Assessing firm innovativeness through work-life balance

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Abstract:

Assessing firms’ innovativeness is not an easy task. The literature recognises a number of innovativeness indicators, all of which have their pros and cons. Most of them are technology-based indicators, such as R&D budget or patents, which perform well in high-tech industries but might be ineffective in other industries where patenting is not usual or in which R&D budgets are low or not formalised.

In this paper, we critically review previous innovativeness indicators and we propose a new approach to assess firm innovativeness that is based not on the role of technology but on that of people. This new approach focuses on work-life balance benefits that are connected with motivation, engagement and creativity in the workplace. We argue that this could be an effective new indicator to assess the innovativeness of firms. Work-life balance benefits could be combined with previously used indicators, and might have considerable advantages such as their suitability for application in any kind of firm regardless of its technological profile.

Key words: Firm innovativeness, Work-life balance

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1. Introduction

Innovativeness refers to a firm’s capacity to engage in innovation; that is, introduction of new products, new processes, or new marketing or organisational methods (OECD, 2005; Hult et al., 2004). This capacity to innovate represents a crucial competitiveness factor influencing different facets of organisational and innovation performance (Rhee et al., 2010; Hurley and Hult, 1998). As a result, an extensive literature stream has emerged showing the importance of inter-firm differences for innovativeness within industries (Talke et al., 2010; Sadowski and Sadowski-Rasters, 2006). More precisely, recent studies have found that innovativeness represents a relevant advantage not only in terms of new product development (Schultz et al., 2013; Salomo et al., 2008), but also with reference to leadership and working climate (Stock et al., 2014; Chiang et al., 2014), adaption to the environment (Akgun et al., 2014; Calantone et al., 2002), and internationalisation (Chiva et al., 2014; Kafouros et al., 2008; Pla-Barber and Alegre, 2007; Basile, 2001).

Furthermore, innovativeness is indeed an important issue for managers who have to make decisions on which firms are the most suitable to cooperate and share knowledge with. Open innovation models (Laursen and Salter, 2014; West et al., 2014; Spithoven et al., 2013; Van de Vrande et al., 2009; Chesbrough, 2003) are becoming increasingly popular in both academic and practitioner circles. Chesbrough (2006) defines open innovation as “the use of purposive inflows and out-flows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively”. In this vein, recent studies are examining matchmaking for successful projects from an open innovation approach (Holzmann et al., 2014; Katzy et al., 2013).
In addition, from the perspective of policy making for innovation support, policy-makers increasingly demand reliable signs that public money is to have significant and tangible outcomes. Innovativeness might determine which firms will make the most of resources from public innovation programmes (Knockaert et al., 2014; Herrera & Sánchez-González, 2013; Clarysse et al., 2009; Autio et al., 2008). Indicators on innovativeness can also be used to appraise the impact of previous innovation policies.

However, assessing the innovativeness of firms is not an easy task (OECD, 2005). The literature recognises a number of innovativeness indicators. Most of them are technology-based indicators, such as R&D budget or patents, which perform well in high-tech firms but might be ineffective in firms operating in other industries where patenting is not usual or in which R&D budgets are low or not formalised (Flor and Oltra, 2004). Small and medium enterprises (SMEs) are another category in which classic technology-based indicators might not work well (Sterlacchini, 1999). Many SMEs do not have an R&D department, do not do R&D or do not report it. Some SMEs might experience more problems than large firms when carrying out R&D activities (Rammer et al., 2009). With the exception of high-tech SMEs, they normally have low or no propensity to patent.

In this paper we critically review previous innovativeness indicators and we propose a new approach to assess the innovativeness of firms that is not based on the role of technology but on that of people. This new approach focuses on work-life balance benefits connected with motivation, engagement and creativity in the workplace. More precisely, we note that one widespread common feature of creative firms is the presence of work-life balance benefits for employees (James, 2014, 2011; Chiva et al., 2014). After assessing the pros and cons of this new approach, we finally
argue that this could be an effective new indicator to assess the innovativeness of firms. The presence of work-life balance benefits could be combined with indicators used previously, and might have major advantages such as their suitability for application in any kind of firm regardless of its technological intensity and its size.

2. Assessment of firm innovativeness

The literature reports a wide range of procedures to assess firm innovativeness. A review of the extant literature identifies two different perspectives to assess firm innovativeness: (1) the firm’s achievements perspective, and (2) the firm’s characteristics perspective. The first approach acknowledges the firm’s innovation achievements such as patents or new products, which vouch for its innovativeness. The second approach focuses on organisational characteristics or pre-requisites upon which the firm’s capacity to engage in innovation activities is grounded.

2.1. The firm’s achievements perspective

Patents

The OECD’s Oslo Manual (2005) defines a patent as “a legal property right over an invention that gives its owner exclusive rights with limited duration to exploit it, while at the same time disclosing the details of the patent”. Based on the assumption that the patent portfolio of a firm reflects its technological potential, patent statistics have been widely used in various ways as innovativeness indicators (Sadowski and Sadowski-Rasters, 2006; OECD, 2005; Hagerdoorn and Cloodt, 2003).

Patent statistics are widely used as indicators of the output of the firm’s research activities (OECD, 2005). The number of patents granted to a given firm may reflect its technological dynamism. The analysis of the evolution of patents provides useful hints on the directions of technological change in a particular firm. While patents have the
advantage of being an objective indicator that comes from accessible published information, there are several disadvantages to their use as an innovativeness indicator (OECD, 2005; Santarelli and Piergiovanni, 1996; Coombs et al., 1996). Patenting is not the only protection mechanism that firms can use (Coombs et al., 1996). As a result, previous studies evidence that firms have different motives and different propensities to patent according to their size (Holgersson, 2013; Santarelli & Piergiovanni, 1996), their strategy (Zhang et al., 2014; Holgersson, 2013; Blind et al., 2009), and the technological features of the industry in which they are operating (Brouwer and Kleinknecht, 1999).

Furthermore, the technological and economic value of patents can vary widely (Griliches, 1990). In fact, some patents might have no technological and economic value at all. In terms of innovation capacity, a patent count might therefore provide only vague information. Some scholars have dealt with this limitation by carefully analysing patents in terms of technological relevance or by examining patent citations to assess their technological impact (OECD, 2005; Albert et al., 1991).

Finally, an additional drawback is that patent databases do not include certain types of innovation such as innovation in services or organisational innovation (Santarelli and Piergiovanni, 1996, Hipp and Grupp, 2005). Table 1 shows some of the basic issues when patents are considered as an indicator to assess firm innovativeness.

Take in Table 1

Innovativeness surveys based on a firm’s achievements

A consistent stream within the innovation management literature has been concerned with analysing firm innovativeness through continuous assessments. The OECD’s Oslo Manual has traditionally provided measurement scales to assess
innovativeness in terms of products and processes. Its latest edition (OECD, 2005) also includes organisational and marketing issues.

The literature has paid special attention to the product portfolio in terms of newness to the firm and newness to the market (Wheelwright and Clark, 1992; OECD, 2005; Alegre and Chiva, 2008). García and Calantone (2002) provided a subsequent development that examined the newness of the product for the firm and the industry in terms of market newness and technology newness. García and Calantone (2002)’s influential operationalisation of product innovativeness has been extensively used (Talke et al., 2010; Renko et al., 2009).

Innovativeness surveys are based on continuous measures, mostly measurement scales. They assume that respondents are sincere, reliable and knowledgeable on the issue they are asked about. Scholars are normally very careful when choosing the key respondents for their surveys to maximise the possibility that these assumptions will be met. Innovativeness measurement scales allow researchers to assess different dimensions or nuances of the concept. They have the advantage of providing first-hand information on the firm’s capacity to engage in innovation. However, Santarelli and Piergiovanni (1996) highlight four main risks related to innovation surveys: possible conceptual confusion (especially in the case of new measurement scales), inadequate respondent, non-response bias and overestimation. Table 2 reports some basic issues when surveys and measurement scales are considered as a means to assess firm innovativeness.

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Take in Table 2

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*New product count and analysis*
The LBIO (Literature-Based Innovation Output) indicator was put forward by a number of scholars to provide a more complete picture of innovation outcomes (Coombs et al., 1996; Santarelli and Piergiorgi, 1996; Kleinknecht et al., 1993; Edwards and Gordon, 1984). The LBIO indicator consists of counting the number of new products firms in an industry launch by examining publications in trade and technical journals (OECD, 2005). The use of this indicator assumes: (1) that firms are interested in publicising their new products (features, functions, etc.) within their industry through specialised industry, trade and technical journals, and (2) that those journals have a new products section in which the editor is interested in publishing such innovations.

The LBIO indicator methodology is particularly appropriate for analysing innovative profile in products. In this vein, scholars such as Kleinknecht and colleagues (1993) and Santarelli and Piergiorgi (1996) do not simply count the new products, but also establish a classification scheme based on the degree of complexity and the type of novelty they represent. The degree of complexity is a factor associated with the knowledge on which the innovation is based, while the type of novelty is a measure of the complementarity of the new product with regard to what it replaces.

The LBIO indicator and classification scheme has been extensively and satisfactorily used in several industries and countries (Dolfsma and van der Panne, 2008; Alegre et al., 2005; Alegre-Vidal et al; 2004; Flor and Oltra, 2004; Hagedoorn and Cloodt, 2003; Santarelli and Piergiorgi, 1996).

With regard to its disadvantages, Kleinknecht (1993) and Santarelli and Piergiorgi (1996) highlight that product counting and analysis though the LBIO method has a similar drawback to patents: firms and industries might have different propensities to publicise their new products and achievements through publications in
trade and technical journals. Hence, researchers cannot be sure that all innovations will be gathered and analysed through this procedure. Furthermore, the LBIO procedure does not include other types of innovation such as process innovation, service innovation, marketing innovation or organisational innovation (OECD, 2005). Table 3 reports some basic issues to bear in mind when considering the LBIO indicator as a means to assess firm innovativeness.

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Take in Table 3

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2.2 The firm’s characteristics (pre-conditions) perspective

The innovation management literature includes another perspective to assess innovativeness that is based on the pre-conditions of being innovative. A general assumption from this perspective is that some firm characteristics are strongly correlated with innovativeness in such a way that firms that score high in these characteristics or antecedents are likely to be more innovative. This approach is well aligned with the concept of capability or the potential to do something. In general terms, one common advantage for the indicators included in this approach is that they normally have a significant positive effect on any of the innovation types: products, processes, organisational and marketing.

R&D budget

R&D budget is based on data on the inputs of the innovation process published in company or sectoral reports. R&D has been extensively used in technology and innovation literature under the assumption that R&D activities will be successful and develop some kind of innovation (Ortega-Argilés et al., 2009; Cainelli et al., 2004;
Evangelista et al., 1998; Patel and Pavitt, 1995). R&D budget information is usually available at the company level and at the industry level. It is an objective indicator that represents relevant current innovation activities.

The literature underscores the following main drawbacks for R&D budget as an indicator of innovativeness (Adams et al., 2006; OECD, 2005; Jacobsson et al., 1996; Santarelli and Piergiovanni, 1996; Patel and Pavitt, 1995). First, some firms, especially SMEs, could be carrying out R&D activities without having an R&D department or a formalised R&D budget. This could undermine the assessment of innovativeness. Second, innovation requires other non-R&D activities to be carried out. A firm could excel in R&D but not in other complementary activities. Third, high levels of R&D could simply be veiling inefficiencies rather than a high innovation capacity. A firm could be investing in R&D unwisely or encountering organisational and coordination problems. Fourth, according to the Oslo manual (OECD, 2005), some firms may experience problems in differentiating between R&D expenditure and other innovation activities, especially at the borderline between R&D and non-R&D activity. Fifth, distinguishing R&D and other innovation activities is particularly difficult for services, due in part to the fact that these activities in services tend to be less formally organised, and that R&D in services is less well defined than in manufacturing. R&D budget could therefore be undermining innovativeness assessment in service firms (OECD, 2005). Finally, the literature acknowledges the phenomenon of non-R&D innovators (Sterlacchini, 1999; Rammer et al., 2009). Therefore, for a number of innovative firms that do not perform any R&D this indicator would not be adequate. Table 4 reports some basic issues when considering R&D as an indicator of firm innovativeness.

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Take in Table 4
Surveys on innovativeness based on the firm’s characteristics

A number of studies have developed measurement scales to assess innovativeness directly at the business unit level (Gatignon et al., 2002) or at the firm level (Akgun and Keskin, 2014; Inemek and Matthyssens, 2013; Calantone et al., 2002). As these are questionnaire-based surveys, it must be stressed that they are based on perceptual measures. They have the same advantages and disadvantages as the innovation outputs surveys.

These innovativeness measurement scales allow researchers to assess different dimensions or nuances of the concept that have to do with the firm’s characteristics in terms of its capacity to engage in innovation. Table 5 outlines some basic issues when surveys and measurement scales are considered to assess firm innovativeness.

Data on employees’ education

Knowledge is a crucial ingredient for innovation. A great deal of knowledge is embodied in people and their skills. The role of human capital in innovation is also relevant in terms of making an intelligent use of external sources or codified knowledge (Evangelista and Savona, 2003; OECD, 2005).

Data on employees’ education is based on data published in company or sectoral reports. Jacobsson and Oskarsson (1995) proposed using these educational statistics as an indicator of technological activity and they could therefore be used to assess the innovativeness of the firm. Subsequent studies have shown the link between employees’ educational level and R&D budget and patents (Jacobsson, Oskarsson and Philipson,
1996; OECD, 2005). While these statistics originally focused on the number or the proportion of engineers and scientists, this approach has been broadened out and now any kind of knowledge employees or skilled human resources is generally accepted (OECD, 2005). The basic assumption underlying the use of this indicator is that engineers, scientists and knowledge employees are the main carriers of creativity in terms of market and technology.

Data on employees’ education is usually available at both company and industry level. The literature underscores three main advantages: (1) it is an objective indicator that represents current relevant innovation activities; (2) it covers firm innovativeness adequately, and is a good antecedent for any type of innovation; (3) it does not discriminate against SMEs as it can be used in all organisational sizes (Jacobsson et al., 1996). Moreover, it is important to note that data on employees’ education can also provide a fair assessment of non-technology based innovativeness, which might be particularly useful when looking at low technology firms.

A general disadvantage concerns the efficiency of knowledge workers in a particular firm (OECD, 2005; Jacobsson et al., 1996). This efficiency could be distributed heterogeneously; that is high levels of knowledge workers could be veiling inefficiencies instead of a high innovation capacity (Table 6).

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Take in Table 6

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3. Exploring the human side of firm innovativeness: work-life balance benefits

The work-life balance concept
The feasibility of innovation depends on several factors, such as corporate finance, networking, marketing strategies, and human resource (HR) management (Wichitchanya and Durongwatana, 2012; OECD, 2005). Specifically, HR management directly and indirectly affects the rest of the factors, because it concerns the people that influence operations, productivity, work-life quality and profitability (Cascio, 2006).

Prior research has identified how HR management affects innovation and corporate performance (Heritage, 2006; Veersma, 2000). HR global systems (Huselid, 1995) as well as specific HR practices such as training (Jiménez-Jiménez and Sanz-Valle, 2005), reward systems (Bau and Dowling, 2007; Chandler et al., 2000), job design variables (Parker et al., 2006) and performance appraisal (Lee et al., 2006, Shalley et al., 2004) have been associated with the firm’s innovation capabilities.

The HR literature suggests that HR practices are central to a firm’s innovativeness, since employees are themselves important sources of innovation (Gomez-Mejia et al., 2004). Recent studies also suggest that employees’ innovative work behaviour could be affected by the HR practices implemented as well as the presence of a supportive work environment (Madjar, 2005). The perception of a supportive and encouraging climate at work can enhance the innovative response from employees and also the way these responses are adapted into the organisations (Prieto and Pérez-Santana, 2014, Amabile et al., 1996). A supportive work environment is likely to encourage engaged employees to come up with innovative and creative ideas (Binnewies and Gromer, 2012).

The role of work-life balance in creating a supportive work environment has been previously analysed (Cook, 2009). However, the relationship of work-life balance and innovation remains scarcely explored (James, 2014).
The work-life balance (WLB) phenomenon emerges as a response to different demographic, economic and cultural changes such as the increasing integration of women in the workplace, technological advances, decline of the birth rate and the need to improve human capital management (Anderson et al., 2002; Pasamar and Valle, 2011; Benito-Osorio et al., 2014). Societal values have changed and as a result, employees are expressing interest in a more balanced work commitment (Burke, 2010). One of the challenges employees face on a daily basis is how to juggle commitments of paid work, home and family. Consequently, employers could enhance learning and innovation processes by providing work-life benefits. Employees who can balance work and life issues are able to concentrate better at work (James, 2014).

At present, the WLB approach includes not only employees with family obligations but any employee who wants to attain a balance in his or her work and non-work activities such as sports, study and travel (Kalliath and Brough, 2008). Work-life balance refers to the ability of individuals, regardless of age or gender, to find a rhythm that will allow them to combine their work with their non-work responsibilities, activities and aspirations, regardless of whether they have family responsibilities or not (Hughes and Bozionelos, 2007).

Several certification programmes have recently appeared to accredit a firm’s orientation to achieve a balance between its own business interests and its employees’ concerns. One such programme is the Work & Life Balance Certification, designed by the European Institute of Social Capital, which involves organisations implementing 19 WLB initiatives. The EFR certification (from the MasFamilia Foundation), the berufundfamilie certificate (from The Hertie Foundation), the Family Audit Standard (Trento, Italy) or the Work-Life Friendly Certification offered by the Government of Quebec are some other examples.
WLB benefits currently include a broad range of practices such as space and time flexibility, periods of leave, compressed working week, extensions to maternity or paternity leave, life skill programmes, working from home, or insurance (Kopelman, et al., 2006; Pasamar, 2015).

Work-life balance implications

Positive consequences of WLB for individuals and organisations have been highlighted by previous studies: reduction of conflicts in the workplace, improved physical and mental wellbeing, life and job satisfaction and commitment, reduced absenteeism and staff turnover, influence on recruitment processes and higher organisational performance and productivity are some of the outcomes linked to the implementation of WLB benefits (Pasamar and Valle, 2015; de Sivatte and Guadamillas, 2013; Hughes and Bozionellos, 2007; Wise and Bond, 2003; Scandura and Lankau, 1997). Interestingly, WLB benefits have been positively related to the work attitudes of people who directly benefit from such policies as well as of those who do not (Grover and Crooker, 1995). WLB practices have also proved useful in large organisations as well as in small firms, as they enable them to retain skilled workers, reduce costs through better productivity and efficiency, and increase profitability (Cegarra-Navarro et al., 2015).

However, the consequences for learning in firms that have introduced work-life arrangements to foster everyday innovation, creativity and learning have attracted little attention from researchers (James, 2014, James 2011). By making WLB benefits available, employers can exert a positive impact on the institutionalised learning and innovation environment (James 2011). Workers’ self-determination – or autonomy over the place and distribution of working hours – should increase employees’ freedom and autonomy, thus raising the quality of everyday performance (James, 2011). Individuals’
and teams’ autonomy in their daily work enhances learning and the generation of ideas (Bailyn, 1985). Effective learning and innovation require employees to feel motivated and engaged (Benner, 2003; Amar, 2004).

Learning and innovation also require effective communication (Brown and Eisendhart, 1995), which may be undermined by everyday work-life conflicts. A fatigued and stressed employee is unlikely to interact and communicate with colleagues in the most effective way. Moreover, the availability of WLB benefits could attract and retain a demographically diverse workforce, which implies widening firms’ perspectives and skills, networks of external contacts and capacities for comprehensive problem solving (James, 2011).

By contrast, researchers have also highlighted the negative outcomes of an unbalanced relationship between work and life issues. The literature has identified health-related consequences such as psychological distress which can have adverse effects on health (Mesmer-Magnus and Viswesvaran, 2005; Frone et al., 1992). But there are also work-related outcomes, such as a decrease in affective commitment (Allen et al., 2000), turnover intentions or job dissatisfaction (Spector et al., 2007) among others. In this vein, James (2014) identified some negative outcomes of the imbalance specifically related to firm competitiveness, creativity and learning, such as under-performance, stress, frustration, perceived lack of employer support and even leaving the job, all of which imply losses for the firm in terms of embedded skills, training investment and experience.

By providing WLB benefits, the workplace learning environment changes resulting in workers’ self-perceived improvement in their concentration, focus, motivation and engagement (James, 2011). While employees’ preferences vary according to gender group or life course, Darcy et al. (2012) recommend organisations
consider WLB in an unrestrictive way and think about different kinds of employees and benefits to foster all the positive consequences of WLB. According to Lambert (2000), the more employees perceive the company’s WLB benefits, the more likely they are to submit suggestions for improvement, to voluntarily attend meetings on quality methods, and to assist colleagues with their work duties.

WLB does not mean working less or a drop in organisational productivity. On the contrary, WLB benefits may improve personal life and organisational performance simultaneously. The implementation of WLB benefits might mean employees concentrate better and are more creative in the workplace since they are less concerned about non-work life issues (Kahn, 1992).

**Assumptions if WLB is used as an innovativeness indicator**

As we highlighted in the previous section, WLB has demonstrable links with job commitment, job autonomy, job satisfaction, diversity, talent attraction and retention, as well as with learning, creativity and innovation. Some recent empirical evidence has also shown that innovative firms tend to adopt and use WLB initiatives (Chiva et al., 2014; James, 2014; James, 2011). For these basic reasons, we assume that WLB could be used to assess firm innovativeness.

The underlying assumptions of WLB are similar to those of other innovativeness indicators based on firm characteristics that have been extensively used previously, such as R&D budget. More precisely, based on previous evidence, the use of WLB to assess firm innovativeness assumes that:

1. WLB benefits are linked to learning, creativity and innovation through their direct effects on job commitment, job autonomy, job satisfaction, diversity, talent attraction and employee retention;
The existence of a WLB programme in a firm is a significant sign of a particular strategy, culture and management style that cares about its employees because they play a key role in any value creation and innovation initiatives.

Based on previous research and on these assumptions, we propose that the presence of WLB programmes is a sign of innovativeness and that there are more likely to be innovations of any kind in a firm with a WLB programme than in one without such WLB benefits.

As with other innovativeness assessments based on the firm’s characteristics, such as educational data, the relationship between WLB and innovation is to be understood as a probabilistic not a deterministic causation. In other words, the likelihood of there being a connection between WLB and innovation is expected to be significant, but it is not an automatic consequence. Hence, we are not suggesting that WLB is either a necessary condition or a sufficient condition for innovation, but a relevant facilitating condition.

We suggest two ways to appraise the existence of WLB benefits in a particular firm: (1) the firm possesses a WLB certification and is listed in a WLB directory, (2) a simple and short questionnaire is sent to the firm to ask about the existence of WLB benefits.

Advantages

The presence of WLB benefits can be considered as a facilitator of innovativeness. Checking for WLB benefits to assess firm innovativeness could have the following advantages and disadvantages:

(1) It is closely linked to the concept of capability (innovativeness).
(2) It covers any type of innovation (product, process, marketing, organisational).

(3) While other indicators based on firms’ characteristics depend heavily on the technological profile of the firm and the endowment of resources (e.g., R&D), the existence of WLB benefits could be used in firms regardless of their technological intensity and size.

(4) It is based on the human factor of the firm which has been so far understudied from an innovativeness point of view, most of previous indicators being based on the technology side of the organisation (OECD, 2005).

(5) It is simple, effective and complementary to previous procedures.

Disadvantages

(1) Data on WLB firms may be unavailable in some countries or regions.

(2) WLB firm lists may not include all firms implementing WLB initiatives.

(3) WLB cannot deterministically assure that real innovations are being developed; it represents a pre-condition or a facilitating factor

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Take in Table 7

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4. Conclusions

This paper has introduced a new way to assess firm innovativeness, namely, the presence of WLB benefits. In order to show why it is an appropriate measure, we have reviewed previous innovativeness indicators, highlighting their definition, their underlying assumptions and their advantages and disadvantages. We classified these previously used indicators into two different approaches: the first focusing on
innovation process outputs, and the second focusing on the firm’s characteristics that could facilitate the development of any kind of innovation.

There is a long tradition of using available technological data such as R&D and patents. However, these data might not be adequate to assess the innovativeness of SMEs and low-tech firms that report very little R&D or do not normally patent. We propose complementing the picture on the firm’s innovativeness phenomenon with other approaches from the human side of innovativeness that to date have attracted little research attention.

We argue that using the presence of WLB benefits as an innovativeness assessment would be based on similar assumptions as other firm characteristics assessments such as R&D budget or educational data. Our proposal contributes to rebalancing the technology-human approach on innovation, which has generally been weighted towards the technology side in the innovation management literature. WLB benefits can exist regardless of the firm’s technological profile and its size; this is an interesting advantage for innovativeness studies. This makes this new way to assess firm innovativeness especially useful in those regional areas where there is a high proportion of SMEs and/or a high proportion of low-tech firms. New interesting insights could be put forward in regions such as Southern Europe or some emergent countries in Latin America.

Using WLB benefits could have advantages for policy-makers: it would allow an objective assessment of firms’ creative intentions that would be independent from their technological profile and size. This assessment could be useful when designing and implementing innovation support policies.

It could also be beneficial for managers who have to assess the creative and innovative intentions of firms in their environment such as suppliers, competitors and
co-operators. This would be especially important for open innovation projects in which the right choice of partner is crucial.

Previous evidence on the link between WLB benefits and creativity and innovation has been mainly based on qualitative analyses. Future quantitative research is needed to empirically assess the statistical connection between WLB and other innovativeness indicators such as R&D, patents or innovativeness surveys.

Another interesting avenue for future quantitative research would be to analyse in detail the links between WLB benefits and innovation. Previous literature suggests a mediating role of concepts such as job commitment, job autonomy, job satisfaction, diversity, talent attraction and retention and learning, all of which require further empirical confirmation.
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Table 1: Measuring innovativeness through patent counts and patent citations analyses

<table>
<thead>
<tr>
<th>Definition</th>
<th>A patent is a legal property right over an invention that gives its owner exclusive rights with limited duration to exploit it, while at the same time disclosing the details of the patent (OECD, 2005)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assumption</td>
<td>Patents represent inventions that will quite likely become new products and processes; therefore it captures the notion of innovativeness.</td>
</tr>
<tr>
<td>Advantages</td>
<td>Objective data</td>
</tr>
</tbody>
</table>
| Disadvantages | - It is limited to products and processes  
- Propensities to patent vary across industries  
- Some patents are more important than others in terms of economic and technological impact |
<p>| Use | Extensive |
| Some previous studies | Griliches, 1990; Albert et al., 1991; OECD, 2005; Hagerdoorn and Cloodt, 2003; Sadowski and Sadowski-Rasters, 2006 |</p>
<table>
<thead>
<tr>
<th>Definition</th>
<th>Perceptual measures on any type of innovation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assumptions</td>
<td>Respondents are sincere, reliable, and knowledgeable on the issue they are asked about</td>
</tr>
<tr>
<td>Advantages</td>
<td>First-hand information on complex concepts with different dimensions or nuances</td>
</tr>
</tbody>
</table>
| Disadvantages              | - Risk of conceptual confusion  
- Risk of inadequate respondent  
- Risk of non-response bias  
- Risk of overestimation |
| Use                        | Extensive |
| Some previous studies      | García and Calantone, 2002; OECD, 2005; Renko et al., 2009; Talke et al., 2010 |
Table 3: Measuring innovativeness through new product count and analysis: Literature-Based Innovation Output method (LBIO)

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<tr>
<th>Definition</th>
<th>Consists of counting the number of new products launched by firms within an industry by examining publications in trade and technical journals (OCDE, 2005).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assumptions</td>
<td>(1) Firms are interested in publicising their new products (features, functions, etc.) within their industry through specialised industry, trade and technical journals, and, (2) These journals have a new products section in which the editor is interested in publishing all these novelties.</td>
</tr>
</tbody>
</table>
| Advantages       | - Data are objective.  
                   - It allows the type of novelty and the degree of complexity to be analysed in order to assess the technological impact of the innovation. |
| Disadvantages    | - Limited to products  
                   - Both firms and industries might have different propensities to announce new product achievements through publications in trade and technical journals |
| Use              | Extensive |
Table 4: Measuring innovativeness through R&D budget

<table>
<thead>
<tr>
<th>Definition</th>
<th>Represents main innovation activities currently being carried out to develop any type of innovations (OCDE, 2005)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assumptions</td>
<td>R&amp;D activities will be successful and will result in an innovation</td>
</tr>
<tr>
<td>Advantages</td>
<td>- Objective data</td>
</tr>
<tr>
<td></td>
<td>- Covers any type of innovation</td>
</tr>
<tr>
<td>Disadvantages</td>
<td>- Not always available</td>
</tr>
<tr>
<td></td>
<td>- Many R&amp;D projects are failures and do not lead to an innovation</td>
</tr>
<tr>
<td></td>
<td>- What about R&amp;D efficiency? It might be distributed heterogeneously</td>
</tr>
<tr>
<td></td>
<td>- What about non-R&amp;D innovators?</td>
</tr>
<tr>
<td>Use</td>
<td>Extensive</td>
</tr>
<tr>
<td>Some previous studies</td>
<td>Ortega-Argilés et al., 2009; Cainelli et al, 2004; Evangelista et al., 1998; Jacobsson et al., 1996; Patel and Pavitt, 1995</td>
</tr>
</tbody>
</table>
Table 5: Measuring innovativeness through surveys on innovativeness/innovation capability (Questionnaires)

<table>
<thead>
<tr>
<th>Definition</th>
<th>Perceptual measures on innovativeness at the firm/business unit level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assumptions</td>
<td>Respondents are sincere, reliable, and knowledgeable on the issue they are asked about</td>
</tr>
<tr>
<td>Advantages</td>
<td>First-hand information on complex concepts</td>
</tr>
</tbody>
</table>
| Disadvantages | - Risk of conceptual confusion  
| | - Risk of inadequate respondent  
| | - Risk of non-response bias  
| | - Risk of overestimation |
| Use | Extensive |
| Some previous studies | Hurley and Hult, 1998, Hult et al., 2004; Gatignon et al., 2002; Calantone et al., 2002; Inemek and Matthyssens, 2013; Akgun and Keskin, 2014; Ruvio et al., 2014; Slater et al., 2014 |
Table 6: Measuring innovativeness through data on employees’ education

<table>
<thead>
<tr>
<th>Definition</th>
<th>Statistics on skilled human resources (OECD, 2005) Statistics which give detailed educational background of staff with higher education in engineering and science (Jacobsson and Oskarsson, 1995; Jacobsson et al., 1996).</th>
</tr>
</thead>
</table>
| Assumptions         | - Engineers and scientists/Knowledge workers are the main carriers of advanced science, technology and innovation  
                      - Engineers and scientists/Knowledge workers are mainly employed in tasks of a scientific and technical nature/creative nature. |
| Advantages          | - Objective data  
                      - Covers any type of innovation |
| Disadvantages       | - What about Engineers and scientists/Knowledge workers’ efficiency? It might be distributed heterogeneously |
| Use                 | Limited |
| Some previous studies | Jacobsson and Oskarsson, 1995; Jacobsson et al., 1996; Carlsson et al., 2002 |
Table 7: Measuring innovativeness through WLB

<table>
<thead>
<tr>
<th>Definition</th>
<th>WLB: the individual’s perception that work and non-work activities are compatible and promote growth in accordance with an individual’s given life priorities (Kalliath &amp; Brough, 2008)</th>
</tr>
</thead>
<tbody>
<tr>
<td>WLB yes/no</td>
<td>Statistics on WLB adoption Statistics on WLB use</td>
</tr>
<tr>
<td>Assumptions</td>
<td>(1) WLB is linked to learning, creativity and innovation through its direct effect on job commitment, job autonomy, job satisfaction, diversity, talent attraction and retention</td>
</tr>
<tr>
<td></td>
<td>(2) The existence of a WLB programme in a firm is a sign of a particular strategy, culture and management style that cares about its employees because they play a key role in any value creation and innovation initiative.</td>
</tr>
<tr>
<td>Advantages</td>
<td>- It covers any type of innovation - It covers any type of industry - It covers any type of technological profile - It covers any firm size - It is based on the human factor of the firm - It is simple and effective, and it complements previous procedures</td>
</tr>
<tr>
<td>Disadvantages of using WLB firms’ lists</td>
<td>- Not always available - WLB firm lists may not include all firms implementing WLB initiatives - WLB cannot assure real innovations are being developed in a deterministic way; it represents a pre-condition/facilitating factor</td>
</tr>
<tr>
<td>Disadvantages of using WLB questionnaires</td>
<td>- Disadvantages of perceptual data - WLB cannot assure that real innovations are being developed in a deterministic way; it represents a pre-condition/facilitating factor</td>
</tr>
<tr>
<td>Use</td>
<td>None</td>
</tr>
<tr>
<td>Some previous studies</td>
<td>James, 2011, 2014; Chiva et al., 2014</td>
</tr>
</tbody>
</table>