

FORMS OF WORK ORGANIZATION AND REGIONAL PERFORMANCE IN EU-28 AND NORWAY

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Abstract

Knowledge, intellectual assets, technology transfer or innovation activities, in general, are sources of growth in companies' competitiveness on markets, for labor productivity or for creation of quality jobs, essential for a sustainable and smart development. The analysis is based on the revised measurement framework for innovation activity and its regional results, on the one hand, and the Eurofound survey on working conditions, on the other. Identifying the direction and degree of interdependence between innovative work organization and innovation performance in 187 EU-28 and Norway territorial units consists of a detailed analysis through which economic and social factors trends favoring innovation can be broken down. This facilitates an appropriate assessment of the areas where the European Commission (or other Community or national institutions) can focus their efforts to improve innovation performance. The estimated results reveal that innovative work organization forms have potentially partial non-homogeneous effects. Thus, the estimation for the most intensive work organization form (discretionary learning) suggests that, above all, a higher level of its presence in companies leads to a higher level of innovation performance at regional level, while "lean" production has negative consequences on performance. For the classical forms of work organization, Taylorism has a positive impact and traditional organizations have a negative one, both on the growth of employment in medium-high/high tech manufacturing and knowledge-intensive services, respectively in sales of new-to-market and new-to-firm innovations.

JEL codes: J81, F66, O31

Keywords: Forms of work organization, workplace innovation, regional innovation

Introduction

Numerous endogenous and exogenous factors are responsible for the results of the innovation process: contextual determinants, modern research systems, financial support and firm investments or R & D concerns, including the creation and development of collaborative networks and the strengthening of intellectual assets, all of which are very important in achieving the expected higher economic and social outcomes. Both organizational structures, through the creation of innovative jobs and opportunities for employee participation and involvement, as well as employment policies that facilitate such effective organizational change are sine-qua-non conditions for a the defining impact of human capital on innovation and productivity (OECD, 2010). Overall, the performances of national innovation systems are central to driving economic processes, increasing employment or improving quality of life.

The aim of the research is to evaluate, in an interdisciplinary approach, the influences and implications of potential, general and specific determinants of innovation (investments in research and development, level of education and experience, intellectual assets, collaboration activities and creation of information networks). The paper focuses on workplace innovation as a dimension of

social innovation, evaluating the impact on employment in knowledge intensive sectors and integration in commercial markets in a wide European regional space.

The analysis is carried out on the basis of the revised framework for measuring innovation activity and its regional results (European Commission, 2017), on the one hand, and Eurofound`s European Working Conditions Surveys, on the other, while taking into account the existence of spatial interdependences between economic and social characteristics of the regions considered in the analysis. The assessment of the relationship between workplace innovation and innovation performance was carried out for 187 territorial units (NUTS 2 and 3) in EU-28 and Norway for 2015, using cross-section data and spatial autoregressive models.

Literature review

Innovation is a key factor for economic growth and development with profound implications for all human activities. The Oslo Manual (OECD, 2005) defines innovation-generating activities at the company level as those in which knowledge is used, including from external sources, for equipment purchases (incorporating superior technological performances but not in R & D directions) and other tangible assets (land and buildings, software) acquired through training, market research or other preparation for the implementation of innovative processes (planning and control, testing and evaluation).

The topic regarding interdependencies between innovation and work processes is thoroughly analyzed by Arundel, Lorenz, Lundvall, and Valeyre (2005), who stress that the way employees work significantly influences the company's ability to innovate. Innovation means not only new products, methods or processes, but the organization ability to adapt itself to changes. Recent studies (Howaldt, Butzin, Domanski, Kaletka, 2014; Howaldt and Schröder, 2018) underline the paradigm shift in innovation, largely reflected in international research, towards opening the innovation process to society with non-technological innovations aimed at changing social practices. The new approach to understanding the challenges of contemporary society is also found in national or European policies, strategies, programs and research innovation; the Europe 2020 Strategy is relevant in this respect (European Commission, 2010, Eurofound, 2016). The new paradigm of innovation not only integrates changes in innovation processes and their implementation into society structures but also changes in the subject of innovation induced by social innovation and for which Howaldt and Schröder (2018, p. 1) cite Gillwald (2000), according to which the relevance of technical novelty should be supplemented with the novelty of social implications and consequences (either benefits or costs) on the relations and structures of society (Choi and Majumdar, 2014, p. 10).

One of the most widely accepted approaches to innovative work organization is that proposed by Lorenz and Valeyre (2005), which outlined four specific forms of work organization defined by them as discretionary learning (DL), lean production (LP), Taylorism (TA) and traditional or simple organizations (SO). Subsequently, these forms of work organization were taken over, explained and used in analyzes and studies by other authors (Arundel, Lorenz, Lundvall and Valeyre, 2007; Lundvall and Lorenz, 2007; Lorenz, 2015; Lundvall, 2016), and also by European Union institutions for projects, policies and initiatives.

Methodology

In analyzing the influence of some economic and social determinants of innovation on occupation and integration in the commercial markets, as impact measures, we have developed an operational research model that includes the theoretical and empirical elements used to substantiate the econometric analysis, the estimation models, the influence variables and their measures, as well as the methods that we have selected and proposed in the assessment of the influence relationship.

The Regional Innovation Scoreboard database includes the innovation dimension for 220 territorial administrative units in 22 Member States and Norway, and for the other Member States, Cyprus, Estonia, Latvia, Lithuania, Luxembourg and Malta the national data is the same for the NUTS-1 or NUTS-2 regions. In the classification of regions, depending on the innovation performance, four categories of regional innovators are defined by the European Commission: Innovation Leaders, Strong Innovators, Moderate Innovators and Modest Innovators.

Database construction for innovation indicators and the estimation of the innovative forms of work organization frequency raised the issue of the non-uniformity in spatial mapping of the observations. For this, there wasn't a perfect correlation between the European classification of the territorial units and the ones from the European Working Conditions Survey. For data comparability, we omitted some regional areas or ranked them at a lower classification level. As a result, the number of NUTS 1, 2 or 3 regions considered in the analysis is 187.

Since the data used for measuring work organization is dichotomic, the working methods comprise of a multiple correspondence analysis (MCA) and a cluster analysis. By assigning values to observations and categories, multiple correspondence analysis quantifies nominal data in order to bring observations in the same category closer. The MCA analysis was based on the results of the EWCS 2015 survey, for which the configuration of the main forms of work organization, according to the theoretical and empirical models of the literature, was made using 15 variables whose observations were grouped on structured factorial axes in relation to the contribution of the variables to the explanation of their total variance. Work organization forms dimensions for innovation leader regions in EU-28 and Norway, comprising the first two axes, are illustrated in the following figure.

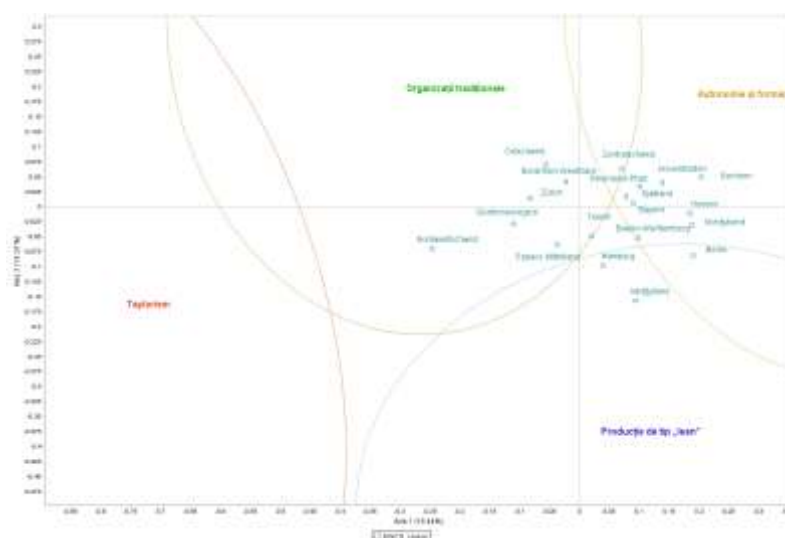


FIGURE NO. 1: **Work organization forms for innovation leaders in EU-28 and Norway, through MCA and cluster analysis**

Source: Authors' processing in SPAD 9.0

Spatial dependence associated with dependent variables, regressions, and error terms is included in estimates by autoregressive spatial models (Belotti, Hughes and Mortari, 2013), as: Spatial Autoregressive Model - SAR, Spatial Error Model - SEM, Spatial Durbin Model - SDM, Spatial Autocorrelation Model - SAC, and Spatial Autoregressive Generalized Method of Moments (SPGMM). The measurement construction of innovative forms of work organization by national and regional units was carried with SPAD software (Statistical Package for Augmented Designs) and STATA 14.0, the latter for evaluating spatial autoregressive models.

Results of the relationship between participatory forms of work organization and indicators of European economic performance

The phase of testing for spatial autocorrelation structure is based on the need to certify the level of dependency between the variables in regions located in the vicinity of others. The results obtained for spatial autocorrelation measurement instruments, Moran and Geary, with a statistical significance of over 99%, reveal the existence of positive spatial autocorrelation for the dependent variables considered. These are presented in Table no. 1.

TABEL NO. 1: Spatial autocorrelation indices at NUTS level, 2015

Dependent variable	Moran's I					Geary's C				
	I	E(I)	sd(I)	z	p-value*	C	E(C)	sd(C)	z	p-value*
Employment in medium-high/high tech manufacturing and knowledge-intensive services	0.349	-0.005	0.036	9.822	0.000	0.653	1.000	0.039	-8.818	0.000
Sales of new-to-market and new-to-firm innovations	0.596	-0.005	0.036	16.771	0.000	0.399	1.000	0.044	-13.776	0.000

Source: Authors' processing in STATA 14.0

In order to reveal the influence of forms of work organization on the dependent variables (the increase of employment and sales), the econometric evaluation of the relationship was tested by sequentially including spatial patterns of both organizational forms and dependent and independent variables. Given that the simultaneous use of all four forms of work organization in the regression equations (discretionary learning, lean production, taylorism and traditional organizations) would lead to shifted results because of their multicollinearity (the estimated coefficients being the same for all forms of organization), in the specifications we considered only three forms of organizations, using alternatively as an explanatory variable the employment in medium-high/high tech manufacturing and knowledge-intensive services, respectively sales of new-to-market and new-to-firm innovations.

TABEL NO. 2: Spatial dependence between forms of work organization and employment

	M1 (SAR)	M2 (SAR)	M3 (SEM)	M4 (SEM)	M5 (SEM)	M6 (SDM)	M7 (SDM)	M8 (SDM)	M9 (SAC)	M10 (SAC)	M11 (SPGMM)
Number of observations	187	187	187	187	187	187	187	187	187	187	187
Wald test	78.20***	75.32***	74.93***	74.49***	65.19***	101.57***	97.27***	91.21***	72.29***	72.01***	70.72***
Log Likelihood function	126.44	126.26***	128.85	128.77	118.57	131.99	131.58	121.90	129.19	129.13	107.29
Spatial autocorrelation tests											
Ho: Error has No Spatial AutoCorrelation / Ha: Error has Spatial AutoCorrelation											
GLOBAL Moran MI	0.29***	0.30***	0.32***	0.32***	0.27***	0.25***	0.27***	0.18***	0.33***	0.33***	0.32***
GLOBAL Geary GC	0.69***	0.69***	0.67***	0.67***	0.73***	0.74***	0.73***	0.81***	0.67***	0.67***	0.67***
GLOBAL Getis-Ord	-0.29***	-0.30***	-0.32***	-0.32***	-0.27***	-0.25***	-0.27***	-0.18***	-0.33***	-0.33***	-0.32***
LM Error (Burridge)	58.43***	63.84***	72.37***	74.49***	50.38***	40.38***	46.73***	21.84***	76.38***	78.16***	70.84***
LM Error (Robust)	25.84***	28.00***	51.10***	55.76***	49.02***	1947.55***	2448.35***	1974.14***	136.99***	145.98***	29.37***
Ho: Spatial Lagged Dependent Variable has No Spatial AutoCorrelation / Ha: Spatial Lagged Dependent Variable has Spatial AutoCorrelation											
LM Lag (Anselin)	102.74***	113.20***	168.52***	177.53***	136.46***	145.58***	173.27***	92.98***	244.67***	256.37***	144.83***
LM Lag (Robust)	70.14***	77.36***	147.25***	158.79***	135.11***	2052.75***	2574.89***	2045.28***	305.28***	324.19***	103.35***
Ho: No General Spatial AutoCorrelation / Ha: General Spatial AutoCorrelation											
LM SAC (LMerr+LMLag_R)	128.57***	141.20***	219.62***	233.29***	185.49***	2093.13***	2621.62***	2067.12***	381.66***	402.35***	174.19***
LM SAC (LMLag+LMerr_R)	128.57***	141.20***	219.62***	233.29***	185.49***	2093.13***	2621.62***	2067.12***	381.66***	402.35***	174.19***
Diagnostic Criteria for Model Selection											
AIC	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
AIC (Log)	-3.89	-3.90	-3.86	-3.89	-3.85	-3.92	-3.92	-3.89	-3.87	-3.88	-3.89
Schwarz Criterion	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.02	0.02	0.02
Schwarz Criterion (Log)	-3.74	-3.76	-3.73	-3.75	-3.72	-3.62	-3.66	-3.64	-3.72	-3.74	-3.73

* p<0.05, ** p<0.01, *** p<0.001

Source: Authors' processing in STATA 14.0

Interpreting individual model results involves checking for spatial autocorrelation within each estimation and selecting the model(s) that best matches the set of observations constituted by factor variables. Tables no. 2 and 3 comprise the results of panel data estimation on **employment in medium-high/high tech manufacturing and knowledge-intensive services**, the first summing up diagnostic tests for spatial dependence and the selection of the models appropriate to the data set, and the latter the extent to which the variables used in the analysis influence employment. Direct effects and recorded spillover effects were calculated for developed models, but they were not represented distinctively.

Even though spatial autocorrelation could be verified in several models, the results obtained for estimated employment elasticity ratios in relation to the explanatory variables differ not only according to the factorial combinations considered in the specifications but also by the type of spatial model used. Analyzing each type of model, the results indicate the lag models, which could indicate the preference in choosing this spatial model, have the highest values for the Durbin specification (Models 6, 7 and 8). For these models, the Akaike Information Criterion (AIC) and the

Schwarz Criterion should be added for the selection based on their lowest values. We note that no precise differentiation can be made based on their values, so we will proceed to choosing the optimal spatial model by maximizing the log-likelihood function, accordingly to the Durbin estimate (Model 6).

TABEL NO. 3: Spatial impacts on employment in knowledge intensive activities

	(1) SAR	(2) SAR	(3) SEM	(4) SEM	(5) SEM	(6) SDM	(7) SDM	(8) SDM	(9) SAC	(10) SAC	(11) SPGMM
DL	0.00212* (2.20)	0.00217* (2.25)	0.00242** (2.58)	0.00242** (2.58)	0.00193* (1.96)	0.00258** (2.61)	0.00261** (2.65)	0.00214* (2.07)	0.00236* (2.57)	0.00236* (2.57)	0.00237* (2.46)
LP	0.000158 (0.19)	0.000199 (0.24)	-0.000135 (-0.17)	-0.000111 (-0.14)	-0.000397 (-0.46)	0.0000192 (0.02)	0.0000331 (0.04)	-0.000135 (-0.15)	-0.000189 (-0.24)	-0.000171 (-0.22)	-0.000181 (-0.22)
TA	0.00190* (2.02)	0.00192* (2.04)	0.00134 (1.51)	0.00136 (1.52)	0.000468 (0.50)	0.00147 (1.52)	0.00148 (1.53)	0.000906 (0.90)	0.00120 (1.36)	0.00121 (1.37)	0.00133 (1.45)
GERD	0.0421** (3.08)	0.0404** (3.03)	0.0394** (2.87)	0.0380** (2.85)	0.0694*** (5.41)	0.0447** (3.14)	0.0408** (3.00)	0.0735*** (5.57)	0.0797** (2.80)	0.0367** (2.79)	0.0406** (2.91)
SME_collab	-0.148* (-2.56)	-0.162** (-3.11)	-0.225** (-3.10)	-0.231** (-3.26)	-0.167* (-2.32)	-0.244** (-3.15)	-0.251** (-3.27)	-0.204* (-2.56)	-0.231** (-3.16)	-0.236** (-3.26)	-0.221** (-3.03)
LLL	-0.0784 (-1.24)	-0.0746 (-1.18)	0.0511 (0.63)	0.0557 (0.69)		0.0403 (0.40)	0.0616 (0.63)		0.0845 (0.94)	0.0897 (1.01)	0.0474 (0.59)
Scient_pub	0.309*** (4.26)	0.300*** (4.23)	0.302*** (4.30)	0.296*** (4.49)		0.290*** (3.96)	0.273*** (3.88)		0.286*** (4.21)	0.281*** (4.23)	0.298*** (4.30)
SME_mark	-0.0411 (-0.59)		-0.0337 (-0.40)		-0.0114 (-0.10)	-0.0818 (-0.87)		-0.0388 (-0.30)	-0.0313 (-0.37)		-0.0345 (-0.41)
SME_prod					0.0603 (0.50)			0.0442 (0.35)			
wlx_DL						-0.00262 (-0.91)	-0.00252 (-0.89)	-0.000873 (-0.29)			
wlx_LP						0.000157 (0.07)	0.00000369 (0.00)	0.000891 (0.36)			
wlx_TA						0.000557 (0.17)	0.000441 (0.14)	0.00318 (0.96)			
wlx_GERD						0.0327 (0.83)	0.0312 (0.81)	0.0275 (0.78)			
wlx_SME_collab						0.219 (1.98)	0.207* (1.98)	0.201 (1.68)			
wlx_LLL						-0.0362 (-0.23)	-0.0368 (-0.24)				
wlx_Scientific+pub						-0.304 (-1.24)	-0.334 (-1.65)				
wlx_SME_mark						0.0398 (0.23)		-0.0189 (-0.09)			
wlx_SME_prod								-0.132 (-0.60)			
cons	0.0429 (0.54)	0.0332 (0.43)	0.282*** (3.94)	0.273*** (4.01)	0.358*** (5.01)	0.0925 (0.42)	0.0975 (0.44)	0.0318 (0.13)	0.395** (2.61)	0.387** (2.61)	0.287*** (4.00)
Rho_cons	0.528*** (6.56)	0.531*** (6.63)				0.542*** (5.95)	0.553*** (6.28)	0.459*** (4.67)	-0.240 (-0.87)	-0.243 (-0.88)	
Sigma_cons	0.121*** (19.14)	0.121*** (19.13)	0.118*** (19.00)	0.118*** (19.01)	0.126*** (19.08)	0.117*** (19.05)	0.117*** (19.05)	0.124*** (19.14)	0.116*** (17.11)	0.116*** (17.14)	
Lambda_cons			0.607*** (7.56)	0.608*** (7.61)	0.537*** (6.09)				0.716*** (5.94)	0.717*** (6.02)	
N	187	187	187	187	187	187	187	187	187	187	187

t statistics in parentheses * p<0.05, ** p<0.01, *** p<0.001

Source: Authors' processing in STATA 14.0

The elasticity coefficients obtained for evaluating the relation between employment and variables of forms of work organization clearly highlight the steady and robust influence of discretionary learning. The estimated coefficients are positive and statistically significant, suggesting the importance of this class of organization in increasing labor market integration. Moreover, the elasticities have a statistical significance of over 95%. The other two forms of organization used in the models generally influence the degree of occupancy in the same direction, but their coefficients are not statistically significant. In addition, discretionary learning has a constant effect on all developed spatial models, whereas the estimated direction of influence of “lean” type fluctuates according to the type of model used (for Models 3, 8 and 9 results are negative); the employment elasticity in relation to the Taylor type of work organization is positive but inconsistent in respect with the economic impact magnitude.

For the cumulated effects of the three forms of organization used, in Models 6 and 7 (Durbin type) the spillover effects are slightly more pronounced than the direct ones, which means there is a strong spatial dependence between the regions considered in the analysis. At the same time, the value of direct effects is highest for discretionary learning, both in Model 9 and Model 6, their value being approximately double than the Taylor type (0.0007) and significantly higher than lean production (0,00). The direct and indirect spatial effects, relative to the type of innovators (firms) that introduced new (or improved) products or processes and new marketing or work organization methods, are positive, with a range of differences in impact size. Thus, if product and process innovators have greater effects in supporting employment in their own region (direct effects), innovation in marketing and organization in a region seems to support an increase in employment in other regions.

Increasing the quality of research is considered a strategic objective of the Europe 2020 R & D system (European Commission, 2010). In all developed models, R & D expenditure - including private, public and tertiary sectors - has been included as explanatory factors. A positive, direct relationship also exists between employment and research spending in the business sector and, being very important for employment growth, the quality of scientific research and the attractiveness of research systems. The development of inter and intra-firm connections leads to different implications. Thus, collaborations between companies on research and innovation do not positively influence the outcome (in our case the occupation) of their own region, but that of other neighboring units. This could be explained by the fact that such collaborations do not always involve new human resources, but only more intense use of internal ones. We can conclude that the results obtained by innovating are being exploited by developing new activities in neighboring regions.

Another performance measure of an innovation system (European Commission, 2017) is given by the *sales of innovative products, new-to-market and new-to-firm*. Similar to the analysis evaluating the influence of forms of work organization on employment, Tables no. 4 and 5 include test results and estimated elasticity coefficients for the assessment of innovative product sales.

TABEL NO. 4: Autocorrelation tests and model selection for sales of innovative products new-to-market and new-to-firm

	M1 (SAR)	M2 (SAR)	M3 (SEM)	M4 (SEM)	M5 (SDM)	M6 (SDM)	M7 (SDM)	M8 (SAC)	M9 (SAC)	M10 (SAC)
Number of observations	187	187	187	187	187	187	187	187	187	187
Wald test	65.81***	77.62***	47.12***	66.96***	65.64***	74.79***	113.66***	70.4***	82.52***	81.62***
Log Likelihood function	166.64	167.99	167.28	170.09	165.35	167.49	172.19	168.17	168.52	168.60
Spatial autocorrelation tests										
Ho: Error has No Spatial AutoCorrelation / Ha: Error has Spatial AutoCorrelation										
GLOBAL Moran MI	0.48***	0.46***	0.53***	0.51***	0.47***	0.46***	0.39***	0.48***	0.45***	0.45***
GLOBAL Geary GC	0.51***	0.53***	0.47***	0.50***	0.53***	0.54***	0.59***	0.51***	0.54***	0.54***
GLOBAL Getis-Ord's GO	-0.48***	-0.46***	-0.53***	-0.51***	-0.47***	-0.46***	-0.39***	-0.48***	-0.45***	-0.45***
LM Error (Burrige)	180.34***	162.10***	211.11***	185.09***	166.17***	152.45***	108.77***	173.50***	154.09***	153.20***
LM Error (Robust)	2649.10***	1953.57***	1254.28***	1084.99***	14300***	10000***	10000***	1230.28***	1828.706***	1793.78***
Ho: Spatial Lagged Dependent Variable has No Spatial AutoCorrelation / Ha: Spatial Lagged Dependent Variable has Spatial AutoCorrelation										
LM Lag (Anselin)	601.69***	541.64***	692.20***	660.31***	717.62***	624.65***	486.12***	517.37***	539.39***	535.75***
LM Lag (Robust)	3070.45***	2333.10***	1735.37***	1560.20***	14800***	10500***	13000***	1574.14***	2214.00***	2176.33***
Ho: No General Spatial AutoCorrelation / Ha: General Spatial AutoCorrelation										
LM SAC (LMerr+LMLag_R)	3250.80***	2495.21***	1946.49***	1745.30***	15000***	10700***	11500***	1747.65***	2368.09***	2329.54***
LM SAC (LMLag+LMerr_R)	3250.80***	2495.21***	1946.49***	1745.3***	15000***	10700***	11500***	1747.65***	2368.09***	2329.54***
Diagnostic Criteria for Model Selection										
AIC	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
AIC (Log)	-4.09	-4.12	-4.00	-4.06	-4.05	-4.07	-4.20	-4.10	-4.13	-4.12
Schwarz Criterion	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Schwarz Criterion (Log)	-3.96	-3.99	-3.86	-3.89	-3.86	-3.84	-3.94	-3.96	-3.98	-3.95

* p<0.05, ** p<0.01, *** p<0.001

Source: Authors' processing in STATA 14.0

We observe very large differences in respect with the relationship between innovative forms of work organization and sales, compared to the relationship with employment. Sales are not influenced by participative, creative work organization, but by widening the use of the classic Taylor form, which is characterized by low levels of labor education and workplace innovation, low wages and the possibility of replacing employees at any time. Influence is constant, clear and irrespective of the spatial model used. Neither research spending nor the increase in the number of researchers have an impact on sales, emphasizing the importance in new products and services creation and less in their distribution.

However, a strong influence on sales is due to labor productivity, calculated by reporting gross value added to the number of people employed or the total number of hours worked. Estimated elasticity coefficients are very significant and positive in all models. Contrary to expectations, an increase in highly qualified population results in a decrease in sales volume. From an economic point of view, it can be interpreted that sales growth is not based on innovative activities that require a high level of knowledge but is based on a higher level of productivity.

The combined influence of classical forms of organization (TA and SO) together with DL leads to similar results, i.e., the lower importance of modern forms of work organizations and the direct association between the traditional organization's frequency and the volume of sales.

TABEL NO. 5: Spatial autoregressive models for testing the influence of work organization on sales of innovative products

	(1) SAR	(2) SAR	(3) SEM	(4) SEM	(5) SDM	(6) SDM	(7) SDM	(8) SAC	(9) SAC	(10) SAC
DL	0.000396 (0.54)	0.000222 (0.30)	0.000179 (0.25)	0.000602 (0.79)	0.000575 (0.75)	0.000599 (0.78)	0.000338 (0.45)	0.000209 (0.28)	0.000228 (0.31)	0.000167 (0.22)
LP	0.000934 (1.45)	0.00106 (1.65)	0.000846 (1.32)	0.000844 (1.33)	0.00123 (1.79)	0.00147* (2.12)	0.00136* (2.01)	0.00105 (1.59)	0.000941 (1.41)	0.000937 (1.41)
TA	0.00143* (1.99)	0.00158* (2.19)	0.00113 (1.62)	0.00138* (1.99)	0.00169* (2.23)	0.00183* (2.43)	0.00166* (2.23)	0.00149* (1.99)	0.00157* (2.15)	0.00152* (2.05)
GERD	0.0124 (1.38)	0.00590 (0.60)	0.00647 (0.59)		0.0209* (2.13)	0.00931 (0.83)	0.00736 (0.66)	0.00491 (0.47)	0.00905 (0.82)	0.0104 (0.90)
Tertiary_edu	-0.0835 (-1.83)	-0.133* (-2.45)	-0.237*** (-3.36)		-0.0792 (-1.49)	-0.178* (-2.48)	-0.238** (-3.17)	-0.167 (-1.87)	-0.142 (-1.87)	-0.140 (-1.84)
Productiv_munc	0.00158*** (3.50)	0.00151*** (3.37)	0.00245*** (3.64)				0.00204** (2.68)	0.00182* (2.30)	0.00178** (2.89)	0.00187** (2.79)
Productiv_hours				0.00404*** (3.81)						
Scientists_perc		0.0111 (1.65)	0.0126 (1.35)	0.0264 (1.93)		0.0199* (2.05)	0.0159 (1.65)	0.0125 (1.58)	0.0100 (1.29)	0.0105 (1.32)
BERD				0.0745 (1.19)						
RDexp				0.105 (1.91)						
SME_inho				-0.0204 (-0.32)					-0.0514 (-0.91)	-0.0492 (-0.86)
Tertiary_scientists_thous				-0.0174** (-3.27)						
Scientific_pub										-0.0250 (-0.39)
wlx_DL					0.00177 (0.89)	0.00180 (0.87)	0.00120 (0.58)			
wlx_LP					0.00198 (1.12)	0.00201 (1.15)	0.00191 (1.11)			
wlx_TA					0.00194 (0.84)	0.00228 (1.00)	0.00262 (1.16)			
wlx_GERD					0.0378 (1.69)	0.0499* (2.11)	0.0323 (1.29)			
wlx_Tertiary_edu					0.138 (1.48)	0.242* (2.03)	0.295* (2.37)			
wlx_Scientists_perc						-0.0163 (-1.13)	-0.00876 (-0.61)			
w1 Productiv_ocup							-0.0000100 (-0.96)			
_cons	-0.00426 (-0.08)	-0.00973 (-0.19)	0.247*** (4.27)	0.206*** (3.37)	-0.239 (-1.45)	-0.274 (-1.66)	-0.259 (-1.59)	0.0286 (0.28)	0.0132 (0.19)	0.0168 (0.23)
Rho_cons	0.679*** (11.59)	0.672*** (11.44)			0.692*** (11.59)	0.689*** (11.43)	0.640*** (9.16)	0.569* (2.34)	0.655*** (4.35)	0.648*** (4.15)
Sigma_cons	0.0954*** (19.05)	0.0948*** (19.06)	0.0945*** (18.97)	0.0934*** (18.99)	0.0959*** (19.01)	0.0948*** (19.01)	0.0932*** (19.02)	0.0957*** (18.67)	0.0948*** (18.10)	0.0948*** (18.14)
Lambda_cons			0.718*** (12.32)	0.696*** (11.45)				0.236 (0.56)	0.0474 (0.13)	0.0638 (0.17)
N	187	187	187	187	187	187	187	187	187	187

t statistics in parentheses * p<0.05, ** p<0.01, *** p<0.001

Source: Authors' processing in STATA 14.0

Conclusions

Referring to the impact assessment on innovation performance, no matter how we measured it, it can be mentioned that the forms of manifestation of innovative work organization forms have potentially partial non-homogeneous effects. Starting from the most knowledge intensive form of work organization, discretionary learning (DL), the effect estimation suggests that predominantly a higher level of its presence in the companies leads to a higher level of performance in innovation at regional level. However, combining it with the traditional form of organizations at the expense of "lean" production has negative consequences in terms of the direction of influence on performance, a possible explanation being that traditional organizations occupy a significant share in the sample of analysis, which is not, however, taken into account - distorting the results obtained.

The inclusion of the "lean" production, together with discretionary learning and Taylorism, leads to positive performance effects, while its cumulation with traditional organizations results in negative effects on both the latter form and on "lean" production. The two classical forms of organization, less intensive, confirm that Taylorism has a positive overall impact, and traditional organizations have a negative one, both on the increase of the occupancy rate, and sales of products.

We cannot ignore the fact that the determinants of spatial autoregressive models, depending on their type, have specific roles in innovation performance. Hence, it is important to take into account their differentiated application according to specific characteristic of each form of work organization, not only at the national level but also at the regional one. Also, this requires orientating the innovative processes towards knowledge development (at company and employee level), respectively the valorization of intensive in knowledge forms of work organization advantages. Concluding, organizational and institutional policies should mainly focus on investing in human resources,

funding innovative activities through R & D spending, improving latent products and processes and, last but not least, increasing employment productivity.

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