

## 10. Creativity at work in the European Union

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### Abstract

*While creativity has attracted the attention of researchers in such disciplines as behavioural psychology, management and education studies, relatively little attention has been given to comparison of creativity across national systems. Drawing on the results of the fourth European Working Conditions Survey carried out in 2005, this paper starts by developing a measure of creativity at work for the 27 member nations of the European Union and shows how the importance of creativity varies according to sector and occupational category for the European Union as a whole. A simple model is presented explaining the likelihood of an employee being engaged in creative work activity in terms of features of work organisation, human resource management policy, and such personal characteristics as educational background and years of working experience. National differences in the importance of creativity are then examined and the links between creativity at work and national innovative performance are explored, using aggregate indicators derived from the fifth Community Innovation Survey. The paper concludes by considering the policy implications of the results and argues that European policy efforts to improve innovation performance as part of the revised Lisbon strategy need to take a closer look at the effects of work organisation and employee learning dynamics on innovation*

## Introduction

Creativity has attracted the attention of researchers in a variety of disciplines including behavioural psychology and management. Within the field of psychology the focus has been primarily on the relation between creativity and such individual attributes as intelligence, knowledge and personality (Barron and Harrington, 1981; Helson, 1996; Sternberg, 1988; Sternberg and Lubart, 1991; Weisberg, 1993)<sup>1</sup>. In the management literature the focus has been more on the how creativity emerges from the interaction between the individual employee and various aspects of management style and work organisation. Woodman, Sawyer, and Griffin (1993), for example, see creativity as resulting from the interaction of individual, group and organisational variables. Amabile et al. (1996) similarly focus on social and organisational factors arguing in particular that creativity at work is supported by organisational and supervisory encouragement as well as by a diversity of ideas within the work group (also see Baharadwaj and Menon 2000; Drazin, Glynn and Kazanjian 1999; and Ford 1996).

Although there has been some work on the cultural or systemic basis of creativity (Csikszentmihalyi, 1988; Lubart, 1999), prior to Richard Florida's publication of *The Rise of the Creative Class* (2002) relatively little attention has been given to analysing creativity at the levels of regions and nations. By putting forward creativity as the driving force of economic growth, and by presenting the rise of creativity as a general account of the current transformation of the economy comparable to the knowledge-based economy hypothesis, Florida's research has done more than any of the more specialised research to bring creativity to the forefront of debate in the social sciences. Further, in a series of empirical studies focusing on the relation between investments in human capital, creativity and regional economic performance, Florida and his co-authors have argued that the creative class provides a new and alternative standard to the level of educational attainment for measuring human capital in studies focusing on regional development (Florida, Mellander, and Stolarick, 2007; Mellander and Florida, 2006)

Drawing inspiration from Florida's research as well as from the more specialised research on creativity in the fields of behavioural psychology and management, in Section 2 of this paper we develop a measure of *creativity at work* and describe how the importance of creativity varies according to sector and occupational category for the European Union as a whole. We then, in Section 3, develop a simple model explaining the likelihood of creativity at work in terms of features of the employee's work organisation, the human resource management policies he or she is subject to, and such personal characteristics as educational background and years of working expe-

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<sup>1</sup> See R. J. Sternberg (1999) for an overview of the literature.

rience. In Section 4 we make use of logit regression analysis to examine differences in the importance of creative work across the 27 member nations of the EU, and we consider to what extent these variations in creativity are associated with differences in national innovative performance.

## Measuring the creative workforce

A major theme in the behavioural psychology literature on creativity is that of 'eminence' or being 'unique in all the world', and there are a number of empirical studies of creativity focusing on the lives of truly exceptional musicians, artists or scientists. In contrast to this focus on eminence, there is a body of research focusing on 'everyday' or 'local' creativity of the sort that a large percent of the working population engage in in the course of their daily problem-solving activities (Reilly, 2008; Craft, 2005; Richards 1996).

Florida's notion of the creative class corresponds to this latter, more broadly distributed, form of creativity. In Florida (2002), he states that the distinguishing characteristic of the creative class is that its members 'engage in work whose function is to create meaningful new forms' (p. 68). The highest level of creative work, characteristic of what Florida refers to as the 'super-creative core', involves 'producing new forms or designs that are readily transferable and widely useful ...' (p. 69). This group includes such occupations as scientists, university professors, poets and architects. Beyond this core, Florida includes within the creative class a diverse group of creative professionals who, 'engage in creative problem-solving, drawing on complex bodies of knowledge to solve specific problems.' He observes, 'what they (creative professionals) are required to do regularly is think on their own' (p. 69). Further, he notes that many technicians are included in the creative class as they, 'apply complex bodies of knowledge to working with physical materials' and in a number of fields, 'are taking on increased responsibility to interpret their work and make decisions ...' (pp. 69–70).

As the above references show, Florida's notion of the creative class is an economic one referring to the kinds of work activities or jobs that different occupational categories typically undertake. Consistent with this, and in order to measure the size of the creative class and its growth over time for the US economy, he draws on the occupational classifications and figures compiled by the US Bureau of Labor Statistics (BLS) which are based on the 1998 Standard Occupational Classification (SOC) system. The SOC, in common with the International Standard Classification of Occupations (ISCO), groups jobs together in occupations and more aggregate groups mainly on the basis of the similarity of skills required to fulfil the tasks and duties of the jobs. This identification of the standard skill requirements for different jobs allows Florida to assign occupations to three distinct social classes: the creative class, the service class and the

working class. The creative class is defined to include most management occupations, professionals and selected categories of technicians and assistant professionals <sup>2</sup>.

Florida (2002, pp. 75, 330) estimates that the creative class increased from three million workers or 10 % of the workforce in 1900 to 38.3 million or 30 % in 1999. In 1999, the working and service classes are estimated at 26.1 and 43.4 % of the work force respectively, with agriculture making up the remaining 0.5 %.

While this way of measuring the size of the creative workforce is appropriate for capturing broad changes in the importance of creativity within an economy over time, it has a number of limitations when it comes to pursue an internationally comparative analysis. Firstly, as Florida's discussion of the creative factory emphasises (Florida, 2002, p. 52), creativity can extend down from the firm's management and technical services to the shop floor, and highly creative firms typically seek to mobilise the knowledge and skills of the entire workforce. The blanket characterisation of the work of operators, sales and service staff and craft workers as non-creative is at odds with a vast literature on 'learning organisations' that emphasise the collective and multilevel nature of learning and creativity at the workplace.

Second, there is a well-established internationally comparative literature which identifies important international differences in the organisation of work. In particular, detailed international comparisons show that the jobs and work activity of the same occupational categories can display significant national variations, requiring more or less learning and problem-solving activity and differences in responsibility and autonomy (Maurice, et al., 1982; R. Dore, 1973, Doeringer et al., 2003; Lorenz and Valeyre, 2006.)

Third, work on sectoral systems of innovation (Malerba, 2002) points to important differences in the technological dynamism of different sectors of the economy and thus it can be anticipated that the work of the same occupational categories will display marked difference in terms of problem-solving activity and creativeness according to the sector. This implies a need to take into account differences in industrial structure across nations in any statistical analysis of the determinants of creativity at the workplace.

In order to develop a measure of the creative workforce that is suitable for a comparative analysis of the EU-27, we draw on the results of the fourth European Working Conditions Survey carried out in 2005 by the European Foundation for the Improvement of Living and Working Conditions. The analysis covers private sector establish-

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<sup>2</sup> For the list of occupational categories included in the creative class see Florida 2002, pp. 328–29. In terms of the ISCO used by the European Union, Florida's creative class is composed of Management Occupations (ISCO 12–13), Professionals (ISCO 21–24) and some of the occupations classified as Technicians and Associate Professionals (ISCO 31–34). The service class is composed of Clerks (ISCO 41–42), Service Workers (ISCO 51–52) and Sales and Service Elementary Occupations (ISCO 91). The working class is composed of Craft and Related Trade Workers (ISCO 71–74), Plant and Machine Operators (ISCO 81–83) and Labourers in Mining, Construction, Manufacturing and Transport (ISCO 93).

ments of the EU-27 employing 10 or more salaried persons and the total size of the sample is 9 240 salaried persons<sup>3</sup>. In order to develop a measure of the creative workforce that is consistent with Florida's (2002) characterisation of the creative class, we use factor analysis to identify the underlying associations that exist among six binary variables that capture key features of creative work activity (See Table 1)<sup>4</sup>. We then use hierarchical clustering in order to group the population into three basic types of workers: creative workers, routine problems solvers and taylorised workers<sup>5</sup>.

**TABLE 1: CREATIVE WORK VARIABLES**

	<b>% occupied persons affected</b>
Problem-solving activities in work	79
Learning new things in work	68
Undertaking complex tasks	62
Using one's own ideas in work	50
Able to choose or change one's work methods	60
Able to choose or change the order of one's tasks	56
<i>N</i>	9 240

**SOURCE:** Fourth Working Conditions Survey, 2005, European Foundation for the Improvement of Living and Working Conditions

Table 1 above shows the percentage of the population characterised by the six work activity variables that are used in order to classify a worker as creative. Thus, as Florida observes, creative workers typically engage in complex problem-solving activities. Further, workers who use their own ideas in settings where they exercise considerable discretion over their work methods or task order correspond to the distinguishing creative feature of being able to, 'think on their own' and to take on, 'increased responsibility to interpret their work and make decisions'. These six work activity variables do not, however, provide a basis for discriminating between the creative workforce as a whole and the 'super creative core' which Florida defines in terms of the outcome of producing transferrable and widely used new forms or designs.

<sup>3</sup> The sample excludes agriculture and fishing; public administration and social security; education, health and social work; and private domestic employees.

<sup>4</sup> The exact wording of the questions upon which the measures are based are presented in the Annex, Table A1.

<sup>5</sup> The factor method used is multiple correspondence analysis. In order to group the individuals, Ward's method of hierarchical clustering is used on the basis of the factor scores, or the coordinates of the observations, of the first two factors which account 59 % of the total variance of the data set. See the Annex for a graphical presentation of the factor analysis.

Table 2 shows the composition of the three groups resulting from the hierarchical cluster analysis. The first group, which accounts for 51 % of the population, is characterised by high levels of problems solving, learning and task complexity. The persons grouped in this cluster use their own ideas and exercise considerable autonomy in carrying out their jobs. We refer to them as ‘creative workers’. The second group is characterised by nearly as high levels of problem-solving and learning and comparable levels of task complexity. However, there is little use of one’s own ideas and levels of autonomy or discretion in work are low. This cluster groups employees who, while regularly solving technical or other problems in work, do so in highly supervised settings offering little scope for developing original or creative solutions based on their own ideas. We refer to them as ‘routine problem solvers’. The third group is composed largely of persons doing deskilled work. Levels of learning, problem-solving and task complexity are low. There is little use of one’s own ideas and there is limited scope for exercising discretion in how work is carried out. We refer to this group as ‘taylorised workers’.

**TABLE 2: CLUSTER ANALYSIS OF TYPES OF WORKERS**

Variable	% occupied persons by type of learner reporting each variable			
	Creative workers	Routine problem-solvers	Taylorised workers	Average
Problem-solving activities in work	96	87	37	79
Learning new things in work	87	84	16	68
Undertaking complex tasks	80	81	8	62
Using one’s own ideas in work	77	24	19	50
Able to choose or change one’s work methods	94	21	29	60
Able to choose or change the order of one’s tasks	92	14	25	56
<i>Total share of occupied persons</i>	<i>51</i>	<i>24</i>	<i>25</i>	<i>100</i>

**SOURCE:** Fourth Working Conditions Survey, 2005, European Foundation for the Improvement of Living and Working Conditions

Table 3 shows that there are variations in the importance of creative learners according to industrial sector. In particular, creative learners are over-represented in business services and in community, social and personal services, while they are under-represented in manufacturing, construction and retail and other services.

**TABLE 3: TYPE OF WORKER BY SECTOR OF ACTIVITY**

Variable	% occupied persons by sector of activity and type of learner			
	Creative workers	Routine problem solvers	Taylorised workers	Total
Manufacturing, construction and utilities	46	27	27	100
Retail and other services	49	23	29	100
Business and financial services	67	19	13	100
Community, social and personal services	59	18	22	100
Average	51	24	25	100

**SOURCE:** Fourth Working Conditions Survey, 2005, European Foundation for the Improvement of Living and Working Conditions

Table 4 points to the considerable diversity that exists in the importance of creative work across broadly defined occupational categories (as defined by the ISCO). Although the large majority of senior managers, professionals and technicians, which make up the bulk of Florida's creative class, are highly over-represented in the creative worker cluster, roughly half of the occupations making up the clerks and sales and service category, who form Florida's service class, engage in creative work activity. Moreover, a significant minority of the manual occupations making up Florida's working class engage in work requiring creative learning, problem-solving and the use of one's own ideas. The results shown in Table 4 point, for the EU at any rate, to the limitations of using standard occupational categories as the basis for identifying the group of workers who are creative in work. Significant proportions of service workers and manual workers may work in settings where they are called upon to make creative use of their own ideas.

**TABLE 4: TYPE OF WORKER BY OCCUPATIONAL CATEGORY**

Variable	% occupied persons by occupational category and type of worker			
	Creative workers	Routine problem solvers	Taylorised workers	Total
Senior managers	82	10	7	100
Professionals and technicians	74	18	8	100
Clerks and service workers	53	23	24	100
Skilled workers and machine operators	38	30	32	100
Unskilled workers	33	24	43	100
Average	51	24	25	100

**SOURCE:** Fourth Working Conditions Survey, 2005, European Foundation for the Improvement of Living and Working Conditions

## Accounting for creativity at work

The analysis above, while identifying important variations in creativity across sectors, shows that 'the creative class' is an elastic category that can be widened to include significant parts of what Florida has defined as the working and services classes. In this section we draw inspiration from the behavioural psychology and management literature in order to test a simple model where the likelihood of an employee having access to creative work activity is determined by features of work organisation and managerial practice as well as by the personal characteristics of the employee.

The behavioural psychology literature focuses on the importance of domain specific expertise for creativity (Csikszentmihlyi, 1996; Sternberg, 2000). Expertise is seen as being based on the mastery of a body of codified knowledge as well as tacit knowledge based on experience. A variety of empirical evidence has been mustered to demonstrate that creativity is preceded by a number of years of working experience in the field, possibly accompanied by formal education and training (Weisberg, 1988; 1993). Although much of the anecdotal evidence focuses on eminent individuals characterised by exceptional creativity (Simonton, 1985), the importance of expert thinking has also been supported by research focusing on everyday or 'local' creativity such as that displayed by group facilitators or teaching assistants in academic settings (Craft, 1998; Reilly, 2008).

Drawing inspiration from this literature, in the econometric analysis presented below we investigate the relation between the likelihood an employee is engaged in creative work activity and indicators of the acquisition of both formal codified knowledge and informal experience-based knowledge. In order to capture the acquisition of formal knowledge of the sort codified in academic texts and manuals, we use a three-level variable, EDUC, indicating whether the highest level of formal education successfully completed is primary or none, secondary or post-secondary but not tertiary, or tertiary. As a proxy for capturing the importance of domain-specific knowledge acquired through a number of years of practical work activity, we use a binary indicator of whether or not the employee has over 10 years of working experience since completing full-time education (EXPRC).

The fourth European Survey of Working Conditions provides only limited information on the characteristics of work organisation and human resources practices. One of the key factors identified in the management literature as promoting creativity is support from management and support from work group members. Amabile et al. (1996, pp. 1158–1161), for example, observe that encouragement at the organisational, management and work groups levels is one of the most frequently cited factors in the literature on creativity at work. The management literature also points to a posi-

tive relation between creativity and the diversity of team members' ideas and backgrounds (Albrecht and Hall, 1991; Amabile, et al., 1996; Kimberly and Evanisko, 1981; Payne, 1990; Roffe, 1999). A third factor is the provision of off-the-job training which can enhance expertise both by updating skills and knowledge acquired through initial formal education and by imparting new formal knowledge that is complementary to that gained through practical work experience (Amabile, 1988; Basadur et al., 1986; Wheatley et al.1991). A fourth factor cited in the management literature is rewards and recognition for creative performance. The impact of rewards and recognition on creativity is ambiguous and contingent on whether or not they combine synergistically with such intrinsic motivating factors as curiosity, enjoyment or a personal sense of challenge. While it is often assumed that extrinsic motivators undermine intrinsic motivation, on Amabile's (1997) account reward and recognition that confirm accomplishment do not necessarily weaken intrinsic motivation and can even enhance performance. On the other hand, if rewards and recognition are perceived by the employee as management tools that are being used to control his or her effort they are likely to be detrimental to intrinsic motivators.

In order to capture the presence of supportive supervision and colleagues, we use two binary indicators. ASTSUP measures whether or not the individual can almost always or often get assistance from his or her superiors/boss when it is asked for; and ASTCLG is a binary indicator of whether or not the individual can almost always or often get assistance from his or her colleagues when it is asked for. In order to capture diversity in the knowledge of employees we use an indicator of whether or not the employee is involved in systems of task rotation requiring different skills, ROTSK. Further training that contributes to expertise is measured by a binary indicator, FTRAIN, of whether or not the employee has over the last 12 months received training to improve his or her skills paid for or provided by the employer. The distinction between rewards that complement intrinsically motivating factors versus those that don't is difficult to capture with survey data. Here we address the issue indirectly by including binary indicators of two forms of variable pay, piece rate or productivity payment, PIE-CRT, and payments based on the overall performance of the enterprise such as profit sharing schemes, CMPAY. Our assumption is that piece rate or productivity payments are likely to be perceived by employees as management devices designed to control their individual effort. Payments linked to overall company performance, on the other hand, are more likely to be perceived by employees as rewards or recognition that confirm collective accomplishment. We thus expect a negative relation between the use of piece rate or productivity payments and the importance of creative work activity, and a positive relation with the use of payments linked to company performance. We also include controls for broadly defined sector of activity (SCRT), occupational

category (OCC), establishment size (SIZE) and gender (GNDR). The formal definitions of the variables used in the econometric analysis including the control variables are provided in Table 5 below.

**TABLE 5: DEFINITIONS OF VARIABLES USED IN ECONOMETRIC ANALYSIS**

Variable name	Definition
EDUC	Three level categorical variable, equal to 1 if the highest level of education successfully completed is primary or none; 2 if the highest level is secondary or post-secondary but not tertiary; 3 if tertiary.
EXPR	Binary variable equal to 1 if the employee has over 10 years of working experiences since completing full-time education; otherwise 0.
FTRAIN	Binary variable equal to 1 if the employee has received over the last 12 months training to improve his or her skills paid for or provided for by the employer; otherwise 0.
ASTUP	Binary variable equal to 1 if the employee can often or almost always get assistance from his or her superiors/boss if it is asked for; otherwise 0.
ASTCLG	Binary variable equal to 1 if the employee can often or almost always get assistance from colleagues if it is asked for; otherwise 0.
ROTSK	Binary variable equal to 1 if the employee's job involves rotating tasks requiring different skills between him or herself and colleagues; otherwise 0.
PIECRT	Binary variable equal to 1 if the employee's remuneration includes piece rate or productivity bonus payments; otherwise 0.
COMPAY	Binary variable equal to 1 if the employee's remuneration includes payments based on the overall performance of the company; otherwise 0.
OCC	Five level categorical variables equal to 1 for senior manager; 2 for professionals, technicians and associate professionals; 3 for clerks and service workers; 4 for craft and related workers; 5 for operators, assemblers and elementary workers.
SCTR	Four level categorical variable equal to 1 for manufacturing, construction and utilities; 2 for retail and other services; 3 for business and financial services; 4 for community, social and personal services.
SIZE	Four level categorical variable equal to 1 if the size of the establishment is between 10 and 49 employees; 2 if between 50 and 99; 3 if between 100 and 499; 4 if 500 or more.
GNDR	Binary variable equal to 1 if the employee's gender is female, 0 if male

Table 6 below presents the results of the econometric analysis for models with and without structural controls and controls for gender. Examining first the model without the control variables, we can see that the results confirm the various hy-

potheses developed above concerning the organisational practices and personal characteristics that favour creativity at work. Thus there are positive and statistically significant coefficients on our measures of the acquisition of both formal codified knowledge (EDUC) and experienced-based knowledge (EXPRC). Moreover, higher levels of formal education are associated with a higher probability of being engaged in creative work activity. There are also positive and significant coefficients on the measures of supportive supervision and support from colleagues, the measure of job rotation practices favouring knowledge diversity, and the measure of further vocational training. As we anticipated, there is a negative relation between the likelihood of creative work and the use of individual piece rate or productivity bonuses, and a positive relation between creative work and the use of payment systems linking an employee's remuneration to overall company performance.

The results in the model including control variables are the same as regards the levels of significance with the exception of the negative coefficient on the use of individual piece rate which is no longer significant at the 5 % level. The positive coefficients on the variables measuring the level of formal education are reduced in size showing that once an employee's occupation is taken into account the positive effect of higher levels of formal education on creative work activity is weakened. Considering the control variables, we can see that relative to manufacturing and mining creative work is more likely in community, social and personal services, while for business and financial services and retail and other services there are no significant differences. As expected, creative work activity is more likely for senior managers and professionals relative to skilled workers and machine operators, and it is also more likely for clerks and sales workers relative to skilled workers and machine operators. Expressed in terms of odds ratios, senior managers are nearly six times as likely to be engaged in creative work activity and professional and technicians are about four times as likely. Sales and clerks are about twice as likely as skilled workers and operators to be engaged in creative work activity. There is a quite strong and statistically significant negative coefficient on the gender variable. Expressed in terms of odds ratios, women are only about 40 % as likely as men to be engaged in creative work activity<sup>6</sup>. The results also show that there are no statistically significant differences in the likelihood of creative work activity across different size categories of establishments.

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<sup>6</sup> It is important to note that this relation holds after controlling for education, years of experience, sector and occupational category. This points to a kind of inequality that might be more important in a dynamic context than gender pay differences.

**TABLE 6: ACCOUNTING FOR CREATIVE WORK ACTIVITY**

	Logit estimates without structural controls	Logit estimates with structural controls
Educ2	.63 **	.50 **
Educ3	1.75 **	1.07 **
Exprc	.36 **	.32 **
Astsup	.37 **	.34 **
Astclg	.39 **	.39 **
Rotsk	.34 **	.37 **
Ftrain	.50 **	.37 **
Pieprt	-.37 **	-.23
Cmpay	.65 **	.56 **
Sctr2		-.05
Sctr3		.11
Sctr4		.50 **
Occ1		1.75 **
Occ2		1.39 **
Occ3		.74
Occ5		-.05
Size2		-.12
Size3		-.18
Size4		-.22
Female		-1.90 **

\* significant at the 5 % level;

\*\* significant at the 1 % level.

Considering the control variables, we can see that relative to manufacturing and mining creative work is more likely in community, social and personal services, while for business and financial services and retail and other services there are no significant differences. As expected, creative work activity is more likely for senior managers and professionals relative to skilled workers and machine operators, and it is also more likely for clerks and sales workers relative to skilled workers and machine operators. Expressed in terms of odds ratios, senior managers are nearly six times as likely to be engaged in creative work activity and professional and technicians are about four times as likely. Sales and clerks are about twice as likely as skilled workers and operators to be engaged in creative work activity. There is a quite strong and statistically significant negative coefficient on the gender variable. Expressed in terms of odds ratios, women are only about 40 % as likely as men to be engaged in creative work activity<sup>7</sup>. The results also show that there are no statistically significant differences in the likelihood of creative work activity across different size categories of establishments.

## National effects

The analysis in Section 3 has brought out certain common determinants of creative work activity for the EU-27. While creative work everywhere is promoted by certain types of work organisation and management policies, as Table 7 below shows, there are wide differences in the importance of creative work activity across EU member nations. Creative workers are most present in Malta, the Netherlands and the Nordic nations and least present in Bulgaria, the Czech Republic, Greece, Spain, Italy, Cyprus, Lithuania, Hungary, Poland, Romania and Slovakia. There are intermediate levels of creative work activity in the continental European nations, Ireland, Portugal and the UK and, amongst the new member nations, in Estonia, Latvia, and Slovenia. The frequency of taylorised workers tends to show the reverse trend to that of creative workers, being lowest in Malta, the Netherlands and the Scandinavian countries and highest in the southern nations, Bulgaria, the Czech Republic, Cyprus, Lithuania, Hungary and Slovakia. The frequency of routine problem solvers is relatively high in Greece and in the new member nations with the exception of Latvia and Slovenia and, to a lesser, extent Lithuania.

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<sup>7</sup> It is important to note that this relation holds after controlling for education, years of experience, sector and occupational category. This points to a kind of inequality that might be more important in a dynamic context than gender pay differences.

**TABLE 7: NATIONAL DIFFERENCES IN TYPES OF LEARNERS: EU-27 (% OCCUPIED PERSONS BY COUNTRY AND TYPE OF LEARNER)**

	<b>Creative workers</b>	<b>Routine problem solvers</b>	<b>Taylorised workers</b>	<b>Total</b>
Belgium	60	21	19	100
Czech Republic	40	30	30	100
Denmark	70	15	14	100
Germany	52	23	26	100
Estonia	58	22	20	100
Greece	39	33	28	100
Spain	35	30	36	100
France	63	18	19	100
Ireland	58	18	24	100
Italy	37	29	34	100
Cyprus	42	26	32	100
Latvia	53	19	27	100
Lithuania	35	27	38	100
Luxembourg	60	20	20	100
Hungary	44	31	25	100
Malta	70	14	16	100
Netherlands	67	16	16	100
Austria	50	28	23	100
Poland	43	34	23	100
Portugal	46	24	29	100
Slovenia	50	25	25	100
Slovakia	33	32	35	100
Finland	66	21	13	100
Sweden	82	10	8	100
United Kingdom	51	22	27	100
Bulgaria	39	30	31	100
Romania	35	38	27	100
EU-27	51	24	25	100

SOURCE: Fourth Working Conditions Survey, 2005, European Foundation for the Improvement of Living and Working Conditions

Table 3 above identified differences in the importance of creative work activity across broadly defined sectors of activity, and some of the national differences in the frequency of creativity shown in Table 7 may be attributable to cross-national differences in industrial structure. It is also possible that international differences in occupational structure or in the size structure of establishments may explain some of the differences in the frequency of creative work across the member nations of the EU. In order to control for the effects of these structural variables, we have undertaken a logistic regression analysis explaining the likelihood an employee is engaged in creative work in terms of nation, industrial sector, occupation and establishment size. The results are presented in Table 8 below.

The first column results in Table 8 show national effects on the likelihood of creative work without structural controls and the second column with these controls. Germany, which has a profile of types of learners close to the EU-27 average, is used as the reference case. The results thus show whether or not creative work activity is significantly more likely in a nation relative to the German case.

The first column results (without structural controls) show that creative work is significantly more likely in the France, Malta, the Netherlands and the Nordic countries. Expressed in odds ratios an employee working in Sweden is 4.4 times as likely as an employee in Germany to be engaged in creative work activity. The likelihood of creative work is not significantly different in the continental nations with the exception of France, and the likelihood is significantly lower in the southern nations with the exception of Portugal for which the difference is not significant. Creative work activity is less likely in a number of the new member nations including, Bulgaria, the Czech Republic, Lithuania, Poland, Romania and Slovakia. Expressed in odds ratios, the likelihood of creative work is only 0.46 times as likely in Slovakia as it is in Germany.

The second column results report national effects after taking into account the effects of cross-national differences in the structure of sectors, occupational categories and establishment size. Most of the results reported in column one remain the same in terms of the direction of the sign and statistical significance. The exceptions are Belgium and Estonia for which the positive coefficients are now significant at the 5 % level, and Cyprus, Poland and Romania for which the negative coefficients are no longer significant at the 5 % level or better.

**TABLE 8: LOGIT ESTIMATES OF NATIONAL EFFECTS ON CREATIVE WORK ACTIVITY**

	Logit estimates without structural controls	Logit estimates with structural controls
Belgium	.33	.44 *
Czech Republic	– .45 **	– .17
Denmark	.81 **	.89 **
Estonia	.26	.45 *
Greece	– .52 **	– .48 *
Spain	– .70 **	– .49 *
France	.48 **	.51 **
Ireland	.24	.06
Italy	– .60 **	– .48 *
Cyprus	– .40 *	– .33
Latvia	.07	.23
Lithuania	– .67 **	– .36 *
Luxembourg	.34	.21
Hungary	– .29	– .07
Malta	.81 **	1.03 **
Netherlands	.66 **	.60 **
Austria	– .08	.06
Poland	– .33 *	– .03
Portugal	– .21	.27
Slovenia	– .06	.10
Slovakia	– .77 **	– .61 **
Finland	.62 **	.68 **
Sweden	1.47 **	1.64 **
United Kingdom	– .01	– .20
Bulgaria	– .54 **	– .41 *
Romania	– .69 **	– .33

\* significant at 5 % level; \*\* significant at 1 % level. Reference country: Germany

There are significant differences in the importance of creative work activity across the member nations of the European Union. Creativity is arguably at the foundation of nation's capacity for knowledge development and in this section we make a prima facie case for the link between the level of creativity at work and a nation's innovative performance. In Figures 1 through 3 below we present a series of scatter plot diagrams showing the correlations between the frequency of creative work activity and

three measures of innovative performance. The first measure, shown in Figure 1, is the number of patent applications to the European Patent Office per million inhabitants. The figure shows that there is a positive correlation between the frequency of creative work and this classic measure of innovative performance ( $R^2 = .46$ )<sup>8</sup>.

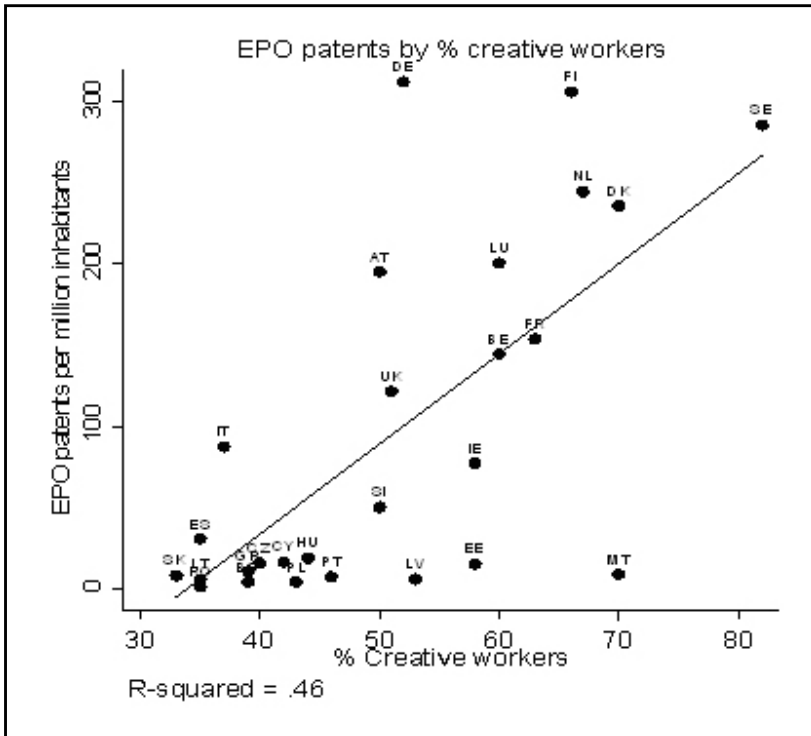


Figure 1

While patents provide a measure of nation's capacity to develop novel products or technologies, the weaknesses of patent statistics for measuring national innovative performance are well known. A large fraction of innovations are not patented and the importance of patenting varies across sectors and size categories of firms. In order to respond to these limitations, Figures 2 and 3 examine the relation between the importance of creativity and two more all encompassing measures of innovation performance based on the results of the fifth Community Innovation Survey, which concerns innovative activity over the period 2004–06. The first is a broad measure of innovation performance, the percentage of firms in the population which have introduced products that are new to the firm. The measure thus includes innovative activity that

<sup>8</sup> The correlation is significant at the 0.0001 level.

varies widely in terms of the firm’s in-house creative effort. Firms classified as innovative by this measure include not only those relying on intensive in-house R & D to develop products or services that are new to market, but also those that have expended minimal effort to introduce new products developed mainly by other enterprises or institutions. Figure 2 nonetheless shows a positive correlation ( $R^2 = .18$ ) between the frequency of creative work activity and national innovative performance<sup>9</sup>.

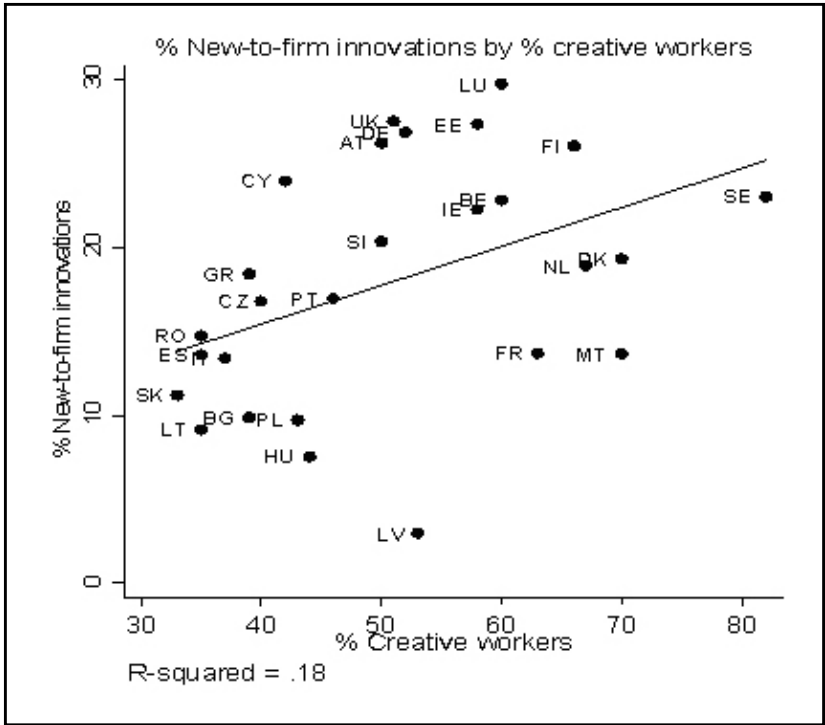


Figure 2

Figure 3 shows the correlation between creativity and the percentage of firms introducing products that are not only new to the firm but also new to the market. This measure of innovation excludes cases of diffusion of innovations through imitation and the in-house creative effort of firms classified as innovative by this measure can be expected to be relatively high. The positive correlation shown in Figure 3 is positive and nearly as strong as that shown between the frequency of creative work and the less encompassing measure of innovation based on EPO patent applications.

<sup>9</sup> The correlation is significant at the 5% level. Figures for France and the UK in Figures 2 and 3 are based on the results of CIS4 and concern innovative activities for the period 2002–04.

( $R^2 = .39$ )<sup>10</sup>. The results thus provide support for the view that the capacity of a nation to develop and bring onto the market authentically new products is closely related to the level of creativity at work.

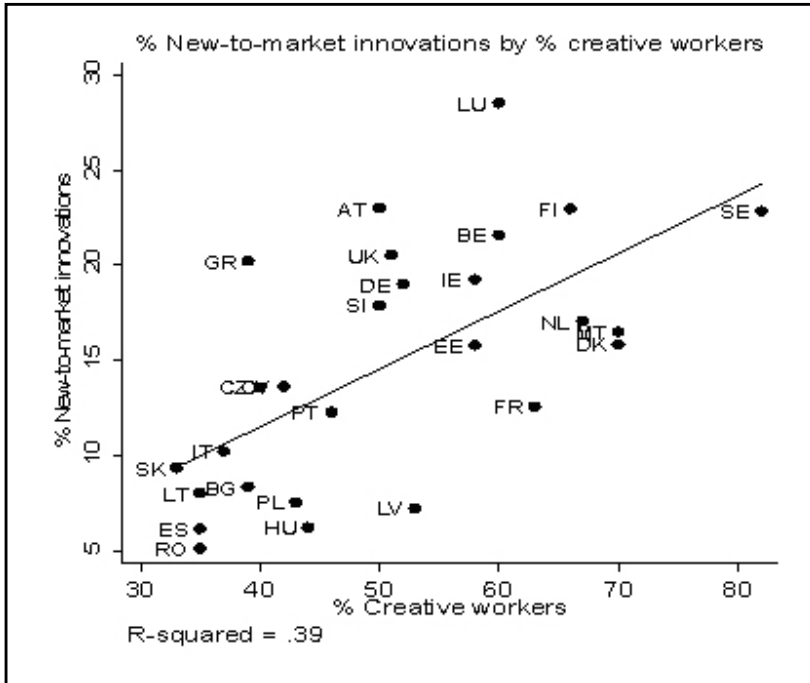


Figure 3

## Conclusions

One of the starting points for this paper was the analysis of 'the creative class' as developed by Richard Florida. With reference to his work we used employee-level survey data from European countries to classify workers as more or less involved in creative work activity. A first result is that while the occupational categories used by Florida to define the creative class provide a useful means for measuring the rise in the creative class over time within a single nation, they are misleading for purposes of international comparisons. National location matters and we find important 'national effects' on the likelihood of creative work activity after adjusting for the effects of an employee's occupation, sector of activity or the size of the establishment he or she works in.

Such national differences may have important impacts on economic performance, and the paper presents some preliminary evidence for systemic links between

<sup>9</sup> The correlation is significant at the 1% level or better.

the level of creative work activity at establishment level and the capacity of firms to introduce new products or services onto the market. The link between creativity at work and innovation performance raises important questions about how creative work environments can be promoted, especially in those southern and new member nations with relatively weak innovative performance. National differences in creativity have different causes and elsewhere (Lorenz and Lundvall, 2009) we have used multilevel analysis to investigate the impact of differences in national institutional framework conditions at the level of education systems and labour markets on the development of creativity at work<sup>11</sup>. Here we have focused more narrowly on the characteristics of work organisation and human resource policies at the establishment level that contribute to building creative work environments. The results suggest that important strides in increasing creativity at work can be made by making appropriate changes in human resource management policies and in organisational practice. More emphasis should be placed on upgrading skills by making investments in continuing vocational training and careful attention should be given to the way compensation policies may impact on intrinsically motivating factors such as personal accomplishment and enjoyment in work. Appropriate changes in work organisation should be made so as to foster knowledge diversity and greater communication and cooperation amongst workers and between workers and management.

These results reinforce conclusions that we have developed with our co-authors elsewhere (Arundel et al., 2007) concerning the need for greater emphasis on EU-policies promoting 'organisational innovation' and the diffusion of good organisational practice. European policy efforts to improve innovation performance as part of the revised Lisbon strategy need to take a closer look at the effects of organisational practice on innovation. The most important bottleneck to improving the innovative capabilities of European firms might not be low levels of R & D expenditures, but rather the widespread presence of working environments that are unable to provide a fertile environment for learning and creative problem-solving. If this is the case, European policy should make a major effort to develop policy instruments that could stimulate the adoption of 'pro-innovation' organisational practice, particularly in countries with poor innovative performance.

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<sup>10</sup> Our analysis in that paper demonstrates that creative work thrives in countries with broad-based education systems and with labour markets that combine flexibility with active training policies and income security in periods of unemployment.

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## Annex

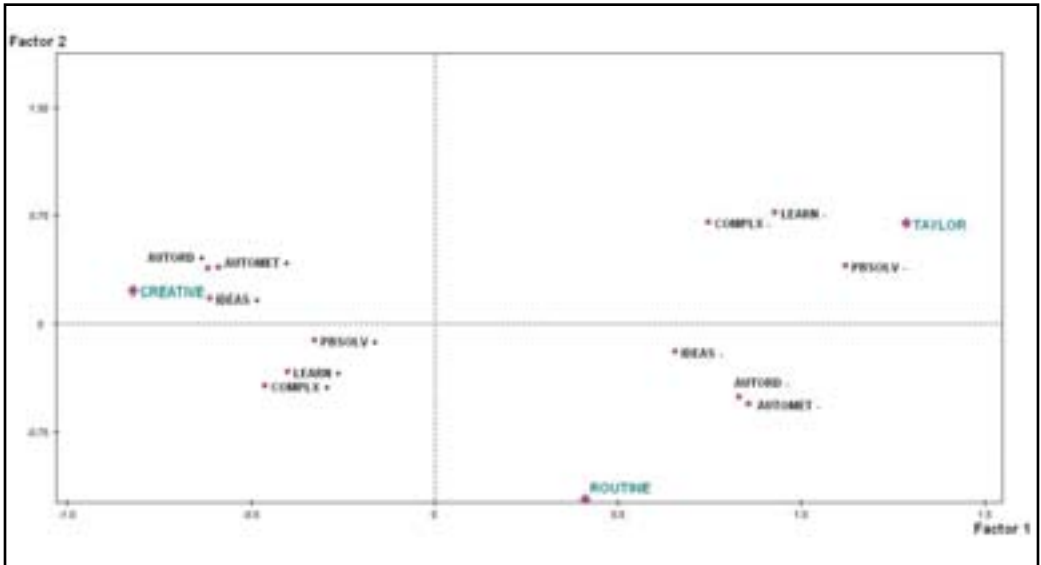


Figure A1: Graphical Representation of first two factors of MCA-6 Organisational Variables<sup>12</sup>

The figure above presents graphically the first two axes or factors of the multiple correspondence analysis (MCA). The first factor, accounting for 42 % of the variance in the data set or the chi-squared statistic, distinguishes between creative workers and Taylorised workers. On the one side of the axis we find the variables measuring the presence of autonomy, learning, problems solving, complexity and the use of one's ideas, and on the other side we find the variables measuring their absence. The second factor, accounting for 17 % of the variance in the data set, is defined by the presence of problem-solving, learning and complexity combined with the absence of autonomy and the use of one's own ideas in work.

The projection of the centre of gravity of the three worker clusters coming out of the hierarchical classification analysis (see Table 2) onto the graphic representation of the first two factors of the MCA shows that the three clusters correspond to the quite different types of work activity. The creative cluster is located to the west of the graph, the Taylorised cluster to the east, and the routine problem-solving cluster to the south.

<sup>11</sup> The + sign indicates the presence of a feature of work activity and the - sign indicates its absence. See Table A1 below for the definitions of the variables.

**TABLE A1: SURVEY QUESTIONS USED FOR THE CONSTRUCTION OF THE BINARY WORK ACTIVITY VARIABLES**

Variable	Survey questions
Learning new things (LEARN)	Generally, does your main paid job involve, or not, learning new things?
Employee problem-solving (PBSOLV)	Generally, does your main paid job involve, or not, solving unforeseen problems on your own?
Task Complexity (COMPLX)	Generally, does your main paid job involve, or not, complex tasks?
Using one's own ideas in work (IDEAS)	Are you almost always or often able to apply your own ideas in your work?
Discretion in fixing work methods (AUTOMET)	Are you able, or not, to choose or change your methods of work?
Discretion in fixing the order of one's tasks (AUTORD)	Are you able, or not, to choose or change your order of tasks?

**SOURCE:** Agnès Parent-Thirion, et al., 2007, pp. 109–134.