The relationship between competencies and non-cognitive dimensions

The experience of the "PIAAC Italia" survey

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Riassunto: L'articolo intende presentare lo scopo e l'impianto metodologico dell'indagine "PIAAC Italia" ("PIAAC-IT" d'ora in poi). L'indagine PIAAC-IT è stata realizzata dall'Istituto per lo sviluppo della formazione professionale dei lavoratori (ISFOL) nel 2014, ed è strettamente collegata al *Programme for the International Assessment of Adult Competencies* (PIAAC) dell'OCSE e, in particolare, alla prima indagine realizzata nell'ambito di tale programma: l'indagine internazionale dell'OCSE "Survey of Adult Skills". Gli assunti di base dell'indagine sono: le competenze valutate in PIAAC sono in relazione con le *skill* possedute dalle persone, ma anche con altri fattori quali i tratti di personalità e le motivazioni che guidano e sostengono l'azione sociale. In letteratura c'è un diffuso consenso sul fatto che dimensioni non cognitive (fattori motivazionali, caratteristiche psicosociali, ecc.) abbiano un effetto importante sia sui percorsi di istruzione, sia sui risultati nel mercato del lavoro. Questi effetti potrebbero risultare importanti tanto quanto quelli generati dalle *foundation skill* o, più in generale, dalle dimensioni cognitive, al fine del conseguimento di una serie di *social outcome*, come la riuscita scolastica, l'inserimento lavorativo, l'inclusione sociale, la carriera, la salute. Il consenso è meno ampio per quanto concerne la misurazione e l'operazionalizzazione di queste dimensioni. L'indagine PIAAC-IT è stata progettata con lo scopo di approfondire, con una *survey* condotta a livello nazionale, *item* e scale create per analizzare la relazione tra dimensioni cognitive e non cognitive delle competenze. La maggioranza di questi item e di queste scale erano state già testate ed utilizzate in diversi studi e ricerche precedenti, ma non in una indagine campionaria. I rispondenti dell'indagine PIAAC-IT sono stati selezionati tra le persone che avevano partecipato al primo ciclo di indagine PIAAC-OCSE (2011-2012). In questo modo è stato possibile creare un *dataset* con dati – raccolti nel periodo 2012-2013 – sui test cognitivi e sulle *skill* utilizzate nel lavoro e con dati – raccolti nel 2014 – sui tratti di personalità e sulle dimensioni non cognitive. Un'ampia parte delle scale utilizzate mostra indici di affidabilità soddisfacenti. Inoltre, come ipotizzato, molte delle dimensioni non-cognitive e dei tratti di personalità

mostrano correlazioni con i punteggi ottenuti nei test cognitivi. L'articolo presenta le ipotesi di ricerca, il *framework* teorico, il disegno di campionamento e le analisi relative al funzionamento del questionario adottato nell'indagine PIAAC-IT.

Parole chiave: Abilità; Adulti; Competenze

Introduction

The OECD Skills Outlook 2013 states that "Skills transform lives, generate prosperity and promote social inclusion. Without the right skills, people are kept at the margins of society, technological progress does not translate into economic growth, and enterprises and countries can't compete in today's globally connected and increasingly complex world" (OECD, 2013, p. 26).

Yet in 2006[1], a Recommendation of the European Parliament and of the European Council stated that "...as globalization continues to confront the European Union with new challenges, each citizen will need a wide range of key competencies to adapt flexibly to a rapidly changing and highly interconnected world. Education in its dual role, both social and economic, has a key role to play in ensuring that Europe's citizens acquire the key competencies needed to enable them to adapt flexibly to such changes..." (European Union, 2006, p. X).

This view on the importance of competencies and skills is broadly shared by policy makers and researchers. The increased (and increasing) availability of international data measuring cognitive skills either at school (e.g., PISA) or in adult life (e.g., PIAAC) support and reinforce this shared view. But by paying so much attention to measures of cognitive skills (e.g., literacy and numeracy), "empirical research has somewhat overlooked the fact that other individual characteristics, which are weakly related to cognition, are potentially as important as cognitive skills for individual development and economic success" (Brunello and Schlotter, 2011, p. 3). These abilities include social skills, locus of control, self-efficacy and learning style, and they are typically non-cognitive in the sense that they are not strictly related to information processes. "This bias in favour of more easily measurable cognitive skills has been partially amended by empirical research carried out mainly in the past ten years in several studies" (*ibidem*, p. 3). In this article, we briefly review this research and present some results from a national survey (2,000 respondents interviewed) conducted in Italy in order to test different measurements of non-cognitive dimensions in relation to cognitive skills. The survey was named "PIAAC Italia Survey" (hereinafter referred to as the "PIAAC-IT"). The main purpose of the survey was to understand how strong non-cognitive dimensions are related to cognitive skills, and then what role they can play in the construction of social competencies, individual development and success.

[1] The said Recommendation is dated 18 December 2006.

What is PIAAC?

The Programme for the Assessment of Adult Competencies (PIAAC[2]) is an international assessment of the skills of the adult population (16-65 year olds), developed under the auspices of the Organization for Economic Cooperation and Development (OECD). The main objectives of PIAAC are to measure the key cognitive and workplace skills needed for individuals to participate in society and for economies to prosper.

The first cycle of the study involved three rounds[3]. Twenty-four countries participated in Round 1, with data collection taking place in 2011-12. The first release of PIAAC results took place on October 8, 2013. Italy participated in Round 1 with a nationally representative sample of 4,600 adults. Similar samples of adults were surveyed in each of the 23 other participating countries.

PIAAC was administered in respondents'homes by trained interviewers. The first cycle of PIAAC involved an assessment of three key information processing skills: literacy (including the so called reading components), numeracy and problem-solving in technology-rich environments (OECD, 2012). The assessments of literacy and numeracy were undertaken by all participating countries. The assessments of reading components and problem solving were optional elements. In addition to these tests, there was a questionnaire (Background Questionnaire - BQ), meant to identify respondents'personal characteristics and background: educational attainment, participation in education and training activities, labour market status, work history, job characteristics, the use of information processing skills at work and in everyday life, the use of generic skills at work, qualifications, skills match/mismatch and non-economic outcomes.

Deriving the piaac-it measure of non-cognitive variables

There is no doubt regarding the importance of the skills assessed in the PIAAC and on the importance of the "stock of human capital" which people must equip themselves with in order to successfully achieve the goals of working, family and social life. The PIAAC has so far assessed the knowledge components mostly linked to those that are referred to as cognitive skills or information processing skills. These are skills which can be measured through assessment processes (tests) and developed and maintained through educational and training processes. Other equally important aspects (which are not strictly connected to information processing) are still not present in the PIAAC framework. These include individuals'motivational factors and psychosocial characteristics, which are all dimensions steering and driving people's social action and which are presumed to be determinant for achieving a series of social outcomes (school achievement, entry in employment, social inclusion, income, behaviour).

There have been several studies (STEP-World Bank; The National Longitudinal Survey of Youth; The British Cohort Survey; The Wisconsin Longitudinal Survey; The

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[2] Please, see note n° 1.
[3] See: http://www.oecd.org/site/piaac/surveyofadultskills.htm

National Education Longitudinal Survey; The Talent Project; The German Socio-Economic Panel; The British Household Panel Survey; The DNB Household Survey) which have taken psychosocial variables into account.

To more deeply analyze the Italian situation, the aims of the PIAAC-IT included using a background questionnaire (hereinafter referred to as the BQ)[4] in order to assess some of the main non-cognitive dimensions measured and used in other studies, such as locus of control, conscientiousness, cultural openness, proactivity, positivity, performance orientation, learning orientation, and working self-efficacy. These dimensions were established by the ISFOL work group on the basis of research questions or hypotheses, and by consulting eminent experts.

This section will illustrate some of the main conceptual sources of references in order to provide concrete indications on the choice of dimensions and scales taken into consideration for the construction of the survey tools for each of the said non-cognitive dimensions.

Locus of Control

This construct was introduced by Rotter (1966) and indicates the degree of control people perceive they have over their life and individual fate. More specifically, the author established two types of locus of control:

- An internal locus of control: as a person's perception that an event was contingent upon his or her behaviour or permanent characteristics.
- An external locus of control: as a person's perception that an outcome was not contingent upon action but instead was the result of luck, fate or the actions and influences of others.

A high internal locus of control tends to indicate that the person perceives s/he is largely determining and controlling the events in his or her life (such as health and occupational achievement). A high external locus of control indicates that a person perceives s/he is swayed by external forces, be it luck, fate or "powerful others"[5]. This dimension was included in studies like the PIAAC-IT and is it geared to assessing the paths and actions taken by individuals in order to develop and maintain their own skills. It may enrich the interpretational picture since it has to do with the degree of commitment, endurance and determination with which people engage in various spheres of life. The PIAAC-IT focused on two specific locus of control domains: Work Locus of Control and Health Locus of Control. The former refers to the perception of control and of influencing decisions (but also relations) of others (supervisors, colleagues, subordinates) within an organizational sphere (Spector, 1982). Several studies have shown how locus of control has a crucial role in working success and in career advancement

[4] It consists of six sections (personal data, non cognitive precedents of skills, employment search, current occupation, skills used in the workplace, education and training).
[5] This term indicates the dependency on other people or social entities which are deemed to have power over our life.

since it is closely connected to the various spheres of working life. Compared to individuals with a greater external locus of control, people with a greater internal locus of control tend to have higher levels of job satisfaction and performance (Spector, 1982; Judge and Bono, 2001), and to have greater motivation and wellbeing (Ng *et alii*, 2006; Spector *et alii*, 2002), to show greater organizational commitment (Coleman *et alii*, 1999; Chhabra, 2010) and, finally, to more easily keep and/or change jobs (Spector, 1982). In order to analyse the Italian context, the researchers in the PIAAC-IT decided to use the Work Locus of Control Scale validated by Argentero (1996). This scale, referred to as LOC-L, enables us to assess four different spheres of working life: relations with one's superiors; the financial aspects linked to one's job; achieving one's objectives in work; career advancement and the gaining/keeping of one's job. The scale consists of 31 items, 17 of which are statements concerning an internal locus of control (such as: "The results of a job mostly depend on the person carrying it out") and 14 statements concerning an external locus of control (such as: "In most jobs you need a lot of luck to excel"). For reasons of parsimony of the study as a whole, the PIAAC-IT only included a third of the items of the original scale. The 11 items of work locus of control were randomly selected and included 6 internal ones and 5 external ones[6].

The second locus of control domain assessed in the PIAAC-IT is the Health Locus of Control (HLC). This represents the extent to which people believe that their own health is controlled by internal or external factors. External refers to the belief that one's outcome is under the control of powerful others (e.g., medical doctors) or is determined by fate, luck or chance. Internal refers to the belief that one's outcome is directly the result of one's behaviour. Wallston and colleagues (1978a) developed the Multidimensional HLC (MHLC) Scale, which has found many applications in research and in health practice. It consists of 18 items equally divided into three scales, described as follows:

1. Internal HLC (IHLC) is the extent to which one believes that internal factors are responsible for health/illness. It measures to what extent patients attribute their pain to their own behaviour.
2. Chance HLC (CHLC) measures the extent to which one believes that health/illness is a matter of fate, luck or chance. It assesses the level of patients'belief that their pain is impacted by chance factors.

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[6] Internal locus of control items in working life.
"To get satisfactory results you need commitment and force of will"
"There is a direct relationship between a person's ability and his/her job"
"The results of a job mostly depend on who does it"
"Most people can do their job well if they really try"
"Promotions are given to people who work well"
"A well prepared person always finds a satisfying job"
Items of external locus of control in working life:
"To get a really good job you need to know people who hold high places"
"Finding a suitable job is mostly a question of luck"
"In most jobs you need a lot of luck to excel"
"Promotions in a job often depend on luck"
"To find a good job you need personal acquaintances rather than actual ability"

3. Powerful Others HLC (PHLC) is the belief that one's health is determined by powerful others such as doctors or health professionals (Wallston *et alii*, 1978b; Stein *et alii*, 1984).

In short, a person with an internal locus of control believes that his or her own health depends on their preventive behaviour, while a person with an external locus of control will attribute responsibility for his or her own health to fate or others (such as medical doctors or other health professionals), regardless of the actions or behaviours implemented by the individual concerned.

An Italian version of the multidimensional health locus of control was used by Fasol and colleagues (1998) to study behaviours linked to health and prevention. Here too, for the same reasons as for the WLC, the PIAAC-IT did not consider all the items of the scale but only randomly selected 6 items for the first two dimensions: 3 for the internal locus of control (IHLC) and 3 for the external locus of control (CHLC)[7]. It did not consider the external dimension referred to powerful others (PHLC) so as not to further increase the number of dimensions to be assessed and also for the lower interest in this from a conceptual standpoint.

The Big Five Model - Conscientiousness and Openness

Given its great predictive nature compared to some of the main outcomes underlying success in one's job (and not only in this) such as job performance, salary and school achievement (Kautz *et alii*, 2014), the PIAAC-IT also took into consideration some dimensions of the by now consolidated theory of five factors of personality, known as the "Big Five Model". More specifically, it included "conscientiousness", that is, the tendency to be organized, responsible and to work hard, and "openness", meant as cultural openness. As some studies show (Roberts *et alii*, 2006; Almlund *et alii*, 2011), these personality traits are as predictive as (if not more than) the same outcomes of the cognitive skills and of IQ.

Conscientiousness. Among the Big Five personality traits, conscientiousness is the one which is more correlated with various organizational behaviours and job success (Lindqvist and Vestman, 2011; Ng and Feldman, 2010). For example, as shown in various studies and meta-analyses, conscientiousness – compared to other traits examined in the model – is the one most strongly connected to job performance (Barrick and Mount, 1991; Rothmann, 2003). Moreover, while the valence of cognitive skills is directly proportional to job complexity, conscientiousness has an omnipresent role and

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[7] Items concerning an internal locus of control:
"If I take care of myself, I can avoid getting ill"
"I feel directly responsible for my health"
"If something goes wrong with my health, it's my mistake"
Items concerning an external locus of control:
"My health mostly depends on luck"
"Even if I look after myself, it's easy to fall sick"
"I feel that my health is strongly influenced by accidental events"

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its importance does not vary much with the degree of difficulty of the tasks concerned (Barrick and Mount, 1991). In a study carried out in the USA, the authors found a positive correlation between conscientiousness and organizational success in all professional profiles (Barrick and Mount, 1991; Barrick *et alii,* 2001). It must be recalled, however (and many studies show this), that although this trait is usually treated as a stable personality trait, this non-cognitive dimension is exposed to social construction processes. The school environment and high profile education processes tend to enhance conscientiousness, and so too do organizational life and ageing (Ng *et alii,* 2005; Ng and Feldman, 2010). For the PIAAC-IT, given the limitations imposed by the breadth of the study, 9 items of the Big Five personality questionnaire (Caprara *et alii,* 2000) were randomly selected. These constitute the measures of conscientiousness (or non-conscientiousness, as in the case of reverse items)[8].

Openness. With regard to openness or broad mindedness, this is the most controversial of the five personality traits analysed by means of the Big-Five Questionnaire (*ibidem*). This trait has been referred to as "Culture" (Norman, 1966),", amongst other terms, "Intellect" (Goldberg, 1990) and "Openness" (Costa and McCrae, 1985). Openness refers to (in its two sub-dimensions: "Openness to culture" and "Openness to experience"[9]) openness to novelty and to diversity, to the acquisition of new knowledge and experiences. Great openness should be characterized by behaviours relating to "keeping informed", "following up important events", being willing to accept other cultures and differences between people. On the other hand, people characterized by little openness should be distinguished by their little curiosity, little attention to keeping abreast of things and to information, a certain rigidity with regard to diversity and to innovative cultural elements. Openness should be one of the non-cognitive variables closer to the levels of proficiency found in the PIAAC study and, more generally, to the objectively measured cognitive abilities, since this dimension is usually correlated to behaviours such as the search for information, lifelong learning, and the learning of new knowledge and skills. As found in many studies, openness is one of the traits (along with conscientiousness) that is greatly predictive of school achievement (Barbaranelli *et alii,* 2003). Even in the organizational sphere, many studies have shown how

[8] Here are the items concerning conscientiousness (those with an R are reverse items):
"I don't finish things" (R)
"I plan things and see them through"
"I have always quickly solved the problems I have faced"
"I avoid my duties" (R)
"I find it difficult to plan things" (R)
"I find it difficult to get down to work" (R)
"I'm always ready to take on my responsibilities"
"I continue working until everything is perfect"
"I waste my time" (R)
[9] According to the definition put forward by several authors (e.g., Caprara *et alii*, 2003; Caprara *et alii*, 2000), the former tends to measure aspects concerning interest in being informed, interest for reading and interest for acquiring knowledge, while the latter measures aspects referring to a favorable disposition towards novelty, the ability to consider everything from various angles, openness to different styles, lifestyles and cultures.

this trait is correlated to educational and training achievement (Barrick and Mount, 1991) and to adjustment to change (Raudsepp, 1990). On the other hand, the hypothesis of a correlation between openness and job performance is controversial. Many of the studies and meta analyses on personality traits and work outcomes (Barrick *et alii*, 2001) found no positive correlation between openness and job performance, also taking different occupational groups into account. However, Tett and colleagues (1991) showed how "there is no *g* factor for personality that would allow the relatively straightforward inference that what is required for one's job is probably required for others" (Tett *et alii*, p. 732). In this regard, Thoresen and colleagues (2004) maintained, for example, that "openness to experience may be a critical factor for performance under certain job circumstances" (Thoresen *et alii*, p. 837), with reference to particular employment periods of transition (such as a new working context, a new work group), in which certain specific characteristics of openness, such as adaptability and mental flexibility, could facilitate access to employment and the worker's integration in the new working context. Finally, the relation between openness and job complexity must be recalled here. "It was seen that openness relates positively to performance in high complexity jobs and negatively to performance in low complexity jobs" (Mohan and Mulla, 2013). In the PIAAC-IT, openness was measured by means of the aforesaid Big-Five personality questionnaire (Caprara, Barbaranelli, Borgogni, 2000). Only 7 items were randomly selected from the original scale and these assessed the degree of openness or of closure (narrow-mindedness)[10].

Proactivity

In the literature, proactivity is considered a general tendency of the individual to implement autonomously generated behaviours without the pressure of external factors or specific environmental factors. Bateman and Crant defined an individual who has a proactive personality as a person who is "relatively unconstrained by situational forces and who effects environmental changes" (Bateman and Crant, 1993, p. 417). It is, thus, a self-nurturing tendency to intervene in the reality to try to configure future events in a coherent manner, by taking the initiative, taking on responsibility and searching for innovation. Many studies have found that proactive individuals obtain better results in terms of adjustment (such as when joining a new social group), positive response to environmental needs (such as entering a new working context), and of innovation and change (such as actions to change the demands of one's job tasks).

This construct was deemed to be interesting for the PIAAC framework because proactivity may be an important psychosocial variable to understand individual orientation in the face of dynamic contexts (such as employment or job market ones). As in other

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[10] These are the items selected for measuring openness (those with an R are reverse items):
"I'm full of ideas"
"I'm very imaginative"
"I have excellent ideas"
"I'm not very imaginative" (R)
"I like thinking up new ways to do things"
"I can cope with a lot of information"
"I love reading demanding things"

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cases, this is a psychosocial dimension which may explain in more detail some PIAAC results concerning, for example, the proficiency of unemployed women compared to unemployed men, and so on.

As regards the operationalization of the construct, it must be said that there are various proactivity scales in existence – some of a general nature, others seeking to assess the degree of "activeness/passiveness" in the face of specific situations and contexts. In the PIAAC-IT it was decided to adopt a shorter version of the original scale (of 17 items) proposed by Bateman and Crant (1993): the Proactive Personality Scale. This shorter version (consisting of 6 items) recalls the one designed by Seibert and colleagues (1999), composed of 10 items, that was translated into Italian and validated by Trifiletti *et al*[11].

Positivity

Over the last decade there has been growing interest in measuring and evaluating positive potential. This interest is part of a broader research paradigm which tends to consider the human being as an agent that can significantly contribute to fulfilling his or her life and actions. Caprara and colleagues, amongst others, have observed how positivity is a dimension "that significantly affects how individuals predispose themselves to actions and experiences" (Caprara, Alessandri, Trommsdorff *et al.*, 2012, p. 77). A positive view of the future is correlated with life satisfaction, self-esteem, and various positive outcomes in social life such as job success, health and social relations. Several studies have found correlations between positivity and the degree of one's life satisfaction (Diener, Emmons, Larsen and Griffin, 1985), self-esteem (Rosenberg, 1965) or optimism (Scheier and Carver, 1987). The link between positivity, self-esteem and positive thinking has also been found by other more recent studies (Caprara and Steca, 2005 and 2006; Caprara *et al.*, 2009).

The degree of positivity and optimism was introduced in the PIAAC-IT survey because it can be an interesting element for predicting people's ability to cope with problems. A positive and constructive orientation in the face of difficulties may favour an accurate search for information, behaviour aiming to strengthen one's skills, and a general conviction of being able to cope (in this sense the positivity construct is close to that of perceived self-efficacy).

With regard to operationalizing the construct, many tools have been proposed so far, but none have obtained unanimous consensus in terms of reliability, validity and stability. The Positivity Test (PT) was introduced by Caprara in order to overcome its limits in psychometric terms and with regard to theoretical anchorage. Genetic, cross-cultural and longitudinal studies on samples of respondents of all ages have validated the goodness of the test, making it one of the most robust tools for measuring

[11] Items for measuring a proactive personality:
"I am constantly searching for new ways to improve my life"
"If I see something I don't like, I try to put it right"
"My first impression of people is always right"
"I love sticking with my ideas even when others don't agree with them"
"I am very good at finding opportunities"
"I always look for the best way to do things"

positivity. The instrument was validated in Italian (Caprara, 2013) and contains four items, all included in the PIAAC-IT questionnaire[12].

Learning and performance orientation

Motivational orientation towards learning is a psychological characteristic of individuals that may condition their behaviours, above all with reference to educational and training experiences, and more generally to the acquisition of competencies. It is a non-cognitive dimension with a prevalently motivational component of goal-directed behaviour. The concept first appeared in the literature in the 1970s thanks to the work of Eison (Payne *et alii*, 2007), but its development received decisive impetus from contributions by Nicholls and Dweck. Dweck, in particular, "identified two major classes of goal orientations: (a) a learning goal orientation, which is to develop competence through expanding one's abilities but mastering challenging situations, and (b) a performance goal orientation which is to demonstrate and validate one's competence by seeking favorable judgments and avoiding negative judgments" (Vande Walle *et al.*, 2001, p. 629). This conceptual modeling was also taken up by various educational psychologists (Button, Mathieu and Zajac, 1996). Jha and Bhattacharyya (2013) put forward a short comprehensive summary of the differences between learning orientation and performance orientation.

Table 1. Differences between learning orientation and performance orientation

Learning-Oriented Individual	Performance-Oriented Individual
Not concerned much with mistakes (Bouffard and Couture, 2003; Dweck and Leggett, 1988)	Persist if they feel that they are skilled (Kohli et al., 1998)
More interested in building skills and abilities for long-term performance (Kohli et al., 1998)	More interested in building skills and abilities for short-term performance (Kohli et al., 1998)
Demonstrate continuous improvement of performance (Dweck and Leggett, 1988)	To portray themselves as successful is important (Ames and Archer, 1988)
Driven by intrinsic motivation (Gonzalez et al., 2001; Kohli et al., 1998)	Driven by extrinsic motivation (Ames and Archer, 1988)
Require teacher-directed learning environments less (Veermans and Tapola, 2006)	

Source: Jha and Bhattacharyya (2013)

[12] Items for assessing positivity:
"I have great faith in the future"
"I'm satisfied with my life"
"I think I have a lot to be proud of"
"I am generally very self-confident".

An examination of this construct may be useful for the development of the PIAAC survey because it grasps one of the potentially predictive aspects of commitment, of motivational drive and of more or less favorable orientation towards processes linked to competence acquisition. This is a non cognitive dimension that can explain the activation and commitment of people in seeking opportunities for cultural and professional enrichment and development. Various batteries in English have been developed to assess goal-orientation (learning versus performance). The one developed by Button and colleagues (1996), called the Goal Orientation Scale, contains 16 items in its original version[13] and was adopted in the PIAAC-IT survey.

Research design and survey sample

PIAAC-IT has the aim to follow-up the sample of respondents interviewed in the PIAAC-OECD survey in 2011-12, less those who declared they were retired and disabled during the survey itself. The PIAAC-IT was designed in order to analyze the link between cognitive skills (literacy and numeracy) and non-cognitive dimensions for their importance as predictive variables in achieving social outcomes. Hence the decision to focus only on specific targets of the PIAAC-OECD sample (employed, unemployed, students, young inactive people), that is, those subjects characterized by greater participation in the job market and in social construction processes.

The PIAAC-IT study is thus, to all intents and purposes, quite a continuation of the PIAAC-OECD survey but it is not merely a longitudinal study in the strict sense: in fact even if it is designed to trace the dynamics of the world of work and any link between having or not having certain competencies which are considered fundamental to live and work in today's societies; the cognitive skills have not been measured again but the survey was carried out through direct interviews by means of a questionnaire ad-

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[13] [Scale Responses: 1=Strongly Disagree, 2=Disagree, 3=Disagree Slightly, 4=Slightly Agree, 5=Agree, and 6=Strongly Agree]
1. The opportunity to do challenging work is important to me.
2. When I fail to complete a difficult task, I plan to try harder the next time I work on it.
3. I prefer to work on tasks that force me to learn new things.
4. The opportunity to learn new things is important to me.
5. I do my best when I'm working on a fairly difficult task.
6. I try hard to improve on my past performance.
7. The opportunity to extend the range of my abilities is important to me.
8. When I have difficulty solving a problem, I enjoy trying different approaches to see which one will work.
9. I prefer to do things that I can do well rather than things that I do poorly.
10. I'm happiest at work when I perform tasks on which I know that I won't make any errors. (…) (…)
11. The things I enjoy the most are the things I do the best.
12. The opinions others have about how well I do certain things are important to me.
13. I feel smart when I do something without making any mistakes.
14. I like to be fairly confident that I can successfully perform a task before I attempt it.
15. I like to work on tasks that I have done well on in the past.
16. I feel smart when I can do something better than most other people.

ministered to the respondents of the previous PIAAC-OECD survey, for whom there was already a score of their literacy and numeracy skills. The choice of variables was driven by methodological and theoretical reasons, but also by more contingent reasons, such as the achievement of a practicable questionnaire length for the survey.

The PIAAC-OECD survey had been designed to provide reliable estimates for the entire target population, that is, 39,844,163 people – the total number of individuals aged 16-65 years, residing in Italy on 1 January 2011. In particular, a wholly probability sampling design was used (without allowing for the substitution of non-respondents) in several selection stages with a stratification of the Italian municipalities, selection of households and selection of the individual to be interviewed in each household among those eligible, by means of a random selection grid.

To provide reliable estimates for the entire target population in the study, the PIAAC used methodologies based on a calibrated regression estimator of the GREG type (Sarnal *et alii*, 1992) for the weight construction procedure. This guaranteed ensured that the estimates of absolute frequencies of the auxiliary variables used as regressors coincided with the known totals observed in the population and established as calibration constraints. In particular, the reference estimates were obtained from the data provided by the social surveys conducted by the Italian National Institute of Statistics (ISTAT) on households and individuals with reference to 2010 and the known totals established in the PIAAC procedure were chosen in order to guarantee consistency with respect to:

- geographical area: North-East, North-West, Centre, South and Islands (Sicily and Sardinia);
- the population's socio-demographic composition: sex, age group, occupational status (employed/unemployed) and academic qualification (below high school diploma, high school diploma, or above high school diploma).

For more details on the PIAAC-OECD sampling process and estimation procedure, see the PIAAC National Report on Adult Competencies (*Rapporto nazionale sulle competenze degli adulti*)[14].

As already said, the PIAAC-IT respondent are established on the basis of the PIAAC-OECD study respondents: 4621 individuals less those who were now outside the parameters (retired and disabled people). Hence, the PIAAC-IT questionnaire was given to 4,043 respondents made up of residents aged between 18 and 68 years (the individuals who during the PIAAC-OECD survey, carried out in 2011-12, were between 16 and 65 years of age). Planning of the interviews to be carried out (2,000 complete interviews) was done so as to guarantee the necessary number of respondents in the sample for statistically significant estimates for the whole target population.

The PIAAC-IT respondents correspond to 34.8% of the PIAAC-OECD sample. Thanks to the adoption of interview quality criteria (interviewer selection, previous working experience with the PIAAC-OECD survey and the specific training of the interviewers) and interview monitoring systems, it was possible to considerably limit the errors found on the final database, thereby considerably shortening the control and correction process.

[14] http://www.isfol.it/piaac.

The survey was constantly monitored throughout its course in the field in order to guarantee reaching the target, but also to obtain information on the contact attempts and interview status (refusal or response), and the following results were obtained: a response rate of 49.5%, with 2003 complete interviews.

To make sure there was an adequate number of respondents in the PIAAC-IT to guarantee reliable estimates for the whole target population, particular attention was paid to the calibration procedure also to correct for the effect deriving from sample self-selection. Not having allowed for an *apriori* planning of the interviews to be conducted (it being difficult to achieve) in each stratum (geographic area or socio-demographic composition of the population), the sectional sample at the end of the survey phase was certainly affected by a self-selection effect. This was due to classic socio-demographic phenomena such as territorial mobility, deaths or household separations, and to the "natural" heterogeneity of the individuals' response propensity (women, youth and respondents with a higher academic qualification turned out to be more willing to undergo a second interview).

Since the PIAAC-IT aimed to consider the analysis as a prospective one, it was decided to consider, as reference, the population at time t0 = 2011, thus referring the study to the estimates produced by the PIAAC-OECD survey (2011-12) and using appropriate corrections for non-responses.

By means of Classification Tree Analysis, homogeneous subpopulations are established with regard to certain individual characteristics which are used in order to specify the known totals to be established as constraints of longitudinal calibration. The final panel weight is obtained by starting from the sectional weight corresponding to the year and by applying a calibration corrector allowing for the effects of wastage, summarizing a great deal of information useful for producing the main longitudinal estimates. The aim is to use all the knowledge available in order to remove such phenomena from the panel data and to focus the attention on the following aspects:

- correcting for the lack of response due to demographic factors (death, change of domicile, other reasons for leaving the household, etc.);
- correcting for the lack of response due to non-demographic factors (telephone number unknown, refusal, poor sensibility with regard to the survey topics, etc.);
- the need to produce panel estimates in line with the PIAAC-OECD target population 2011-12 and the ISTAT social surveys on households and individuals referring to the year 2013;
- producing longitudinal estimates for phenomena of primary interest for the survey (transitions between occupational states).

The relation between competencies and non-cognitive skills

Here follow the results of the analysis of the data gathered according to the aforesaid procedures. In particular, they concern:

a. the results of the analysis of reliability and the construction of the index;

b. the results of the set of correlations obtained between the non-cognitive measures and the variable relating to the score measured through the PIAAC test.

Various analysis and verification operations were conducted starting from the scales presented in the questionnaire in order to grasp the non-cognitive dimensions of the competencies. In a first step, for each scale, Cronbach's Alpha was calculated along with the scale values, normalizing them on a range from 1 (minimum) to 5 (maximum). Cronbach's Alpha is a particular interclass correlation coefficient which measures the reliability of a scale through its *internal consistency*, that is, the degree of agreement among the questionnaire items. In other words, Cronbach's Alpha allows us to assess to what extent the various items of a scale univocally go to measure the underlying construct. Cronbach's Alpha is based on a relationship between the variability of the individual variables (or scores) and the variability of the sum variable.

The following values are normally assumed:

- values > 0.90: excellent;
- values between 0.80 and.90: good;
- values between 0.70 and.80: fair;
- values between 0.60 and.70: satisfactory;
- values < 0.60 unsatisfactory.

These thresholds must obviously be taken as indicative (above all, at a testing and validation stage) and thus susceptible to a certain margin of discretion on the part of the data analyst. One must also bear in mind that Cronbach's Alpha is sensitive to the number of items making up the scale. The higher the number of items, then generally the higher the value of the index.

Here is the table relating to the eight scales produced starting from the original battery of items.

Table 2. The eight scales adopted in the PIAAC-IT survey

Variable	Cronbach's Alpha	N. of Items	Reliability
External LOC	.780	8	**
Internal LOC	.628	9	*
Proactivity	.650	5	*
Openness	.781	7	**
Conscientiousness	.792	8	**
Positivity	.714	4	**
Performance orientation	.748	5	**
Learning orientation	.806	6	***

Source: ISFOL, PIAAC-IT Survey (2014)

As the table above shows, all the scales exceeded the critical threshold of 0.6 and many of them had more than satisfactory Cronbach Alpha values. The following table also includes the mean, upper and lower limits and standard deviation of each scale.

The standard deviation (and hence the estimate of the variability of a measurement in a population) appears to be very similar among the scales produced, showing considerable uniformity of the normal distributions.

Table 3. The eight scales adopted in the PIAAC-IT survey: descriptive statistics

	N	Minimum	Maximum	Mean	Std. Deviation
External LOC	2003	1.00	5.00	3.1993	.75282
Internal LOC	2003	1.17	5.00	3.7078	.50845
Proactivity	2003	1.20	5.00	3.8497	.47864
Openness	2003	1.00	5.00	3.6699	.58840
Conscientiousness	2003	1.25	5.00	3.0330	.56172
Performance orientation	2003	1.20	5.00	3.7691	.61781
Learning orientation	2003	1.00	5.00	3.8822	.55421
Positivity	2003	1.00	5.00	3.6393	.63780
Valid N (listwise)	2003				

Source: ISFOL, PIAAC-IT Survey (2014)

Finally, the mean values of the obtained measures must be considered. These measures (in view of the previously illustrated reliability and substantial normality) are thus replicable and can undergo ANOVA (Analysis of Variance) on the basis of the variables considered each time as independent on the basis of the PIAAC theoretical framework and of the various needs of the study.

The next step after constructing the scales (and the reliability analysis) consisted of estimating (by means of the Pearson correlation coefficient, which expresses a linear relation, if any, between two statistical variables) the bivariate relations between the aforesaid scales and the literacy measure produced by the PIAAC study (in this case, the so-called "plausible value 1", in table PVLIT1, was used).

From the set of correlations between the scales and the result of the PIAAC test, we can observe that several non-cognitive dimensions (both motivational and relating to specific personality traits) are at the same time significantly correlated each other and correlated to the level of skills measured by the PIAAC test. So we can affirm that the levels of competence functional to the work and social life of individuals are substantially associated not only with the variables of type ascriptive and socio-demographic (as well-known in literature), but also with factors of a psychological nature. As we have seen, the scales used for the detection of these dimensions (with methods of "self-reporting») show a more than acceptable, and sometimes good, reliability on the psychometric and statistical plan.

Table 4. Bivariate relations between the scales adopted in the PIAAC-IT survey and plausible **value 1**

	External LOC	Internal LOC	Proactivity	Openness	Conscientiousness	Performance orientation	Learning orientation	positivity	PVLIT1
External LOC	1								
Internal LOC	0.011	1							
Proactivity	0.036	.315**	1						
Openness	-.066**	.197**	.523**	1					
Conscientiousness	-.123**	.281**	.431**	.387**	1				
Performance orientation	.276**	.301**	.165**	-0.029	.102**	1			
Learning orientation	-.102**	.275**	.530**	.539**	.425**	.089**	1		
Positivity	-.190**	.303**	.372**	.364**	.388**	0.037	.381**	1	
PVLIT1	-.211**	-.123**	.049*	.133**	.060**	-.168**	.123**	.053*	1

** The correlation is significant at level 0.01 (two-tailed).

* The correlation is significant at level 0.05 (two-tailed).

Source: ISFOL, PIAAC-IT Survey (2014)

The relationship between competencies and non-cognitive dimensions

Looking at the correlations within the group of non-cognitive dimensions, it is important to underline the strength of association among the "Positivity" measure with those defined as "Conscientiousness" (r=.388), "Learning orientation" (r=.381) and "Proactivity" (r=.372): this is a core of common variance that opens up new tracks of analysis on the complex relations between the non-cognitive dimensions and the impact of these dimension on the levels of competence measured by proficiency test.

In a similar way, it can be observed a strong and substantial correlation among the "Learning orientation" measure and those defined as "Openness" (r=.539), "Proactivity" (r=.530) and "Conscientiousness" (r=.425).

In this case the core of common variance is even stronger and the correlation set provides important indications on the non-reciprocal independence among the non-cognitive dimensions. Looking at the correlation among the non cognitive dimensions and the level of skills measured by the PIAAC test, we can observe both positive and negative correlation (and it means that the non-cognitive traits are not playing the same role in relation to the possession of a given level of competence). We find considerable and significant negative correlations for the dimensions relating to "External Locus of Control" (r= -.211), to "Performance orientation" (r= -.168), and positive correlations for "Openness" (r=.133) and "Learning orientation" (r=.123). Obviously we cannot say if those non cognitive dimensions have an influence on cognitive test scores or vice versa, but for the case of the correlation among the cognitive score and the dimensions "Openness" and "Learning orientation", we can legitimately assume a mechanism of mutual reinforcement. Similarly, the relationship between "External LOC" (that approximates the degree of fatalism) and "PVLIT1" shows a clear and intelligible dynamic (individuals more fatalistic performed worse in the test, but we also know that fatalism is linked to elements referring both to the personality and to the cultural environment – e.g., family background or educational level – of an individual).

In conclusion, it is important to emphasize that all of these correlations (as shown in the table) are significant for a p value of 0.01. They are thus fully significant. Other correlations also emerged from the analysis, but they either had a lower p-value than the ones illustrated so far or are very close to zero (thereby indicating the absence of a linear type relation between the scale and the competence measured).

Conclusions

This article introduced the origin, the purpose and the methodological design of the "PIAAC Italia Survey" ("PIAAC-IT"). The PIAAC-IT survey attempted to overcome the limitations encountered in previous investigations and to lead to a series of encouraging results, on both theoretical and methodological level. As the previous IALS surveys, the PIAAC or PISA surveys "are a remarkable development, very carefully designed to provide robust information on literacy" (St. Clair, 2012, p. 773) and on other foundation skills. Despite this, we would argue that we need other elements to understand how policy makers, practitioners and researchers should intervene. Sometimes a certain level of frustration persists in opinion leaders or policy makers when they use direct

measures of proficiency. In their «objectivity» these measures tend to produce a rich estimate of the situation of adult skills, but such a kind of estimate is still insufficient to understand on which levers they need to act, the policies they should adopt, the micro-interventions they should implement and the specific target populations they should take into consideration.

Bowles and Gintis (1976) already in 1976 have "highlighted the role of attitudes, motivation and personality traits, rather than academic skills, as determinants of labour market success. Their findings have been reinforced by more recent studies, which have demonstrated the significant role of non-cognitive skills (e.g., attitudes, motivation and personal characteristics) over and above cognitive skills in shaping labour market outcomes, social behaviour and health (Farkas, 2003, Heckman *et al.*, 2006)" (Gutman and Schoon, 2013, p. 7). The non cognitive dimensions could covariate with or explain the level of proficiency. Non cognitive dimensions such as fatalism, learning orientation, motivation could be strongly related to the level of proficiency, and they could give a better explanation of several phenomena, together with classical variables such as education or occupation. The results of the PIAAC-IT survey confirm – at least in a promising way – these hypotheses. According to the results of the survey it can be stated that the scales adopted in order to measure the non cognitive dimensions show a more than acceptable and sometimes good reliability. Moreover, several dimensions analyzed – related to specific personal traits or to motivational dimensions – are significantly correlated to the level of skills measured by the PIAAC tests (literacy and numeracy). This means that the level of individual skills seems to be associated not only to variables of ascriptive or to socio-demographic factors, but also to psychological factors (e.g., learning orientation, fatalism, openness).

It would be interesting and useful to take into consideration various other dimensions of potential interest in terms of their relationship with the foundation skills. For example, some domains or dimensions of personality related to the Big Five model could be taken into consideration (e.g., extraversion and neuroticism). But also other variables deserve a similar exploration to the one conducted here: for instance, the size of social networks of respondents or the variables that fall under the broad and sometimes a bit vague label of "emotional intelligence". If future surveys will base their frameworks both on cognitive and non cognitive dimensions, a finer analysis about the social groups that are particularly vulnerable in terms of life and work outcomes will be available. Thus, it will be more easily implementing targeted policies and intervention plans, in schools and universities as well in employment services. These surveys won't be tools with (mainly) descriptive purposes anymore, but tools for social and psychological diagnosis, able to guide policies and intervention initiatives.

Finally, concerning the limits of this article, we believe that multidimensional analyses are needed to estimate the relation between cognitive and non cognitive dimensions, controlling for socio-demographical characteristics and other variables. For reasons of parsimony these analyses have not been included in this article. These analyses will clarify still further the importance of non cognitive dimensions in the analyses of skills.

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