Qual Quant (2015) 49:349–363
DOI 10.1007/s11135-014-9990-1

The quality of work in public universities with no-parametric statistical models

Benedetto Torrisi

Published online: 23 January 2014

Abstract The existing studies investigating well-being in public universities indicate that there are unresolved issues: how does one measure the quality of work and the quality of the organisation in the university sector? What is the quality of life for Italian researchers in the workplace? What information can provide results in terms of suggesting new governance structures? The aim of this study is to answer these questions using a sample survey and the results obtained from the PIR 2012 project, "Productivity of Italian Researchers". The information is obtained from micro data at a highly specific level and represents a first step toward an in-depth examination of an issue that is related more to theory than to empirical analysis. This objective was achieved through multivariate statistical models that determine the relationship between the quality of work, the quality of the organisation and governance policies.

Keywords Quality in academic work · Quality in organisational work · Quality Academic Score

1 Introduction

This paper represents an attempt to assess the quality perceived in an academic workplace as a mixture between organisational well-being, size and workload.

Well-being is an expression of a condition that creates benefits and perceptions of quality. In the context of this analysis, to study well-being as an expression of quality is one of the

The data base and the empirical research project, including data collecting and data processing, are the work of Benedetto Torrisi (StatEcon—Area of Economic Statistics, University of Catania), author and principal investigator of the project PIR "Productivity Italian Researchers" and "Italian Academic Potential Brain Drain". Inglish language text audited and corrected by Elsevier Language Service.

B. Torrisi (✉)
Economics and Business Department, Catania University,
c.so Italia 55, 95129 Catania, Italy
e-mail: btorrisi@unict.it

phenomena on which the estimates are formulated, indicators are developed and variables are selected. Attempts to measure the macro dimensional identity of well-being are numerous.

Academia have been unable to establish a clear and simple quantification of the concept of well-being, as it is a complex mix of relationships due to its structure, its policies with respect to governance, and its visions, which are apparently aimed at productivity. Nonetheless, well-being may be the key to the organisational environment as well as to the quality of the organisation as perceived by its staff.

Quality, in the context of the organisation's well-being, is synonymous with high levels of organisation and adequate workloads or levels of engagement, which represent the worker's propensity to be present in the organisation. Being present, in this sense, means following and acting in the best interests of the organisation with attraction (or force), dedication (DE) and enthusiasm [or absorption (AB); Schaufeli and Bakker 2003).

Accordingly, the perceived quality, with respect to academic circles, is a mixture of multi-dimensional aspects of organisational and working commitments.

The purpose of this paper is to provide a quantitative analysis of the quality of the academic environment as assessed through two dimensions: the organisational well-being and the level of engagement. To accomplish this, a survey was administered to 2,738 respondents from 26 Italian public universities as part of a research project, titled "Productivity Italian researchers" (PIR) in year 2012.

The PIR project questioned respondents on the following aspects: A: family and academic context (to discover the relationship between academic productivity and family influence), B: academic work times and network relationships, C: scientific production, D: teaching productivity, E: work environment satisfaction, and F: work and well-being survey (UWES—Utrecht Work Engagement Scale). The variables used in this paper were extracted from specific items in Parts A, E and F of the PIR 2012 project.

2 Scientific studies

The study of Henry De Man (in the 1920s) focuses on feelings toward work. As a result of this study, it was possible to identify factors that contribute to feelings of joy in the work environment (elementary instinctive motives, occasional favourable feelings of societal obligations) and factors that present obstacles to experiencing joy at work (technical, internal company issues, issues external to the company).

Following De Man's work (1931), and along with the discovery of the human factor by Elton Mayo, is a series of studies that focus on finding satisfaction and job dissatisfaction (Accornero 1992, 1999, 2000). Over time, there have been studies that analysed the multidimensionality of job satisfaction dependent on individual and social factors, including relationships with colleagues, as well as cultural, environmental and organisational influences (Torrisi 2012).

Each dimension generates an effect on the quality as perceived by the individual workers in the workplace (Weiss et al. 1967), and the mixture of these aspects generates internal, environmental and general impacts. Thus, there is the creating of an overall cause and effect on the lives of individual workers (Torrisi 2012).

The results of this study lead to a better understanding of the quality, as perceived in the workplace, to be a mixture of multi-dimensional job satisfaction, the organisational system as a whole, and the extent of engagement (or commitment) on the part of the worker.

The measure of engagement (work commitment) represents one of the last scenarios of the assessment of organisational well-being. It is the worker's propensity to be fully present in

the organisation and the willingness of individual to adhere to and support the interests of the organisation, as demonstrated through feelings of attraction, commitment and enthusiasm.

3 Sampling and data

3.1 The survey instrument

We use a questionnaire as the instrument of our investigation. The questionnaire was constructed to achieve the goals proposed by the PIR project—"The Productivity of Italian Researchers" and "Potential Academic Italian Brain Drain". The goal of the PIR is to understand and evaluate the "academic productivity correlated with well-being at work and propensity and motivation to emigrate or remain in Italy".

3.2 Sampling and the data set model

A statistical sampling model cannot be adopted because there is not a dataset of direct contacts for the academic population in Italy, which consists of 71,000 academics, including full professors, associates, researchers, PhDs, and post-docs. Conversely, the existence of a structured database of contacts for stages of the population (universities scientific-disciplinary areas–academic roles) would lead to a three-stage random sampling.

Accordingly, the survey model used was as follows:

- In 2011, we invited all of the rectors of Italian public universities to authorise the online distribution of the questionnaire to the mailing list of their university.
- Of 83 Italian universities, 26 supported the initiative (and authorised the online distribution of the questionnaire), 6 universities declined to of the Italian universities, 31 % agreed to participate in the research project.
- Over a 3-month period in 2012, we received responses from 2,738 anonymous academics who were members of those universities that disseminated the questionnaire. The questionnaires were delivered via computer the researchers of the universities participating in the project. The researchers were invited to participate in the compilation of the questionnaire. The anonymity and free participation of researchers guaranteed a random sample.

While there was no selection sampling, the anonymity of the questionnaire assured that the participation of the interviewees was random, thereby overcoming the problems of self-selection.

Of the 71,808 individuals in the academic Italian population (see Table 1; including PhD students, contractors, researchers, and ordinary members), 2,738 academics responded. Missing or inconsistent responses reduced the sample to 1,474 units (see Table 1). Thus, we based our elaboration on this sample.

The sample size was determined by the level of adherence to the questionnaire. The results of the χ^2 test run for the difference between two or more proportions (sample and population, SDA and academic role) were satisfactory, and the associated p-values are reported in Table 1 (not p-values <0.01 are not significant). The results of the test indicate that because most of the differences are not significant, the results of the sample are representative of the population ($1 - \alpha = 99\,\%$).

A non-parametric test was also conducted among more than two proportions, and the results of the test were not significant. This confirms that there is no significant difference

Table 1 Academic Italian population (N) in different roles

Italian SDA classification	N (population) n (sample) p (run test)	Total	Full professor	Associate professor	Researcher confirmed and not	Researcher a term	Post doc
Area 01: Mathematical and Computer Sciences	N	3,680	882	945	1,254	80	519
	n	165	22	22	52	1	68
	p-value	0.000	0.002	0.000	0.497*	0.170*	0.000
Area 02: Physical Sciences	N	3,020	517	746	868	95	794
	n	64	11	13	22	0	18
	p-value	0.796*	0.989*	0.420*	0.325*	0.150*	0.742*
Area 03: Chemical Sciences	N	3,880	624	889	1,308	87	972
	n	111	24	20	36	2	29
	p-value	0.000	0.119*	0.225*	0.779*	0.757*	0.797*
Area 04: Earth Sciences	N	1,404	228	337	455	34	350
	n	33	6	9	9	0	9
	p-value	0.437*	0.765*	0.664*	0.533*	0.366*	0.759*
Area 05: Biological Sciences	N	6,546	1,095	1,289	2,279	176	1,707
	n	171	27	22	48	0	74
	p-value	0.001	0.745*	0.026*	0.067*	0.030*	0.000
Area 06: Medical Sciences	N	11,951	2,031	2,755	4,777	271	2,117
	n	170	13	35	69	0	53
	p-value	0.000	0.001	0.449*	0.871*	0.047*	0.000
Area 07: Agricultural and Veterinary Sciences	N	4,119	745	868	1,330	81	1,095
	n	74	18	14	29	0	13
	p-value	0.242*	0.168*	0.652*	0.209*	0.223*	0.081*
Area 08: Civil Engineering and Architecture	N	4,623	885	1,051	1,475	146	1,066
	n	67	7	11	22	1	26
	p-value	0.003	0.072*	0.220*	0.871*	0.437*	0.002

Table 1 continued

Italian SDA classification	*N* (population) *n* (sample) *p* (run test)	Total	Full professor	Associate professor	Researcher confirmed and not	Researcher a term	Post doc
Area 09: Industrial and Computer Engineering	*N*	8,245	1,493	1,515	1,951	322	2,964
	n	189	27	31	57	2	72
	p-value	0.110*	0.176*	0.488*	0.038*	0.044*	0.543*
Area 10: Antiquities, Philological, Literary, Historical and Artistic	*N*	5,907	1,306	1,508	2,180	178	735
	n	108	11	25	28	0	44
	p-value	0.213*	0.003	0.574*	0.019*	0.067*	0.000
Area 11: Historical, Philosophical, Pedagogical and Psychological	*N*	5,605	1,308	1,321	1,935	194	847
	n	74	12	15	27	0	20
	p-value	0.000	0.150*	0.506*	0.724*	0.103*	0.005
Area 12: Legal Studies	*N*	5,303	1,532	1,118	1,966	160	527
	n	58	15	12	18	0	13
	p-value	0.000	0.613*	0.942*	0.343*	0.179*	0.002
Area 13: Economics and Statistics	*N*	5,449	1,466	1,314	1,729	259	681
	n	148	32	22	58	1	35
	p-value	0.000	0.152*	0.01*	0.055*	0.020*	0.000
Area 14: Political and Social Sciences	*N*	2,076	405	465	763	90	353
	n	42	1	8	14	0	19
	p-value	0.925*	0.005	0.606*	0.649	0.168	0.000
Total	*N*	71,808	14,517	16,121	24,270	2,173	14,727
	n	1,474	226	259	489	7	493
	p-value	0.000	0.000	0.000	0.616*	0.000	0.000

Respondents who answered completely (*n*) and *p*-value results by run difference proportion test

Source Torrisi 2013

p-value results by run difference proportion test (* $p < 0.01$ is not significant difference between the proportions of respondents championships and those of the population: $H_0 : \pi_N = \pi_n$; $H_1 : \pi_N \neq \pi_n$)

between the proportions of respondents championships and those of the population (see Table 1; critical value = 69,83, χ^2 test statistic = 3.91, p-value = 0.9878).

4 Material and methods

The variables that we used from the questionnaire are as follows (see Tables 2, 3).

UWES is a questionnaire composed of 17 items (*UWES-17*; *see* Table 4) *that measure the three basic dimensions of work commitment*: *vigour* (*VI*), (*DE*), *and* (*AB*). The three dimensions were calculated as averages of the results obtained from the items pertaining to

Table 2 The socio-economic determinants (Part A PIR): that is, the ability to reconcile professional and private life and personal aspirations with the working environment

Variables	Items	Likert scales
(X_1)	The family burden: "If you have family burden (child care, management of the elderly, nursing home) by a weight to your commitment within the family"	0–10
(X_2)	Free time: "How much free time you have off from work commitments"	0–10
(X_3)	Perception of economic status: "How Do You Rate your current economic condition"	0–10
(X_4)	Perception of safety or job security: "Do You Rate your current condition of job security"	0–10
(X_5)	Inclination to work in Italy: "You think that Italy is the right place for your work?	0–5
(X_6)	Propensity to move abroad: "What is your propensity to abroad?"	0–5

Source Elab. StatEcon Area: year 2013 on data of year 2012

Table 3 Assessment of the satisfaction of the work environment: Part E PIR

Variables	Items	Likert scales
(X_7)	Ratings total of work organization	0–5
(X_8)	Assessment of the appropriateness of the workplace	0–5
(X_9)	Satisfaction about public policy to support research	0–5
(X_{10})	Satisfaction on the adequacy of the administrative system to support your activities	0–5
(X_{11})	Rating on career prospects	0–5
(X_{12})	Evaluation of working hours	0–5
(X_{13})	Rating on relations with colleagues from more senior roles	0–5
(X_{14})	Rating on relationships with peers academic role	0–5
(X_{15})	Assessment of the availability of scientific equipment	0–5
(X_{16})	Rating similarities in work teams	0–5
(X_{17})	Satisfaction of the university bureaucracy	0–5
(X_{18})	Safety assessment (environmental) of the workplace	0–5
(X_{19})	Satisfaction of their salary	0–5
(X_{20})	Satisfaction on the distribution of research funds	0–5
(X_{21})	Job satisfaction or perceived quality in their work	0–5

Source Elab. StatEcon Area: year 2013 on data of year 2012

Table 4 Rating on Work Engagement Scale [vigor (VI)–dedication (DE)–absorption (AB)–UWES-17]: Part F PIR

Variables	Items	Likert scales
VI	1: In my work, I feel full of energy	0–5
DE	2: I find my work full of meaning and objectives	0–5
AB	3: Time flies when working	0–5
VI	4: In my work, I feel strong and vigorous	0–5
DE	5: I am enthusiastic about my job	0–5
AB	6: When I work I forget everything else	0–5
DE	7: My work inspires me	0–5
VI	8: In the morning when I get up, I want to go to work	0–5
AB	9: I'm happy when I work intensively	0–5
DE	10: I am very proud of my work	0–5
AB	11: I am immersed in my work	0–5
VI	12: They are able to work for long periods without stopping	0–5
DE	13: For me, my job is challenging	0–5
AB	14: I let myself get completely when working	0–5
VI	15: In my business, when under pressure, I remarkably resilient mental	0–5
AB	16: Its hard to detach myself from my job	0–5
VI	17: In my work I always persevere even when things do not go well	0–5

Source Elab. StatEcon Area: year 2013 on data of year 2012

each dimension, as follows: VI = the average of the scores for items 1, 4, 8, 12, 15, 17; DE = the average of the scores for items 2, 5, 7, 10, 13; AB = the average of the scores for items 3, 6, 9, 11, 14, 16 (Schaufeli and Bakker 2003). The α scores (Cronbach's α in Koufteros 1999) of the three factors are *VI* ($\alpha = 0.93$), *DE* ($\alpha = 0.94$), *AB* ($\alpha = 0.92$).

All items used Likert scales for 5 or 10 terms.

The areas related to disciplinary Italian (ASD) have been reclassified in accordance with the international classification and can be traced back to the classification of Scopus (see Table 5): *life sciences* (*LS*), *health sciences* (*HS*), *physical sciences* (*PS*), and *social sciences*, *arts and humanities* (*SSH*).

5 Results

The interviewees were academics qualified in various scientific research fields, and they performed different roles within those fields (see Table 6).

Of the subjects, 36.7 % are women. Over 53 % have had experience abroad, and the majority of respondents demonstrate a positive perception of their profession (10.5 % gratifying + 19.7 % very satisfying + 19.9 % excellent).

Most of the participants have family ties, as approximately 53 % have children. These specific researchers contend that children affect their level of productivity at work with over 50 % claiming that productivity is influenced by family ties. Fifty percent of the respondents with families or with family ties assessed their commitment to family to be above average. This result is reflected by their participation in leisure activities such that 69 % have little free

Table 5 The reclassification of disciplinary Italian (ASD) in international Scopus classification

Italian ASD classification	Scopus
Area 01: Mathematical and Computer Sciences	PS
Area 02: Physical Sciences	PS
Area 03: Chemical Sciences	PS
Area 04: Earth Sciences	PS
Area 05: Biological Sciences	LS
Area 06: Medical Sciences	HS
Area 07: Agricultural and Veterinary Sciences	HS
Area 08: Civil Engineering and Architecture	PS
Area 09: Industrial and Computer Engineering	PS
Area 10: Antiquities, Philological, Literary, Historical and Artistic	SSH
Area 11: Historical, Philosophical, Pedagogical and Psychological	SSH
Area 12: Legal Studies	SSH
Area 13: Economics and Statistics	SSH
Area 14: Political and Social Sciences	SSH

Source Elab. StatEcon Area: year 2013 on data of year 2012

Table 6 Distribution of academic roles interviewees

Roles	*n*	Percent
Contracts teaching	17	1.2
PhD	275	18.7
Post doc	201	13.6
Researcher a term	7	0.5
Researcher	356	24.2
Researcher no confirmed	133	9.0
Associate professor	259	17.6
Full professor	226	15.3
Total	1,474	100.0

Source Elab. StatEcon Area: year 2013 on data of year 2012

time, which is high compared to the 8.4 % who struggle to make time for leisure activities, while 1.10 % reported having a significant amount of free time for leisure activities.

Only 4.4 % perceive themselves as wealthy, which is low compared to the 44 % who view their economic status as being intermediate. The rest state that their economic status is below the European average (average salary of an academic in Europe). Despite negative opinions regarding economic conditions, most of the respondents find security in their employment status (approximately 66 %).

While the majority of respondents is aged 50 years or below, there is a certain percentage of older respondents (see Table 7).

Regarding questions about the average amount of time dedicated to work on a daily basis and the amount of time dedicated to network relationships, the following results emerge. The average number of hours devoted to academic work on a daily basis ranges between 6 and 12 h. This time is divided among tasks related to teaching, scientific research and bureaucracy. It seems paradoxical that most interviewees stated that 1–3 h per day on average are spent on bureaucratic tasks. This fact explains the various components

Table 7 Distribution of academic interviewee age

Age in class	*N*	Percent
24–30	205	13.9
30–35	301	20.4
35–40	256	17.4
40–45	196	13.3
45–50	191	13.0
50–55	135	9.16
55–60	79	5.36
>60	111	7.53
Total	1,474	100.00

Source Elab. StatEcon Area: year 2013 on data of year 2012

Table 8 Distribution of academic interviewee in relation of Scopus scientific sectors

Roles	Scopus scientific sectors				Total (%)
	HS (%)	LS (%)	PS (%)	SSH (%)	
Post doc	9.90	18.70	46.20	25.20	100.00
Researcher	8.50	18.50	43.30	29.60	100.00
Associate professor	10.40	11.20	44.40	34.00	100.00
Full professor	11.90	14.20	37.20	36.70	100.00
Total	9.80	16.60	43.60	30.00	100.00

Source Elab. StatEcon Area: year 2013 on data of year 2012

of the academic load, which confirm our theory of departure (academic productivity as a combination of the various multilateral components: scientific, teaching, external, and bureaucratic).

Full questionnaire replies were in 1,474 respondents: 496 researchers, 493 post-doc, 259 and 226 ordinary members. 44.4 % belong to the sectors PS, 34 % SSH, 11.2–10.4 % LS and HS. This distribution remains almost constant in the different academic positions (see Table 8).

These were mainly respondents under the age of 55 years, mainly with family burden (i.e. children) and with a slight predominance of men over women. Nearly 53 % belong to the universities of northern Italy, with 35 % working in the south, and the rest working in the centre.

While the respondents (see Table 9) state that the average weight of family responsibilities (X_1) with respect to work represents the norm, this result is, on average, differs significantly among the various roles (ANOVA p-value = 0.000 between the roles) and is dependent on roles (p-value χ^2 test of dependency = 0.000). This trend is also reflected in the perceptions of economic status (X_3), as the respondents are "almost sure" of the security of their employment (X_4).

To assess the possible conciliation between professional life and private life, we asked the four groups to express their views on certain issues that were presented in the form of closed questions (with responses ranging from 0 to 5). Several interesting observations regarding the groups were revealed when comparing the average scores.

Table 9 Average levels and results of the ANOVA test and χ^2 test between the academic roles

Items	Mean	*p*-value ANOVA test between the academic roles	*p*-value χ^2 test between the academic roles and items
(X_1)	2.39 (Normal)	0.000	0.000
(X_2)	2.06 (Normal)	0.430	0.021
(X_3)	2.40 (Normal)	0.000	0.000
(X_4)	2.83 (Almost security)	0.000	0.000
(X_5)	1.39 (Short)	0.000	0.000
(X_6)	2.02 (I think)	0.000	0.000

Source Elab. StatEcon Area: year 2013 on data of year 2012

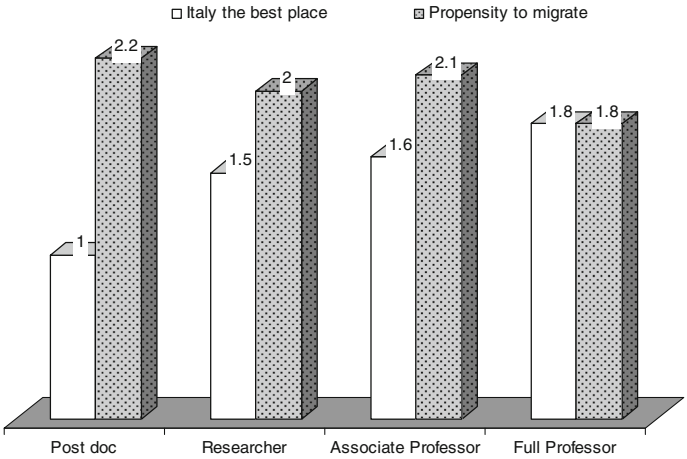

Fig. 1 Average levels between X_5, X_6 and academic role. *Source* Elab. StatEcon Area—year 2013 on data of year 2012

The first observation is related to the sense of job security (X_4). The results indicate that the higher the academic position, the higher the average level of job security. The results are as follows: post-doc = 1.43, researchers = 3.26, associate professors = 3.64, full professors = 3.89). However, these results do not transfer to the current degree of satisfaction with perceived relative economic status, the factor exhibiting the lowest average scores, thus suggesting dissatisfaction relative to the economic status. The scores are as follows: (X_3) (post-doc = 2.09, researchers = 2.37, associate professors = 2.62, full professors = 2.88).

There is evidence that Italy is not the right place (X_5) for our researchers (the evaluation is low, short right =). The level of dissatisfaction increases as the academic position of the respondent increases. Thoughts of emigrating (X_6) ("on average, I think about migrating") decrease in relation to the subject's role (see Fig. 1). These trends appear among employees and among different roles (see Table 9).

5.1 Environmental and organisational determinants

The results of low or sufficient perception of most of the items leads to the conclusion that the organisational structure is deemed unsatisfactory (see Table 10).

Table 10 Average levels and ANOVA test results between academic positions on environmental and organizational determinants

Items	Mean	*p*-value ANOVA test between academic positions
(X_7)	Sufficient	0.130
(X_8)	Sufficient	0.079
(X_9)	Low	0.002
(X_{10})	Low	0.002
(X_{11})	Low	0.000
(X_{12})	Sufficient	0.000
(X_{13})	Sufficient	0.184
(X_{14})	More than sufficient	0.007
(X_{15})	Sufficient	0.089
(X_{16})	Sufficient	0.177
(X_{17})	Low	0.008
(X_{18})	Sufficient	0.040
(X_{19})	Low	0.000
(X_{20})	Low	0.122
(X_{21})	Sufficient	0.044

Source Elab. StatEcon Area: year 2013 on data of year 2012

If we compare the average results of the levels of engagement detected among Italian researchers with the standards of normality based on the UWES-17, we find that the three levels are normal. While the mean scores for work engagement, as determined for the four academic positions investigated in this study, are similar to each other, they are significantly different, as determined by ANOVA with $p < 0.05$ and higher mean scores for the normative UWES-17 (see Fig. 2).

There is no significant difference in mean levels of engagement with respect to geographical areas. This result is representative of a load situation and participation in work that is equivalent from northern to southern Italy (see Table 11).

5.2 The relationship between job satisfaction and socio-economic variables, organisational variables and work engagement

Table 12 shows the statistically significant (p-value <0.05) relationships between job satisfaction and specific variables, such as socio-economic variables, organisational variables and work engagement.

5.3 Econometric model

The extent of the impact of the variables that identify the perception of quality in the academic organisational environment regarding the level of satisfaction of the academics with the organisation as a whole in relation to the three levels of engagement was estimated using multiple stepwise regression models.

These models, estimated for the four academic positions, provide a representation of what variables are predictors of perceptions of the quality of work and the quality of the organisation in academia. In particular, we obtained the following stepwise regression models.

For *post-doctoral* work, the quality or level of job satisfaction (X_{21}) depends on positive relationships with colleagues from blackberries senior roles (X_{13}), on their level of satisfac-

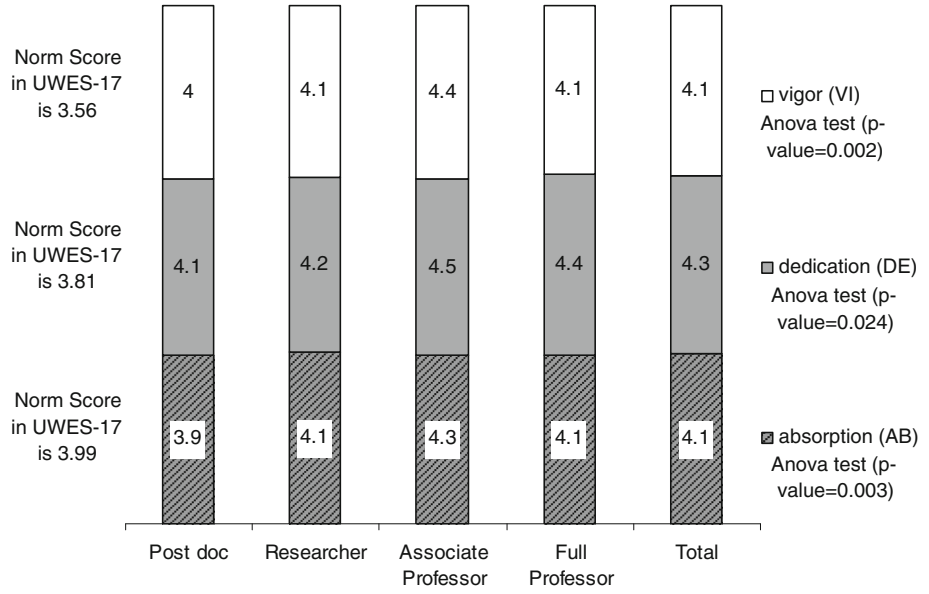

Fig. 2 Mean scores between the roles of academics, compared with normal UWES score of 17 and the results of the *p*-value test all'ANOVA. *Source* Elab. StatEcon Area—year 2013 on data of year 2012

Table 11 Average levels of VI, DE, AB between geographical areas

	VI	DE	AB	Total_UWES
Sud	4.156	4.202	4.079	4.145
Centro	4.249	4.544	4.303	4.361
Nord	4.059	4.244	4.003	4.101
Total	4.117	4.268	4.068	4.149
ANOVA *F*	1.700797	3.7956	3.349	2.7429
p-value	0.182897	0.0227	0.0354	0.0647

Source Elab. StatEcon Area: year 2013 on data of year 2012

tion with the distribution of research funds (X_{20}), on their level of DE, on their relationships with peers in academic roles (X_{14}), on their amount of free time (X_2) and on their level of satisfaction with their salary (X_{19});

$$(X_{21})_{\text{Post doc}} = 0.195 + 0.142\,(X_{13}) + 0.216\,(X_{20}) + 0.213\text{DE} + 0.160\,(X_5) + 0.173\,(X_{14}) - 0.107\,(X_2) + 0.121\,(X_{19})\,.$$

($R^2 = 0.717$, $R^2_{\text{Adjusted}} = 0.497$, F test $= 29.16$, p-value $= 0.000$. Based on t-tests, all parameters are statistically significant, demonstrating a p-value of <0.05).

With respect to *researchers*, the quality of work (X_{21}) increases with the total ratings of the work organisation (X_7) increase, with the feeling that Italy represents the most suitable country for them (X_5), with the belief that they have strong relations with senior colleagues senior roles (X_{13}), with their level of DE, with their degree of satisfaction with their salary (X_{19}) and with the level of affinity with their team (X_{16}).

$$(X_{21})_{\text{Researcher}} = 0.398 + 0.285\,(X_7) + 0.194\,(X_5) + 0.160\,(X_{13}) + 0.158\text{DE} + 0.146\,(X_{19}) + 0.116\,(X_{16})\,.$$

Table 12 Kendall's tau_b between X_{21} and other variables

	(X_{21})		(X_{21})
(X_1)	−0.077**	(X_{10})	0.217**
(X_2)	0.086**	(X_{11})	0.287**
(X_3)	0.197**	(X_{12})	0.232**
(X_4)	0.184**	(X_{13})	0.377**
(X_5)	0.409**	(X_{14})	0.302**
(X_6)	−0.168**	(X_{15})	0.261**
VI	0.151**	(X_{16})	0.276**
DE	0.276**	(X_{17})	0.197**
AB	0.123**	(X_{18})	0.235**
(X_7)	0.417**	(X_{19})	0.339**
(X_8)	0.257**	(X_{20})	0.279**
(X_9)	0.215**	(X_5)	0.409**
		(X_6)	−0.168**

Source Elab. StatEcon Area: year 2013 on data of year 2012
** p-value < 0.05

($R = 0.654$, $R^2_{\text{Adjusted}} = 0.417$, F test $= 41.71$, p-value $= 0.000$. Based on t-tests, all parameters are statistically significant, demonstrating a p-value of <0.05).

With respect to *associate professors*, the quality of work increases with the perception that Italy represents the most suitable country for them (X_5), with the belief that they have strong relationships with colleagues in more senior roles (X_{13}), with the total ratings of the work organisation (X_7), with their level of satisfaction with their salary (X_{19}), and their degree of DE.

$$(X_{21})_{\text{Associate professor}} = 0.336 + 0.304\,(X_5) + 0.254\,(X_{13}) + 0.247\,(X_7) + 0.199\,(X_{19}) + 0.219\text{DE}.$$

($R = 0.706$, $R^2_{\text{Adjusted}} = 0.485$, F test $= 37.18$, p-value $= 0.000$. Based on t-tests, all parameters are statistically significant, demonstrating a p-value of <0.05).

For *full professors*, the quality of work increases with the perception that Italy represents the most suitable country for them (X_5), with the total ratings of the work organisation (X_7), with their level of satisfaction with their salaries (X_{19}), with their level of DE, with the levels of relationships with peers and their academic roles (X_{14}) and with the affinity of teamwork (X_{15}).

$$(X_{21})_{\text{Full professor}} = 0.403 + 0.323\,(X_7) + 0.191\,(X_{19}) + 0.140\,(X_{14}) + 0.139\,(X_5) + 0.151\,(X_{15}) + 0.113\text{DE}.$$

($R = 0.688$, $R^2_{\text{Adjusted}} = 0.454$, F test $= 23.87$, p-value $= 0.000$. Based on $t$tests, all parameters are statistically significant, demonstrating a p-value of <0.05).

The generalised ordinal regression model with probit algorithm generated the following significant results (see Table 13).

Overall, and independent from the academic role, the quality of work in academia in Italy depends significantly on certain factors. Based on the model, it is evidenced that the perception of quality in the academic work environment (X_{21}) decreases by:

- High perceptions of economic status (X_3; the greater the state of economic welfare X_3);
- Perceptions of job insecurity over job security (X_4);
- Dissatisfaction with Italy (X_5);

Table 13 Probit in ordinal regression model: variable dependent (X_{21})

	Estimates	*p*-value		Estimates	*p*-value
$[(X_3) = 0.00]$	−15.597	0.000	$[(X_{13}) = 0.00]$	−1.236	0.001
$[(X_3) = 1.00]$	−16.789	0.000	$[(X_{13}) = 1.00]$	−1.106	0.001
$[(X_3) = 2.00]$	−16.135	0.000	$[(X_{13}) = 2.00]$	−0.735	0.010
$[(X_3) = 3.00]$	−16.089	0.000	$[(X_{13}) = 3.00]$	−0.555	0.033
$[(X_4) = 0.00]$	−0.927	0.030	$[(X_{14}) = 0.00]$	−1.675	0.002
$[(X_4) = 1.00]$	−1.065	0.004	$[(X_{16}) = 1.00]$	−0.842	0.010
$[(X_5) = 0.00]$	−2.515	0.000	$[(X_{16}) = 2.00]$	−0.653	0.035
$[(X_5) = 1.00]$	−1.815	0.006	$[(X_{18}) = 0.00]$	−1.007	0.007
$[(X_7) = 0.00]$	−3.442	0.000	[DE = 1.00]	−4.24	0.000
$[(X_7) = 1.00]$	−1.99	0.000	[DE = 2.00]	−2.495	0.000
$[(X_7) = 2.00]$	−1.383	0.007	[DE = 3.00]	−1.221	0.000
$[(X_{12}) = 2.00]$	−0.513	0.041	[DE = 4.00]	−0.703	0.009
$[(X_{12}) = 3.00]$	−0.566	0.017	[AB = 1.00]	3.342	0.001

Model fitting information

Model	−2 Log likelihood	χ^2	df	*p*-value
Intercept only	2,499.688			
Final	1,793.735	705.953	96	0.000
Link function: logit				

Pseudo R^2

Cox and Snell	0.534
Nagelkerke	0.572
McFadden	0.282
Link function: logit	

Source Elab. StatEcon Area: year 2013 on data of year 2012

- Low levels of academic quality in the organisation itself (X_7);
- Dissatisfaction with work schedules (X_{12});
- Dissatisfaction with relationships with colleagues, particularly senior colleagues (X_{13});
- Dissatisfaction with relationships with peers and their academic roles (X_{14});
- Low satisfaction with team relationships (X_{16});
- Environmental insecurity in the workplace (X_{18});
- Low levels of dedication DE;
- High perceptions of labour absorption AB.

6 Conclusions

Italian researchers exhibited a normal family burden according to their high levels of engagement and the satisfactory assessment of the work organisation but only in their own sphere of action. Overall, the researchers in this study gave unsatisfactory marks to everything that revolved around their personal scope of employment, such as policies, support, funds for research, and quality of academic bureaucracy. The researchers demonstrate, however,

a work commitment above the international average, as assessed by the *UWES*-17, which suggests a high state of VI, DE and AB in their work. Conversely, this translates to a low quality of life (lack of leisure and family time).

In Italy, the quality of work in academia depends mainly on the academics perceived level of satisfaction with their salary, job security, academic quality of the organisation, satisfaction with peers and their academic roles, satisfaction with team relationships and AB in their jobs.

The Italian academic environment must improve its well-being by creating a lean organisation and work procedures, developing a functional and integrated research climate and harmony among academics from all levels. Where there is an atmosphere of well-being, the work environment is perceived as welcoming, and challenging. Accordingly, it exudes an atmosphere of quality and is perceived as an attractive migration (with the best indicators in engagement).

Conversely, where the perceptions tend toward zero or toward low levels, a mediocre work climate that lacks stimulation is viewed as unattractive and as offering a poor quality of life, thereby rendering it unable to draw international attention.

These are the first results on which to begin to reflect and solicit further details.

References

Accornero, A.: In: il Mulino (ed.) La parabola del sindacato (1992)
Accornero, A.: In: Laterza (ed.) Lùltimo tabù. Lavorare con meno vincoli e più responsabilità (1999)
Accornero, A.: In: il Mulino, B. (ed.) Era il secolo del lavoro (2000)
De Man, H.: In: La Terza, B. (ed.) La gioia nel lavoro (1931)
Koufteros, X.A.: Testing a model of pull production: a paradigm for manufacturing research using structural equation modeling. J. Oper. Manag. **17**, 467–488 (1999)
Schaufeli, W.B., Bakker, A.B.: Test Manual for the Utrecht Work Engagement Scale. Utrecht University, Utrecht (2003)
Torrisi, B.: Academic productivity correlated with well-being at work. Scientometrics **80**, 1–17 (2012)
Torrisi, B.: A multidimensional approach to academic productivity. Scientometrics (2013). doi:10.1007/s11192-013-1149-7
Weiss, D.J., Dawis, V., Lofquist, L.H.: Manual for the Minnesota Satisfaction Questionnaire. University of Minnesota, Minneapolis (1967)