Industry 4.0. Autonomy and control at work: the italian case

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1. Introduction

Digitization and automation are the two reference categories when we deal with "Industry 4.0" and with the transformations involving production concerning companies and the labour market. Therefore, when we observe the processes accompanying Industry 4.0, it is essential to take into account the hypothesis, widespread in the literature that the reorganization processes related to technological development will lead to an increase in the demand for qualified work. This approach argues that the diffusion of ICT fosters the development of high employment profiles and specialized occupations (Kiley, 1999). These profiles, characterized by higher skills and qualifications are considered as potentially able to increase productivity. This is related to the use of technology as an input in the cognitive professional activities often associated with higher autonomy and control at work (Kiley, 1999) and it is crucial to monitor the way in which technological changes impact on organizational models, on the work processes and on its quality.

2. Theoretical framework and general objective

In Italy, the theoretical reflection about the quality of work starts between the late '70s and early' 80s thanks to Luciano Gallino and Michele La Rosas' sociological studies. To define the concept of quality of work the authors go beyond the working conditions, enriching the Anglo-Saxon tradition and extending the conceptualization to the work experience complexity and to all the aspects of the work referring to the needs of the individual (Isfol, 2016).
The emphasis on the heterogeneity and complexity of the concept requires decomposing quality of work into different dimensions many-sided, "plastic", non-hierarchical and not necessarily connected. All the dimensions together represent the quality of work comprehensively (Centra et al., 2013). Gallino and La Rosa (Gallino 1978, 1983, La Rosa 1983, 1998 and 2000) propose five dimensions: ergonomic, complexity, autonomy, control and economic.
Two dimensions in particular can provide a useful insight regarding the impact of the new industrial revolution on work organization: autonomy and control. A widespread point of view highlights, indeed, that some factors characterizing the ongoing productive changes can play a role in the work organization. This is especially true considering "self-determination" and "self-regulation" (Sai, 2017) and also the significant skills investment and the implementation of advanced workplace performance practices (Oecd, 2017).
The theoretical framework of quality of work enlightens the studies and the surveys conducted by Inapp in which the five dimensions are operationalized (see http://bw5.cineca.it/bw5ne2/opac.aspx?WEB=INAP&IDS=19730) according to Gallino and La Rosa approach (Isfol, 2013; Centra and Gualtieri 2018).
This contribution aims at investigating how the dimensions of autonomy and control have changed over time. These dimensions are primarily studied starting from the analysis of a set of "elementary symptoms". Secondly, we created two composite indicators of autonomy and control.
Data used come from the Inapp Quality of work Surveys (https://inapp.org/it/dati/qualitadellavoro), a sampling survey, launched in 2002 and subsequently carried out in 2006, 2010 and 2015. The survey takes the cue from the Eurofound European Working Condition Survey (EWCS).

3. Autonomy and control over time: the elementary symptoms

3.1. Autonomy

Available data on the repetitiveness of tasks show an increase (even not particularly significant) in the share of workers who declare to perform routine tasks.
On the other hand, there is a positive shift in terms of chance to choose or change the order of tasks: the share of workers that cannot choose at all declines from almost 45% in 2006 to about 30% in 2015. This seems a fairly stable and progressive path not interrupted during the economic downturn.
Improvements in the management of tasks can be more positive if compared with the fact that there are no changes in the share of workers with a direct supervisor. Therefore, the observed increase in choices seem to be in a framework of hetero-direction that has not changed. There is a path towards autonomy, at least in this case, not generated by a lack of coordination, but maybe by new and emerging production methods.
A certain rigidity in terms of working time schedules is still evident over time and there seems to be a certain stability in the organizational models.
Looking at the trend over time in the possibility to choose or change the speed and the pace, interesting dynamics emerge and we observe a reduction of this chance. In the years under review there is not a full continuity and the point of real "break" is in 2010 (full crisis). In 2015, only around 33% of workers had always the possibility to modify the speed and the pace of their activity while in 2006 the share was about 42%.
The demand expressed from customers, passengers, etc. is the main pace of work determinant, even if there are no substantial variations over the years. The second pace determinant is the numerical production targets or performance targets. The importance of these two factors suggests a progressive shift towards a production model regulated more from the outside and from the requests and not from the stocks production as it was before the crisis. Furthermore, there is an increase between 2006 and 2015 in the technological constraint in determining paces that can represents a pathway to Industry 4.0. This increase with the boost registered considering the presence of a supervisor seems to indicate that the pervasive use of technological tools leads to a higher ex-post control of workers activities.

3.2. Control

Looking at the chance for workers to choose strategies and goals we point out a rise from 25.3% in 2006 to 42.2% in 2015. Data from 2010, collected in the midst of economic crisis, highlight the presence of less participative working contexts. Only 46.7% of workers (adding up the “yes” and “sometimes”) had the choice in 2010 while in in 2015 the same quota reached about 61%.
At the same time, observing the evolution in the chance to choose the plan of the activities, again we observe deep transformations from 2006 to 2015. In 2006 and 2010, we observe similar percentages (32.8% and 33.8%) of workers not having at all the chance to change while in 2015 the share decreases (26.8%). The presence of very open-minded work places is particularly clear in 2006 (42.9% could always choose the planning of their activities), while in 2015 there is a considerable increase in organizational models in which, only in few cases, the worker has the possibility of change.
The planning of the activities is undoubtedly related to the techniques and methods of work. This is clear if we look at the trend in the quotas of workers declaring not having the chance to choose methods and techniques of work that decrease over the years.
Also considering responsibilities, there are substantial changes: over time there is a strong increase in the share of workers who declare to coordinate one or more colleagues.

4. Summary indicators of autonomy and control

The elementary symptoms used in the 2015 quality of work survey, constituting each dimension, are used to develop composite indicators (fig. 1).

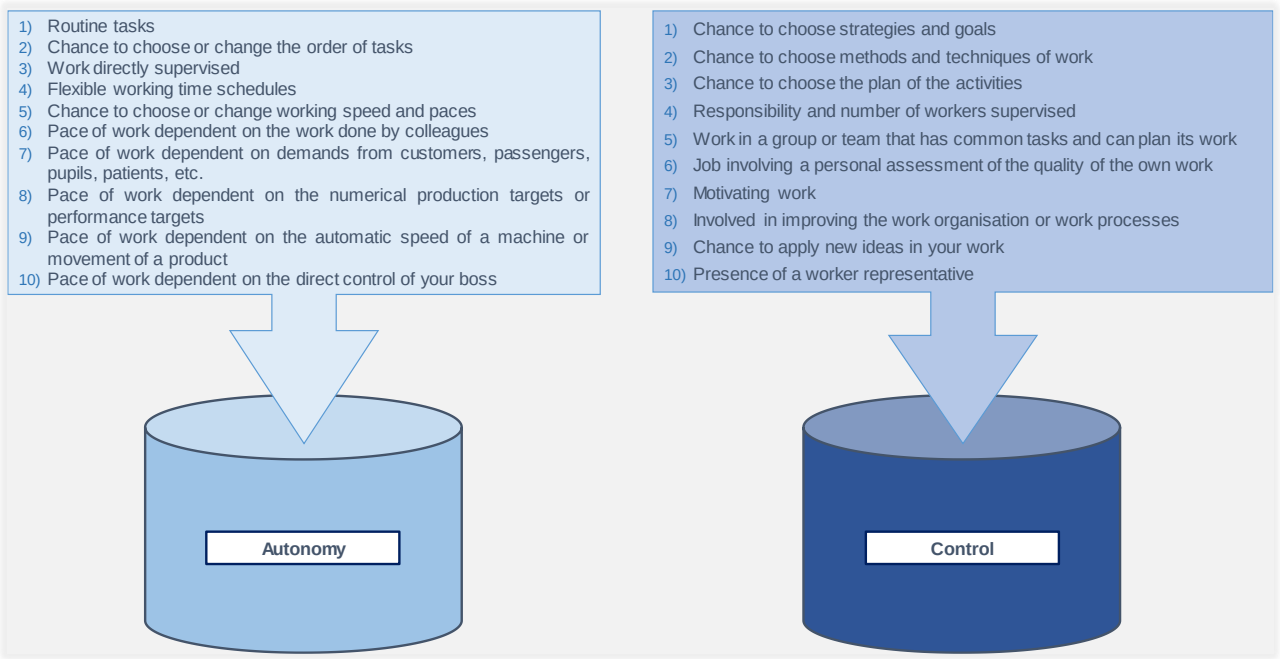

Figure 1 – Elementary symptoms and indicators

The variables are dichotomized by assigning to different responses a value equal to 1 in the cases of autonomy and control and equal to zero in the other cases. The algebraic sum of the elementary symptoms generates the two composite indicators assuming values from 0 to 10.

For a better understanding of the indicators and to compare them with some variables representing workers characteristics and their job (age, gender, profession, sector, etc.), the two indicators are reclassified in three ways (from 0 to 4 low level, 5 medium level, from 6 to 10 high level).

Observing how workers are distributed respecting these two dimensions (fig. 2) we note that high and medium autonomy levels have a higher concentration than the corresponding levels relating to control.

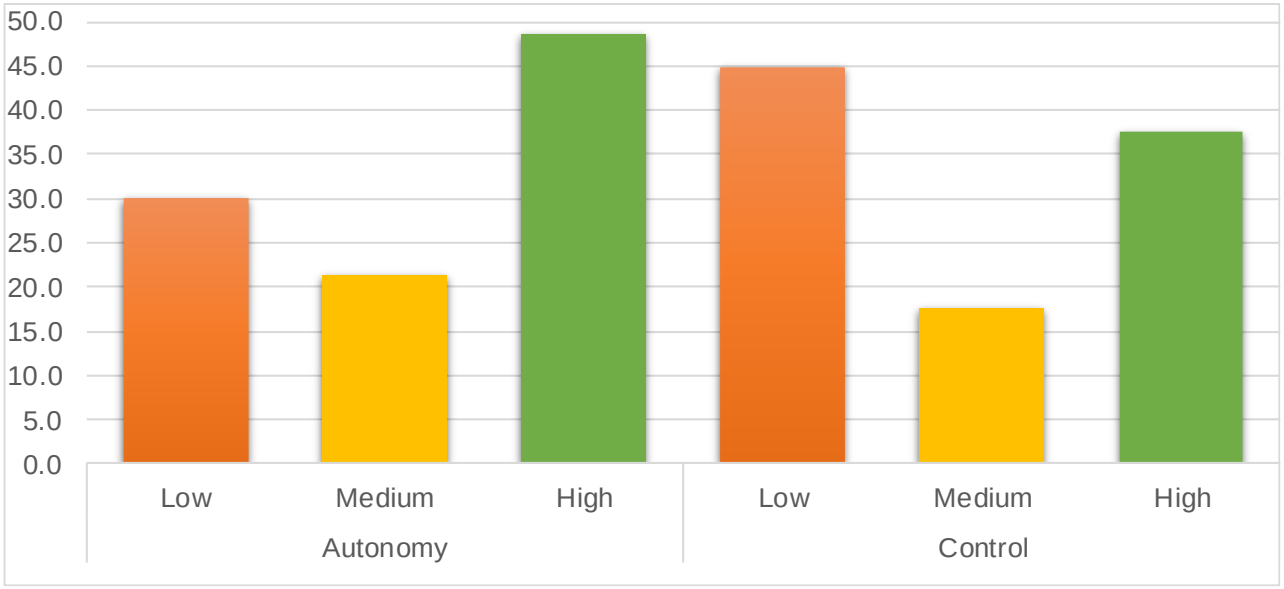

Figure 2 – Employers distribution among summary indicators of autonomy and control
Source: own calculations based on INAPP-QdL

5. Autonomy and control: the key determinants

The traditional determinants are not neutral considering the levels of autonomy and control at work: age, gender and educational attainments are significant discriminating factors (fig. 3). Young people show smaller shares of high autonomy and control, in particular the control is even less than autonomy, but on the average, the degree of autonomy is generally higher than control.

Considering the gender distribution, men and women are similar in terms of levels of autonomy (with a slight advantage for women), while we notice an opposite dynamic in terms of control: women have a lower level of control than men of about 7 percentage points. This gap brings to mind the well-known problem of the “glass ceiling”, and highlights gender differences observing the levels of participation in the company management, even more than in the management of activities and tasks.

Educational level is undoubtedly a key element: 64.3% of workers with tertiary education show high levels of autonomy and 48.8% of them high control. On the opposite, the less educated (primary and lower secondary) have low autonomy and low control. It seems to be a sort of polarization in the possibility to manage the own work and the strategies and goals of the company (control dimension). This trend conforms to the belief of a positive effects of technological development on the skilled labor demand (Kiley, 1999, Autor, 2015).

Contractual arrangements have a strong influence on the levels of autonomy and control. The share of fixed-term employees associated with high levels of autonomy and control is very low, with a distance from the average of almost 10 percentage points for control and over 8 percentage points for autonomy. As expected, for the freelance workers greater levels of autonomy are outlined.

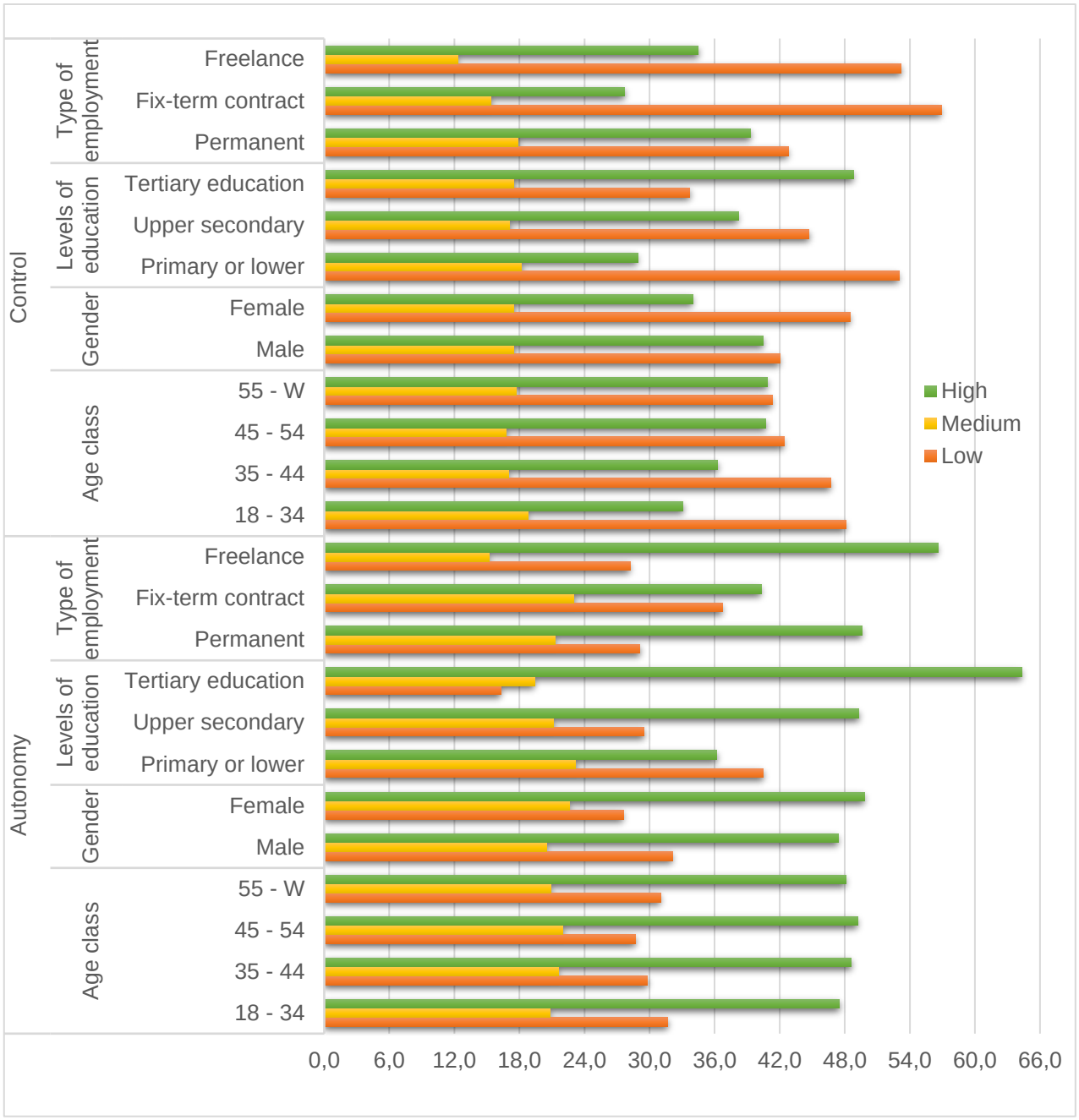

Figure 3 – Autonomy and control by some characteristics of the worker, Year 2015 (%)
Source: own calculations based on INAPP-QdL

The economic sector and the local unit size play an important role in changing the degree of autonomy and control at work (fig. 4). As far as productive specialization is taken into account, the agricultural sector is particularly disadvantaged, especially in the control dimension: only about 24% of workers, in fact, declare a condition of high "governance". On the contrary, greater autonomy and control describes services and industry. In smaller companies, characterized by a lower hierarchical organization of functions, we found the highest levels of autonomy; oppositely, there are higher levels of control in the large companies.

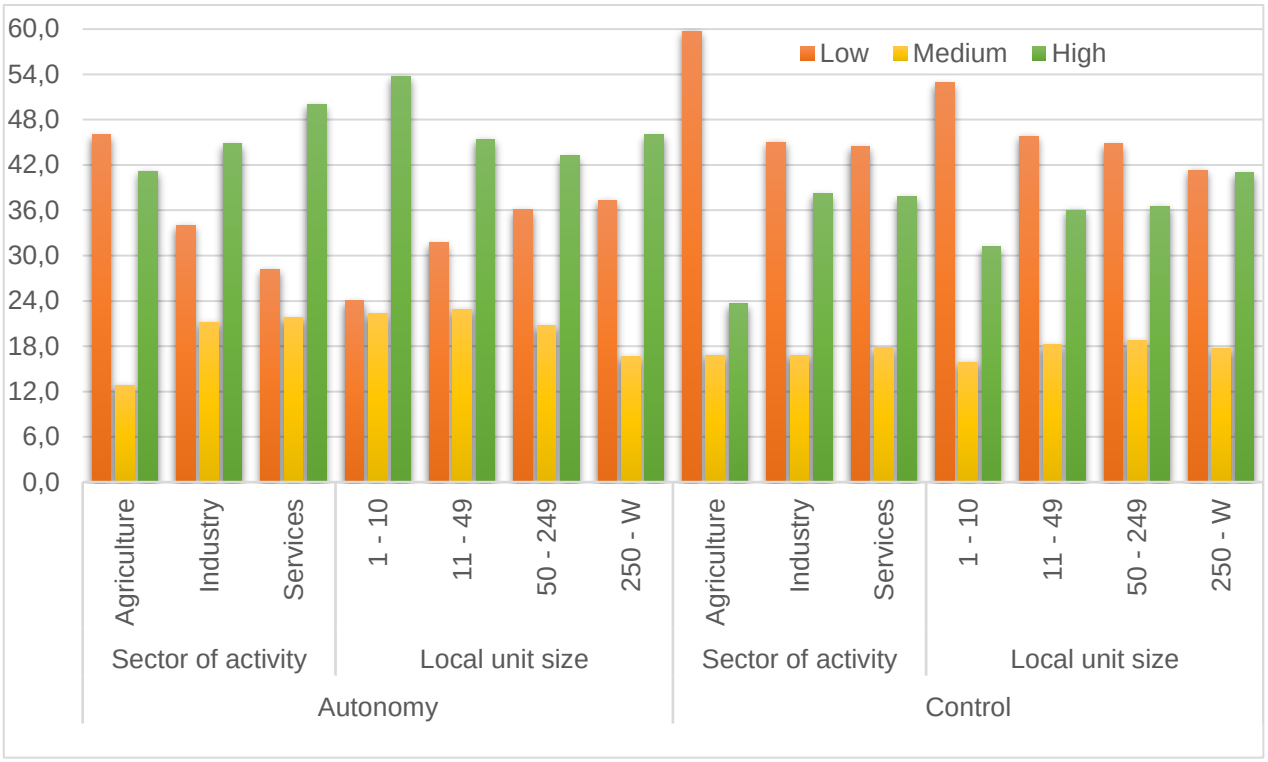

Figure 4 – Autonomy and control by characteristics of the enterprises in which the worker is employed, Year 2015 (%)

Source: own calculations based on INAPP-QdL

A useful contribution to the analysis considering the perspectives of "Industry 4.0" framework is outlined in figure 5. Among workers using computers or other electronic equipment and using internet and e-mail, there is a greater concentration of high levels of autonomy (mainly) and control. On the contrary, activities carried out with machinery and automated systems seem to impact on autonomy negatively. The technological innovations have therefore effects on the analysed dimensions, but with different directions relating to the means of work. In the work automation, there is a substitute effect between workers and machine and the result is less autonomy. Instead, in the case of a job involving the use of computer equipment (pc, internet, email, etc.) the effect is not substitutive but complementary and does not penalize autonomy and control. The issue of technology's non-neutrality recurs.

We already underlined that over time there has been a greater dependence of work pace on the speed of machines. In perspective, the progressive diffusion of highly automated work (as indeed desirable) could lead to an increase in the hetero direction of the working activity with a consequent loss in the possibility of intervening autonomously in performing ones own tasks for higher and higher shares of workers.

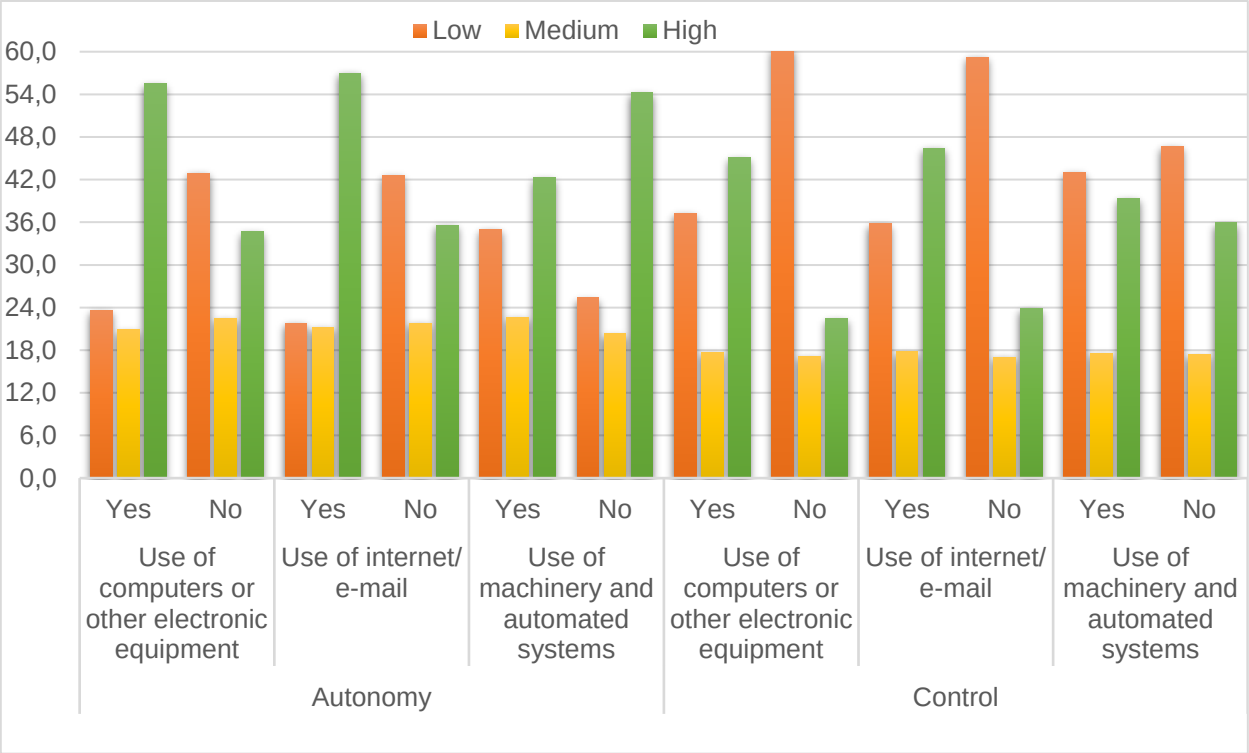

Figure 5 – Autonomy and control by use of technologies, Year 2015 (%)
Source: own calculations based on INAPP-QdL

6. Concluding remarks

The trend analysis of the elementary symptoms of autonomy and control highlights a scenario with continuing transformations that influenced the ability of workers to affect the performance of their work activities as well as those of the company. In general, the years of the crisis seem to be a break point between a starting period (2006) in which workers were polarized between high and low levels in autonomy and control and a final period (2015) in which a higher concentration is observed into intermediate levels.

The analysis of the composite indicators also pointed out how some characteristics are still qualifying workers as more disadvantaged in their degree of autonomy and control: Young people, women and workers with fixed-term contracts are the categories most penalized. This confirms the well-known segmentation of the Italian labour market.

However, new trends are emerging in the relationship between autonomy, control and use of ICT. The impact of technologies is non-neutral for the working life: the use of computer equipment or software is associated with high levels of autonomy and control, while automation affects both indicators negatively.

Bibliography

Autor D. (2015). Why are there still so many jobs? The history and future of workplace automation. The Journal of Economic Perspectives, n.3, 2015, pp. 3-30.

Canal T., Gualtieri V. (2018). Dentro il lavoro: qualità del lavoro, pratiche organizzative e risultati d'impresa. Etica ed economia (en linea).

Centra M., Curtarelli M. e Gualtieri V. (2013). La 'via italiana' alla qualità del lavoro e il contributo dell'ISFOL. En Gualtieri V. (Ed.), Le dimensioni della qualità del lavoro. I risultati della III indagine Isfol sulla qualità del lavoro. I libri del Fondo Sociale Europeo, Roma: Isfol.

Gallino L. (1983). Informatica e qualità del lavoro. Einaudi: Torino.

Gallino L. (1978). Dizionario di sociologia, alla voce “sociologia del lavoro”, pp. 390-400, Torino: Utet.
Gualtieri V. (Ed.) (2016), La qualità del lavoro durante la crisi economica: alcuni approfondimenti. I Libri del Fondo Sociale Europeo, Roma: Isfol.
Gualtieri V. Ed.). Le dimensioni della qualità del lavoro. I risultati della III Indagine Isfol sulla qualità del lavoro. I Libri del Fondo Sociale Europeo, Roma: Isfol.
Kiley M. T. (1999). The Supply of Skilled Labour and Skill-Biased Technological Progress. The Economic Journal, 109 (458), p.708-724.
La Rosa M. (1983). Qualità della vita, qualità del lavoro. Milano: Franco Angeli.
La Rosa M. (1998). Il problema della qualità del lavoro. En La Rosa M. (Ed.). Il lavoro nella sociologia. Roma: Carocci.
La Rosa M. (2000). Dalla sicurezza alla qualità del lavoro. Osservatorio Isfol, n. 2-3, Roma: Isfol.
OECD (2017). Skills strategy diagnostic report: Italy. OECD.
Sai M. (2017). Industria 4.0: innovazione digitale e organizzazione del lavoro. Quaderni di Rassegna Sindacale, n. 3-2017.