examine

[4] The analysis was carried out with deviations from the mean as well as deviations from the median. The results are qualitatively similar and are available upon request.

whether hiring economists that hold PhD from the same country affects relative productivity. We will refer to this characteristic as national inbreeding.

4. Methodology

As noted in the previous section, the goal of this study is to investigate the drivers of relative productivity. The dependent variable takes the value of 0 (if the productivity of the researcher is below the country average) and 1 (above the average)[5]. The simplest way of dealing with binary dependent variables is the adoption of the linear probability model (LPM). In our case the latter can be written as follows:

$$P_i=p(y_i=1)=\beta_1+\beta_2(Belgium*PhD^{US})+\beta_3(Denmark*PhD^{US})+\beta_4(Germany*PhD^{US})+\beta_5(Greece*PhD^{US})+\beta_6(Italy*PhD^{US})+\beta_7(Portugal*PhD^{US})+\beta_8(Belgium*PhD^{Belgium})+\beta_9(Denmark*PhD^{Denmark})+\beta_{10}(Germany*PhD^{Germany})+\beta_{11}(Greece*PhD^{Greece})+\beta_{12}(Italy*PhD^{Italy})+\beta_{13}(Portugal*PhD^{Portugal})+\beta_{14}(Belgium*Female)+\beta_{15}(Denmark*Female)+\beta_{16}(Germany*Female)+\beta_{17}(Greece*Female)+\beta_{18}(Italy*Female)+\beta_{19}(Portugal*\ Female)+u_i \quad (1)$$

where y_i is 1 if the difference between papers (citations) per faculty per year and the country average is positive and 0 if it is negative, *Belgium* ,…, *Portugal* are dummy variables denoting the country a research is based, PhD^{US} is a dummy variable taking the value of 1 if the researcher has completed her/his PhD studies in the US, $PhD^{Belgium}$ is also a dummy variable that takes the value of 1 if the

[5] The analysis was carried out for deviations form the median as well and the results are available upon request.

researcher completed PhD studies in Belgium and *female* is a gender dummy taking the value of 1 if the researcher is female.

LPM can produce estimated probabilities that are negative or greater than one. For this reason, we will employ the logit model (cumulative logistic distribution) and the probit model (cumulative normal distribution) (see also the discussion in Greene 2018). Interpretation of the coefficients of these two models requires caution to be exercised. Instead of focusing on the estimated coefficients, we will calculate the corresponding marginal effects that allow us to interpret the coefficients and compare them across different models.

5. Results

Equation 1 is estimated for two relative measures of productivity. We consider above country average papers per faculty per year and citations per faculty per year. Table 1 presents the results when a researcher has more papers per year than the country average. In the probit model, the factors that affect in a negative and significant (at the 90% significance level) way relative productivity are: (i) having a US PhD and work in Germany, (ii) a German PhD and work in Germany (inbreeding at the national level), (iii) a Greek PhD and work in Greece, (iv) Italian PhD and work in Italy, (v) Portuguese PhD and work in Portugal and (vi) being female in Germany, Denmark and Italy. The coefficient of the Greek inbreeding is the most negative one (with a marginal effect of -0.41).

In the logistic model these factors are (negative and significant at the 90%): (i) having a US PhD and work in Germany, (ii) a US PhD and work in Denmark, (iii) a

German PhD and work in Germany (inbreeding at the national level), (iv) a Danish PhD and work in Denmark, (v) an Italian PhD and work in Italy and (vi) being female in Germany, Greece, Italy and Portugal.

Table 2 presents the results for citations per faculty per year. The only variable that affects this measure of relative productivity in a positive way is holding a US PhD and working in Italy. The ones that affect in a negative and significant way (90%) are: (i) a German PhD and work in Germany, (ii) a Greek PhD and work in Greece, (iii) an Italian PhD and work in Italy, (iv) a Portuguese PhD and work in Portugal and (vi) being female in Belgium, Germany, Denmark and Italy. The results are similar in the case of the logistic function: (i) a PhD from Belgium and work there, (ii) German PhD and work in Germany, (iii) a Danish PhD and work in Denmark, and (iv) being female in Germany, Greece, Italy, and Portugal.

Overall, the highest marginal effects are for above average papers per faculty per year: (i) being female in Denmark (-0.502), (ii) holding a Greek PhD in Greece (-0.410) and (iii) holding a Portuguese PhD in Portugal (-0.331) (in the probit model). For the logit: (i) holding a Danish PhD in Denmark (-0.585), (ii) being female in Greece (-0.423) and (iii) holding a US PhD in Denmark. For the citations (probit), the largest marginal effects are observed for being female in Belgium and Denmark (-0.311 and -0.252 respectively). In the logit, inbreeding in Belgium and Denmark (-0.337 and -0.257).

6. Concluding remarks

This study examines the drivers of relative productivity among 1431 economists

from six European countries. Scopus database was the source of the data for economists based in three northern European countries (Belgium, Denmark, and Germany) and three south European countries (Greece, Italy and Portugal). We identify the drivers of relative productivity in terms of deviations from the national average in papers per faculty per year and citations per faculty per year. We employ probit and logit models given that the dependent variable is binary (above the national average 1, below 0). For papers the most important variables that were affecting relative productivity in a negative fashion were gender in Denmark and national inbreeding in Greece and Portugal; for the citations, gender and national inbreeding in Belgium.

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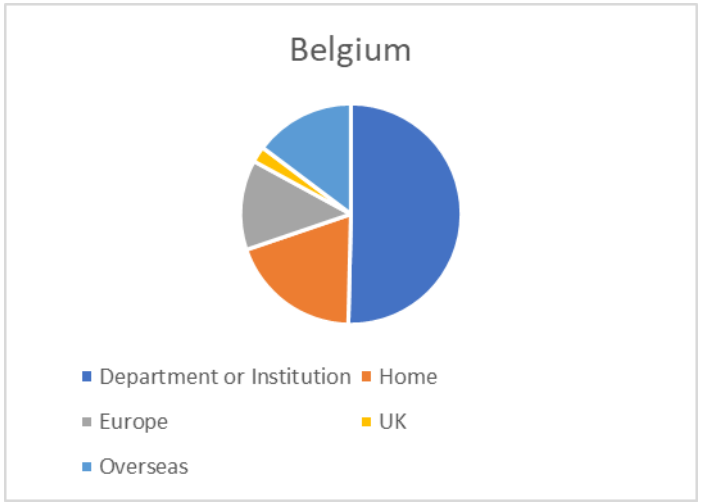
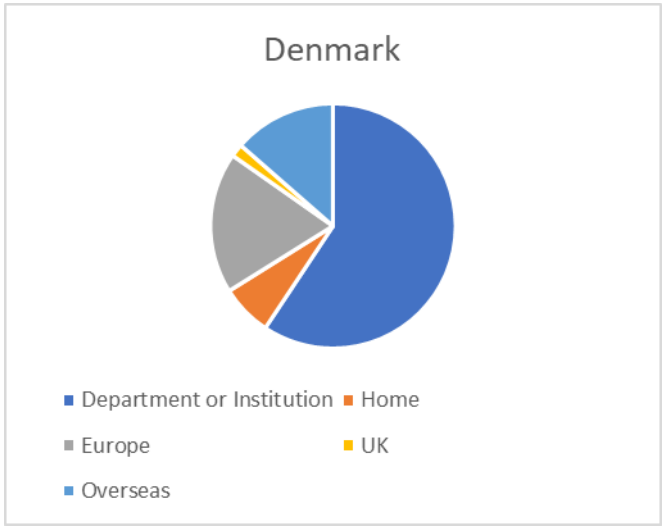
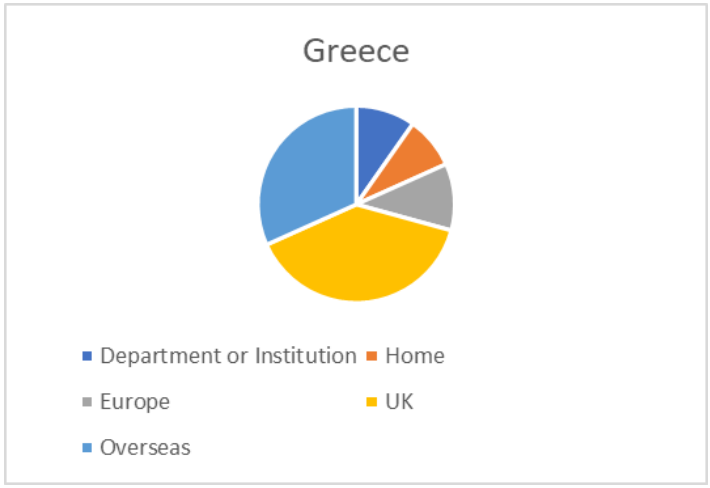
Figure 1: PhD Origin in % per country







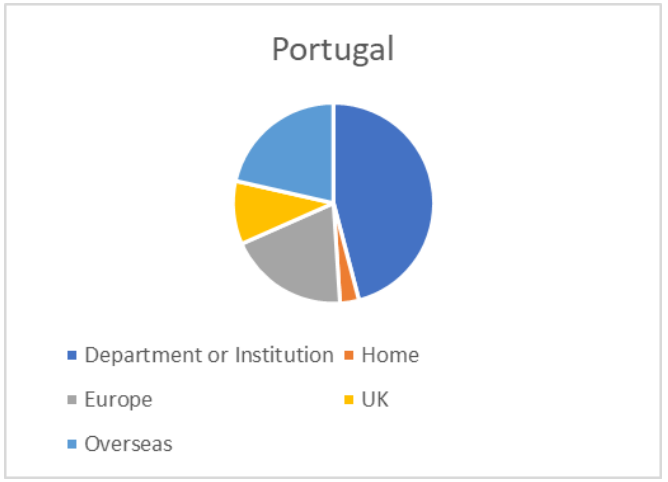


Table 1

	Probit						Logistic					
	papers above average											
	Coef.		P>z	[95% Conf.	Interval]	dy/dx	Coef.		P>z	[95% Conf.	Interval]	dy/dx
BE US_PhD	-0.149		0.625	-0.746	0.448	-0.054	-0.249		0.612	-1.209	0.712	-0.055
DE US_PhD	-0.420	*	0.055	-0.849	0.009	-0.153	-0.691	*	0.055	-1.396	0.014	-0.154
DK US_PhD	-0.692		0.111	-1.543	0.159	-0.252	-1.378	*	0.086	-2.950	0.195	-0.307
GR US_PhD	-0.074		0.804	-0.659	0.511	-0.027	-0.122		0.799	-1.059	0.815	-0.027
IT US_PhD	0.042		0.821	-0.319	0.402	0.015	0.065		0.825	-0.512	0.642	0.014
PT US_PhD	-0.188		0.509	-0.748	0.371	-0.069	-0.311		0.498	-1.211	0.589	-0.069
BE Inbreeding	-0.225		0.156	-0.536	0.086	-0.082	-0.706		0.251	-1.912	0.500	-0.157
DE Inbreeding	-0.207	**	0.030	-0.394	-0.020	-0.075	-0.652	**	0.019	-1.199	-0.105	-0.146
DK Inbreeding	0.122		0.553	-0.281	0.525	0.044	-2.620	**	0.014	-4.701	-0.539	-0.585
GR Inbreeding	-1.126	***	0.007	-1.940	-0.311	-0.410	-0.742		0.240	-1.979	0.495	-0.166
IT Inbreeding	-0.614	***	0.000	-0.823	-0.405	-0.223	-0.502	**	0.026	-0.945	-0.059	-0.112
PT Inbreeding	-0.908	***	0.000	-1.397	-0.419	-0.331	-0.277		0.565	-1.223	0.668	-0.062
BE female	-0.434		0.241	-1.161	0.292	-0.158	-0.363		0.154	-0.863	0.136	-0.081
DE female	-0.397	**	0.018	-0.726	-0.067	-0.144	-0.335	**	0.029	-0.635	-0.034	-0.075
DK female	-1.379	***	0.005	-2.351	-0.408	-0.502	0.221		0.506	-0.430	0.872	0.049
GR female	-0.461		0.231	-1.214	0.292	-0.168	-1.896	**	0.014	-3.403	-0.388	-0.423
IT female	-0.301	**	0.025	-0.564	-0.037	-0.109	-1.002	***	0.000	-1.346	-0.658	-0.224
PT female	-0.176		0.540	-0.740	0.387	-0.064	-1.512	***	0.001	-2.370	-0.653	-0.337
constant	0.036		0.620	-0.106	0.178		0.062		0.592	-0.165	0.289	

Note: dy/dx provides the marginal effects using the delta method. All estimations are done in Stata. BE refers to Belgium, DE to Germany, DK to Denmark, GR to Greece, IT to Italy and PT to Portugal. The delta method was used to calculate the marginal effects.

Table 2

	Probit						Logistic					
	citations above average											
	Coef.		P>z	[95% Conf.	Interval]	dy/dx	Coef.		P>z	[95% Conf.	Interval]	dy/dx
BE US_PhD	0.096		0.758	-0.516	0.708	0.030	0.162		0.748	-0.826	1.149	0.029
DE US_PhD	-0.118		0.595	-0.555	0.318	-0.036	-0.198		0.592	-0.921	0.526	-0.036
DK US_PhD	0.029		0.940	-0.731	0.789	0.009	0.027		0.967	-1.238	1.292	0.005
GR US_PhD	0.343		0.248	-0.239	0.926	0.105	0.547		0.249	-0.384	1.478	0.100
IT US_PhD	0.453	**	0.014	0.092	0.814	0.139	0.726	**	0.015	0.144	1.308	0.132
PT US_PhD	-0.173		0.565	-0.764	0.417	-0.053	-0.291		0.562	-1.276	0.693	-0.053
BE Inbreeding	-0.162		0.330	-0.488	0.164	-0.050	-1.850	*	0.079	-3.914	0.213	-0.337
DE Inbreeding	-0.253	**	0.011	-0.449	-0.058	-0.078	-0.702	**	0.034	-1.351	-0.053	-0.128
DK Inbreeding	-0.005		0.982	-0.411	0.402	-0.001	-1.415	*	0.076	-2.976	0.147	-0.257
GR Inbreeding	-0.771	*	0.063	-1.584	0.041	-0.237	-0.027		0.964	-1.219	1.165	-0.005
IT Inbreeding	-0.744	***	0.000	-0.976	-0.512	-0.229	-0.410		0.126	-0.936	0.115	-0.075
PT Inbreeding	-0.761	***	0.006	-1.302	-0.220	-0.234	-0.670		0.257	-1.828	0.488	-0.122
BE female	-1.013	**	0.049	-2.022	-0.005	-0.311	-0.271		0.324	-0.810	0.267	-0.049
DE female	-0.408	**	0.029	-0.774	-0.043	-0.125	-0.418	**	0.011	-0.742	-0.094	-0.076
DK female	-0.821	*	0.057	-1.666	0.024	-0.252	0.005		0.987	-0.658	0.669	0.001
GR female	-0.025		0.947	-0.768	0.718	-0.008	-1.328	*	0.084	-2.836	0.180	-0.242
IT female	-0.255	*	0.094	-0.554	0.044	-0.078	-1.289	***	0.000	-1.702	-0.877	-0.235
PT female	-0.389		0.234	-1.029	0.251	-0.119	-1.327	**	0.010	-2.338	-0.316	-0.241
constant	-0.338	***	0.000	-0.484	-0.192		-0.542	***	0.000	-0.780	-0.304	

Note: dy/dx provides the marginal effects using the delta method. All estimations are done in Stata. BE refers to Belgium, DE to Germany, DK to Denmark, GR to Greece, IT to Italy and PT to Portugal. The delta method was used to calculate the marginal effects.