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Topic 2: Measuring the dimensions of quality of work with statistical indicators: current national experiences, relevance and usability of the proposed set of statistical indicators and sources of data collection

QUALITY OF EMPLOYMENT: AN EMPIRICAL APPROACH FOR THE CHOICE OF INDICATORS

Invited paper submitted by ISTAT*

I. OVERVIEW

1. Quality of work assumes great relevance in most countries of the world. Monitoring and measuring its aspects is becoming even more relavant in these years of deep economic and social changes and fast evolution of labour market conditions, which involve mainly developing countries but reflect also on advanced economies.

2. Up to now different qualitative aspects of work have generally been measured separately[1]. Neverthless, there are several attemps to wrap them up in a general conceptual framework, among which the most relevant are the ones by the ILO, the European Union and the European Foundation for the Improvement of Living and Working Conditions. Of course each proposal reflects the interests of the proposing institution. The ILO *Decent work* framework reflects ILO four strategic objectives: employment, the promotion of rights at work, social protection and social dia logue; similarly, the European Union *Quality of work* framework descends from the Social Policy Agenda

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[1] For instance the EU-LFS, just to mention the main statistical source on labour market in Europe, has a long experience in collecting information about labour market opportunities and working conditions (working time arrangements, temporay/permanent employment, etc.). Recently the EU-LFS has been enriched with new variables related to quality of work, among which is wages of employees. Other aspects of quality of work are furthermore surveyed through ad hoc modules.

of the European Union, which includes the promotion of quality of work as one of its guiding principles[2]. In spite of the inevitable differences among frameworks, comparative works[3] have highlighted outstanding similarities, which may provide the basis for the development of an international standard in the measurement of quality of work.

3. At this purpose, in 2006 a Task Force on the Measurement of Quality of Work was created, including members from ILO, European Commission, OECD, UNECE, European Foundation for the Improvement of Living and Working Conditions, Canada, Hungary and Italy. A paper reporting first results of its work is being presented at this Joint UNECE/EUROSTAT/ILO Seminar on the Quality of Work[4]. The main proposal consists in a multidimensional *Quality of Employment* paradigm, embedding both ILO and EU frameworks and which is equally relevant for differently developped economies.

II. DESCRIPTION OF THE APPROACH

4. The choice of indicators to fill in the conceptual framework is of course a matter of great importance. A great deal of topics and indicators have been proposed in time. On the other hand, there is a general agreement on the idea that they should be in limited number (say about 20). In spite previous discussion on decent work has brought to progressive refining, for each area a great number of equally relevant indicators may still be considered. In addition to this, indicators for the same topics may be calculated in several ways.

5. Then, how to make a choice among items conceptually equally relevant which does not rely exclusively on theoretical reflections? This paper proposes to include among selection criteria the capacity of indicators to highlight differences among countries. At this purpose we follow an empirical approach. Referring only to topics related to the "Employment" pillar of the *Quality of employment* paradigm[5], we examine the performance of several indicators by using Principal Components Analysis (PCA)[6].

6. Our simulation uses only Italian national data broken down by Nuts 2 areas (Regions). As a matter of facts, Italian regional economies and labour markets present deep differences – in terms of GDP per capita, sectorial specialization, labour market participation, job opportunities, working conditions, etc. – which go over the main and usually mentioned North/South divide. In our exercise the 21 Italian regions are therefore considered as if they were different countries.

7. For each region we have built and tested 33 variables referring to 22 different indicators related to the Employment dimension. Variables are more than indicators because indicators are often generic and leave room for manifold variables. In these cases we've calculated more than one variable for a same indicator in order to choose the one which better fulfils our goal. Most of indicators and variables come from the proposal of the Task Force on the Measurement of Quality of Work, which in their turn are mostly derived from the ILO *Decent work* and EU *Quality of work*

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[2] International Labour Organization, *Decent work: Report of the Director-General. International Labour Conference*, 87th Session, ILO, Geneva, 1999. Lozano, E., *Quality in work: Dimensions and Indicators in the Framework of the European Employment Strategy*, UNECE/ILO/Eurostat Seminar on the Quality of Work, Geneva, May 11 to 13, 2005.

[3] Chernyshev, I., *Towards an international quality of employment framework: conceptual paper of the task force on the measurement of quality of work*, Working Paper No 1. Joint UNECE/ILO/EUROSTAT Seminar on the Quality of Work. Geneva, 18-20 April 2007

[4] Ibid.

[5] Ibid.

[6] PCA is a method for reducing the dimensionality of a set of correlated continuous variables in few components that are derived in order to importance in term of proportion of variance explained. Details on PCA can be found in Cattel, R. B., 1978, The Scientific Use of Factor Analysis in Behavioural and Life Sciences, Plenum Press, New York..

frameworks. We also tested a few more variables which may be of great relevance in the measurement of quality of work and which were proposed during the Task Force discussion[7]. The full list of indicators and variables we considered is shown in table 1. Following international recommendations, they are practical, simple and produced from data programs common in many countries[8]. As a matter of facts, we obtained them from the Labour Force Survey, except four (specifically Labour productivity, Real per capita earnings of employees, Real per capita GDP, % informal employment) coming from National accounts.

Table 1 – List of indicators and variables

Indicators	Variables	Formulas
Labour force partecipation rate	Labour force participation rate (15-64)	% labour force 15-64 /population 15-64
Employment to population ratio	Employment to population ratio (15-64)	% employment 15-64 /population 15-64
Temporary employment	% temporary employees	% of employees with temporary jobs / total employees
Temporary employment	% temporary employment	% of employees with temporary jobs or parasubordinate workers/ total employment
No longer employed because temporary contract ended	% no longer employed because temporary contract ended	% people no longer in employment for temporary job /total people no longer in employment
No longer employed because temporary contract ended	% no longer employed because temporary contract ended and unemployed	% people no longer in employment for temporary job and unemployed/total people no longer in employment and unemployed
No longer employed because temporary contract ended	% no longer employed because temporary contract ended and in search and/or available	% people no longer in employment for temporary job and in search or available/total people no longer in employment and in search or available
Total unemploym ent rate	Unemployment rate	% unemployment / labour force
Unemployment rate by level of education	Unemployment rate - Isced 0-2	% unemployment Isced 0-2/ labour force Isced 0-2
Unemployment rate by level of education	Unemployment rate - Isced 3-4	% unemployment Isced 3-4/ labour force Isced 3-4
Unemployment rate by level of education	Unemployment rate - Isced 5-6	% unemployement Isced 5-6/ labour force Isced 5-6
Long-term unemployment rate	Long-term unemployment rate	% people unemployed for one year or more / labour force
Youth unemployment	Youth unemployment rate	% unemployment 15-24/ labour force 15-24
Youth unemployment	Youth share of unemployment	% unemployment 15-24 / total unemployment
Youth inactivity rate	Youth inactivity rate	% people not in labour force 15-24 / population 15-24
Youth inactivity rate	Youth inactivity rate (except students)	% people not in labour force 15-24 (except students)/population 15-24 (except students)
Time-related underemployment	% time-related underemployment	% time-related underemployed/total employment
Excessive hours of work	Eccessive hours of work	% employment working 49 hours or more per week /total employment
Excessive hours of work	Eccessive hours of work of employees	% employees working 49 hours or more per week /total employees
Excessive hours of work	Eccessive hours of work of self-employeed	% self-employment working 49 hours or more per week /total self-employment
Share of involuntary part-time	% employment usually working part-time for involuntary reasons	% people usually working part-time for involuntarily reasons / total part-time employment
Share of wage employment in non-agricultural employment	% employment in non-agricultural industries	% employment in non-agricultural industries / total employment
Share of wage employment in non-agricultural employment	% employees in non-agricultural industries	% employees in non-agricultural industries/total employees
Share of self-employed workers in total employment	% self-employed on total employment	% self-employment/total employment
Share of high-skilled employment	% employment in high-skilled	% employment in occupation ISCO88 1-2-3 /total employment

[7] Bowlby, Geoff., Toward an International Quality of Work Framework: A report to the Task Force on the Measurement of Quality of Work. Mimeographed. Statistics Canada, Ottawa, September 2006. Massarelli, N., Pintaldi, F, Comments on the Toward an International Quality of Work Framework: A report to the Task Force on the Measurement of Quality of Work by Geoff Bowlby, Statistics Canada. Mimeographed. National Institute of Statistics of Italy (ISTAT), October 2006.

[8] Ibid.

	occupations (ISCO 1-3)	
Share of high-skilled employment	% employment in high-skilled occupations (ISCO 2-3)	% employment in occupation ISCO88 2-3 /total employment
Overeduction	% overeducated employment	% employment with high level of education (ISCED 5-6) and working in not-skilled occupations (ISCO88 4-9)/total employment with high level of education (ISCED 5-6)
Inadequate pay rate	Inadequate pay rate	% of employees below 1/2 median hourly earnings
Wages	Ratio temporary/permanent workers wage	Average wage of temporary employees / average wage of permanent employees
Labour productivity	Labour productivity	Added value/full-time equivalent units
Real per capita earnings	Real per capita earnings of employees	Total real earnings of employees / full-time equivalent employees
Real per capita GDP	Real per capita GDP	Total real GDP / total labour units
Informal employment	% informal employment	Irregular full-time equivalent units/Total full-time equivalent units

8. Among "new" indicators we tested there are a few concerning being no longer in employment because a temporary contract ended. Fixed-term contracts have indeed several disadvantages with respect to permanent contracts. The most relevant probably concerns the event to be no longer employed at the end of the contract. As a consequence, the quality of temporary contracts is related to the probability they'll end up in unemployment. Another important issue of quality of work concerns overeducation, meaning the share of highly educated people working in occupations requiring lower qualification. Overeducation indicates mismatch between demand and supply of skilled employment. In particular, it is directly related to the number of persons with university degree and inversely related to the demand for skilled employment. Overeducation reveals waste of human capital for the economic system as a whole, whereas from an individual perspective it would presumably turns into job dissatisfaction[9].

9. As pointed out above, for a few indicators we considered more than one variable. In the case of *temporary employment*, for instance, we calculated both the incidence of temporary wage employment on total employees, which is the measure usually adopted at EU level, and the one of all kinds of temporary employment (i.e. including parasubordinate work) on total employment. We also tested two different *youth inactivity rates*, one including all persons aged 15 to 24 not in labour force, the other excluding students. As we see it, students should not be considered inactive because they're investing on their future. Should students be included among inactive, by the youth inactivity rate countries with better educational systems, where young people study more and get higher education would get a lower score. As far as *excessive hours of work* topic is concerned, we considered three groups: employees, self-employed and total employment. As a matter of facts, implications of long working times on quality of work are different for employees and self-employed. Working time is usually a given constraint for employees, whereas self-employed can adapt it to their needs, at least to some extent. This means that long working times usually are imposed to employees, on the contrary being their own choice for self-employed[10].

III. ANALYSIS AND MAIN RESULTS

10. In order to select the most effective indicators and variables representing the "Employment" dimension of the Quality of employment framework we used PCA. In addition to this, PCA allows to

[9] Sloane P., Battu H., & Seaman P. T., *Overeducation, Undereducation and the British Labour Market*. Discussion Paper No 9. Aberdeen: University of Aberdeen, Dept. of Economics, 1995. Groot, W., van der Brink, H.M., *Overeducation in the labor market: a metaanalysis*, Economics of Education Review, vol. 19, 2000.

[10] Furthermore, for self-employed distinction between working time and personal life may be not clearly defined. Self-employed tend in fact to say they're always working, for they continuously think of their business. As a consequence, a large number of self-employed (over 1 out of 3) says he works more than 48 hours a week. For employees the share is 6.6%.

ascertain to what extent indicators used represent a single underlying dimension (i.e. "Employment"). Starting from the results of this first step, we carried out a second PCA including only a subset of variables. This exercise provides a clearer representation of dimension "Employment", in terms of indicators and variables which fit it best.

11. Preliminary analysis of correlation matrix shows that, in general, our variables are highly correlated. More in detail, correlation among participation rate, employment rate, unemployment rates (total, by Isced groups, long-term, youth), youth inactivity rates, inadequate pay rate, real per capita GDP, incidence of informal employment exceeds in modulus 0.8. On the other hand, these variables show lower correlation with the ones related to working time (i.e. time-related underemployment, excessive hours of work, share of involuntary part-time work), with the share of non agricultural employment and of self-employment, with those describing other working conditions (temporary employment, ratio temporary/permanent workers wage, no longer employed because temporary youth share of unemployment, share of employment in high-skilled occupations, overeducation).

12. PCA allows a synthetical view of relations among all variables. A first strong result is the clear indication of a single main dimension underlying our variables. As a matter of facts, the first principal component explains over 55% of overall variability.

Table 2 – Total Variance Explained

Component	Eigenvalues		
	Value	% expl. variance	Cumulative % expl. var.
1	18,2	55,1	55,1
2	3,3	10,0	65,1
3	2,6	7,8	72,9
4	2,3	6,9	79,7
5	2,1	6,4	86,1
6	1,3	3,8	90,0
7	1,0	3,1	93,1
8	0,6	1,7	94,8
…	...	...	...
33	0.0	0.0	100.0

Figure 1 – Scree Plot

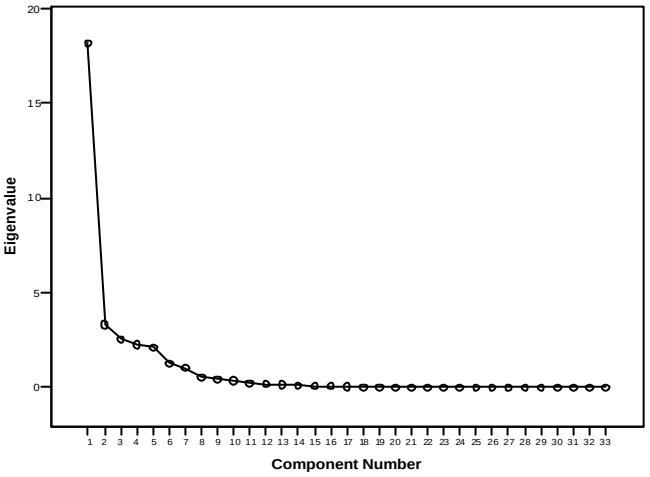
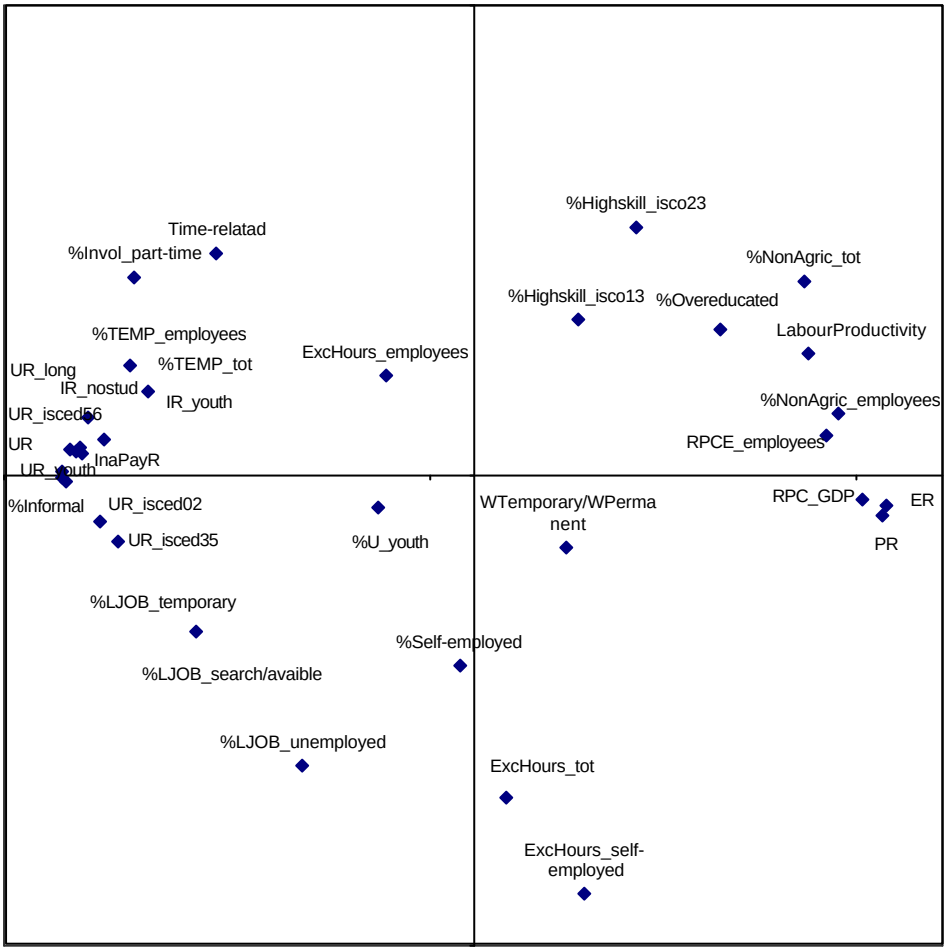


Figure 2 – Plot of component loadings of first and second principal component (33 variables)



13. The second component explains 10% of variability. As a conequence, the first factorial plane accounts for a large part of total variability (figure 2). On the positive side of the first component lay employment and activity rates, real per capita GDP, real per capita earnings of employees, share of employment in non-agricultural sector, incidence of high-skilled occupations, labour productivity, overducation. At the opposite, unemployment rates, time-related underemployment, share of involuntary part-time, incidence of informal employment, inadequate pay rate, youth inactivity rate, share of temporary employment, share of not employed persons who ended some temporary contract are on the negative semiaxis. The first component clearly shows which indicators best denote respectively good and bad quality of work[11]. Indicators which are loosely correlated with the first component and lay in the middle (i.e. excessive hours of work, ratio temporary/permanent workers' wage, share of self-employment, share of youth unemployment) probably provide less clear information with regard to quality of work. For instance, the two variables on excessive hours of work of employees and self-employed lay on opposite sides, thus providing puzzling indications.

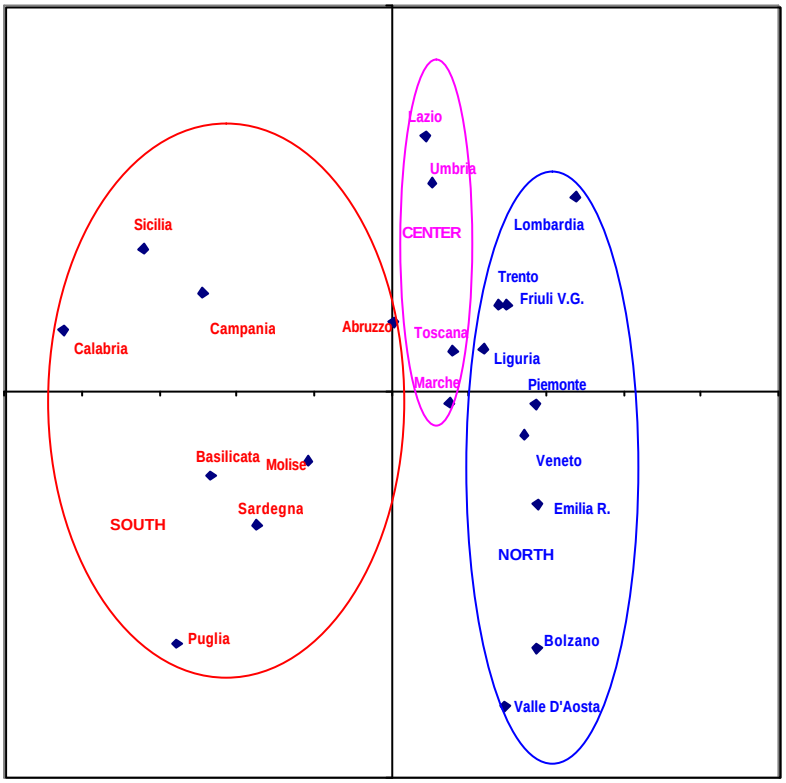
14. The second component reveals a dimension not directly associated to quality of work. It substantially opposes self-employment to wage employment; on the positive side are indicators usually related to employees, such as eccessive hours of work of employees, time-related

[11] The only apparently unexpected result is given by overeducation, which lays on the positive side. Actually, overeducation arises when supply of highly educated labour force exceeds demand for high-skilled employment. It is therefore directly related to the share of highly educated workforce, which is higher in regions with higher and better working opportunities.

underemployment, part-time work for involuntary reasons, overeducation, share of employment in high-skilled occupations. On the other side can be found share of self-employment and eccessive hours of work of self-employed.

15. Projecting Italian regions on the factorial plane provides immediate insight on territorial differences in the quality of work, showing once again a North/Centre/South divide. As a matter of facts, northern regions clearly stand on the right side of the plane; central ones are rather in the middle whereas southern lay on the left side (figure 3).

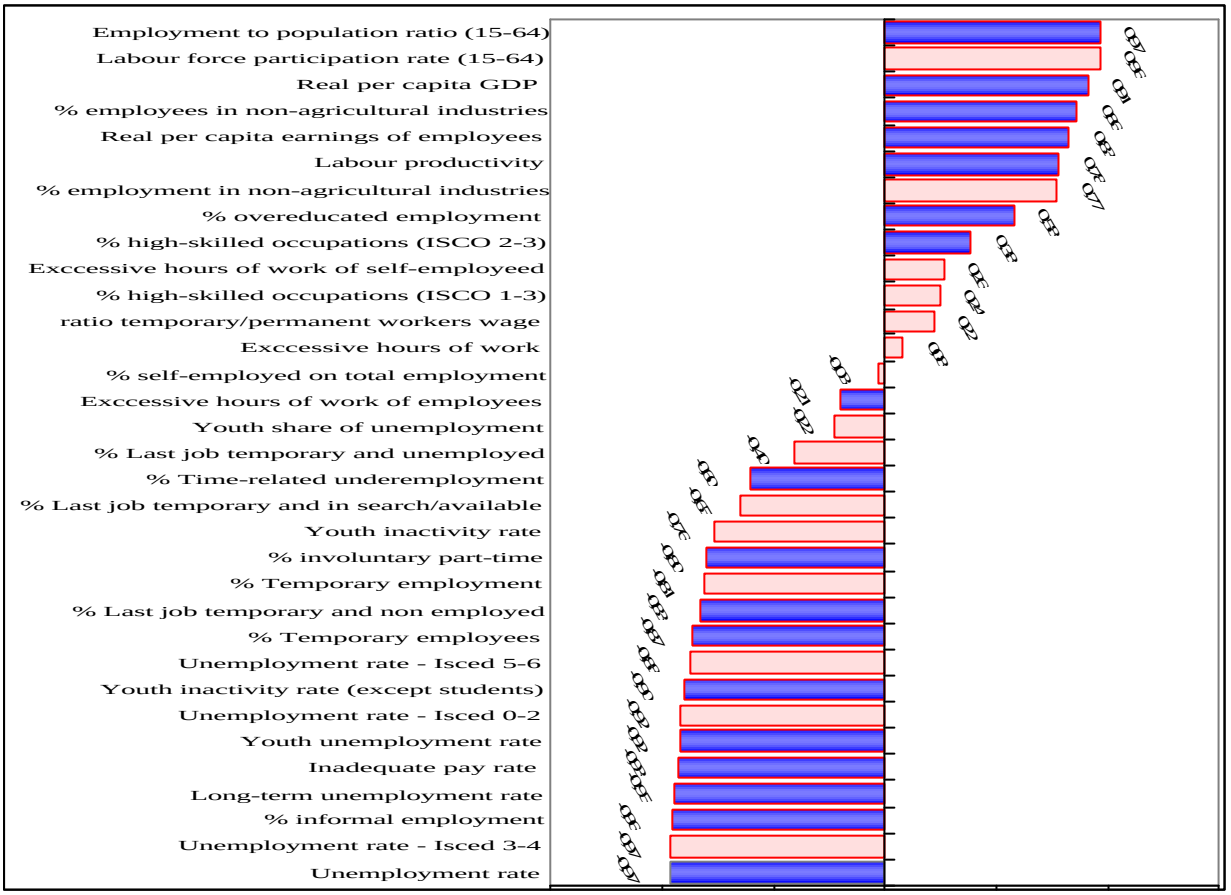
Figure 3 – Plot of Italian regions' component scores



IV. THE CHOICE OF INDICATORS

16. Results of PCA help selecting a more restricted number of indicators and variables among the 33 we started with. On the one hand, it is possible to rank indicators on the basis of their capacity to assess quality of work, measured by component loadings (figure 4). On the other hand, the same criteria can be applied in order to choose the best variable when there is more than one related to the same indicator.

Figure 4 – Component loading of the first component



17. Following a parsimony criteria, we think that labour force participation rate is redundant, being strongly correlated to employment rate and getting a lower component loading. For the same reasons we'd rather keep total unemployment rate, excluding isced-specific rates. Similarly, we prefer youth inactivity rate excluding students, which provides better results than the one including all young inactive population. About "No longer employed because temporary contract ended", the variable providing the best performance (and also the easiest to compute) is the one considering all persons who ended a temporary contract, regardless of being at present unemployed or available to work. On similar basis, with regard to temporary employment and share of employment in non-agricultural industries we suggest to consider only employees rather than total employment. Finally, Isco 2-3 seems to better represent high-skilled occupations than Isco 1-3.

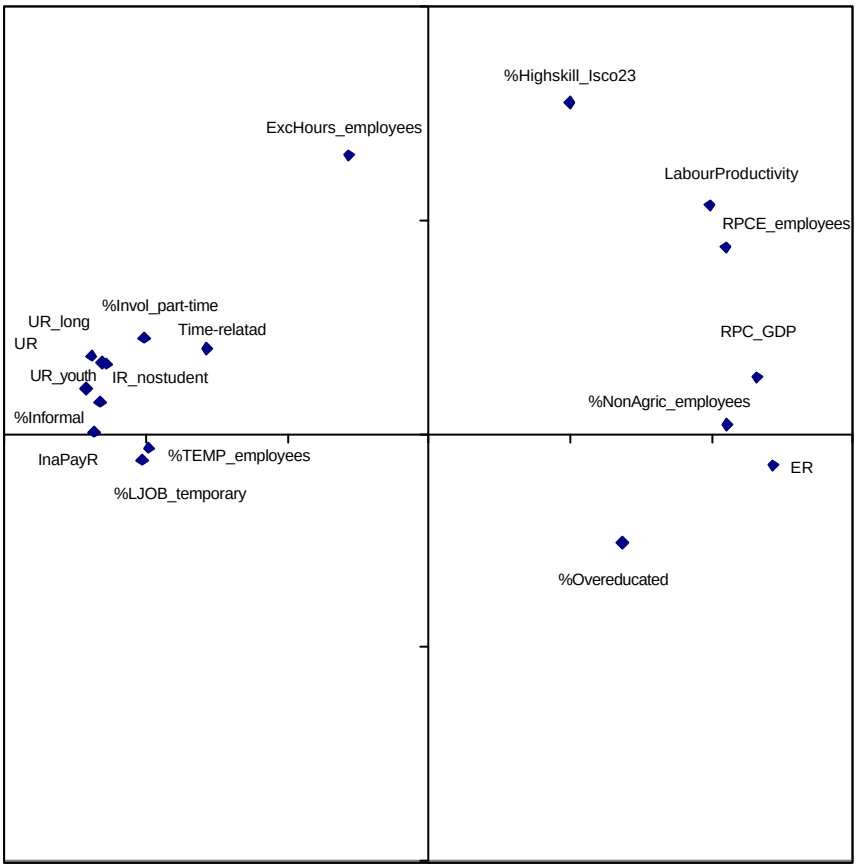
18. On the other hand, four indicators may be excluded for their low correlations with the first component: excessive hours of work, percentage of self-employed on total employment, ratio temporary/permanent workers wage and youth share of unemployment.

19. Further details can be obtained by a second PCA including only selected variables (the blue ones in fig. 4). Despite the poor results in the first analysis, we decided to futher investigate on excessive hours of work, which is relavant from a theoretical point of view. We included in this second round the variable considering only employees, which best performed in the first PCA among the three we tested.

20. In this second PCA, variance explained by the first components rises to 67%. Now all variables are clearly polarized on the first component except, as expected, excessive hours of work

(see figure 5). But it is the second component, which adds more insight. As a matter of facts, it highlights some differences among indicators, which lay on the same positive side of the first component. In particular, it opposes the share of skilled work to overeducation. This result suggests that, in Regions with similar share of highly educated population, overeducation is lower where the demand for skilled workers is higher.

Figure 5 – Plot of component loadings of first and second principal component (18 variables)



21. Excessive hours of work, on the other hand, assumes an unexpected position on the second component. It is close to the share of high-skilled employment, whereas one would expect it to be more related to low skilled occupations. This result depends on the fact that, among employees, the incidence of those working more than 48 hours a week is much higher for managers (33% for Isco group 1) than for elementary occupations (4% for Isco group 8). We may conclude that excessive hours of work in its present formulation is not discriminant of quality of work among Italian regions. Further variables may be tested, for instance excluding managers, or considering only involuntary long working times.

V. CONCLUSIONS

22. By PCA, considering Italian Nuts 2 Regions as different countries, we selected a subset of indicators considering their capacity to describe quality of Employment and highlight differences among countries. Starting from 22 indicators and 33 variables, we singled out 17 variables, each

representing one indicator. We think that these indicators are still too many for a single dimension of the framework, so we are aware of the fact that a further selection is necessary. Nevertheless we think that this group of indicators may represent a good base for coming discussion. A further selection may be obtained replying the analysis using data of different countries. This allows to point out general tendencies regarding relations among indicators.

23. Among selected indicators there are a few, which were originally included neither in ILO *Decent work* nor in EU *Quality of work* paradigms. A first one is overeducation, which, together with share of high-skilled employment, improves information on labour markets offering similar job opportunities in terms of employment and unemployment rates. A second one is given by the share of persons no longer in employement because a temporary contract ended. In our opinion, this indicator better represents labour market precariety than the share of temporary employment, which is rather a measure of flexibility.

24. One last consideration concerns possible further applications of the approach we propose. PCA may indeed be useful to test the conceptual framework, based on four different dimensions. As a matter of facts, PCA should find four main principal components and associate each mainly to indicators of one of the four dimension of the framework.

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