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OVERCOMING THE BARRIERS TO LEAN PRODUCTION IMPLEMENTATION IN SMALL ENTERPRISES

Purpose.

The purpose of this paper is to elaborate an empirical model highlighting how small, family-owned companies can overcome the barriers highlighted by different disciplines that hinder the implementation of lean production in this category of enterprises.

Design/methodology/approach

A multiple case study involving five small manufacturing firms accurately selected and operating in Northern Italy was conducted through interviews with key managers and visits inside plants. This data was integrated by a specific seminar and by interviews with unions and training specialists.

Findings

The resulting empirical models highlights the significance of social relations among small entrepreneurs in order to overcome the lack of commitment towards lean changes, the role of consultants and of practical training to settle the barrier of resource constraints, and the channelling and control of employee involvement to encourage their participation in lean activities. Where present, unions also play a role in preventing situations of excessive work intensity.

Practical implications

Knowledge on how to overcome the barriers to lean production implementation can help social actors both inside and outside of small firms who are involved in applying the system or who intend to implement it.

Originality/value

The literature has not treated the subject of lean successful application in small enterprises so far. The uniqueness of the contribution is reinforced by its analysis of different bodies of literature, including management, operations, human resources and employment relation whereon adopting an interdisciplinary and broad analytical perspective of the system.

1. INTRODUCTION

Small manufacturing firms play an important role in European national economies. They employ a significant number of workers and produce a substantial proportion of national turnover (Djassemi, 2014). In the case of Italy, structural official business statistics for manufacturing confirm the country's weighting towards smaller firms. In particular, small manufacturing companies enjoy an even more important role than is typical of the 28 European Union (EU) member states. In 2012, Italian small manufacturing firms (albeit the data reported did not include the construction sector) comprised a share of total manufacturing employment equal to 30.4% (compared to 20% in the EU-28) and produced 22.8% of the total turnover (11.5% in the EU-28) (Eurostat, 2013). This article concentrates on small manufacturing firms that are family-owned, which constitute the vast majority of small enterprises (Klein, 2000, Organisation for Economic Co-operation and Development, 2014). These small firms are usually managed by the proprietor, who acts as owner-manager. They are also independent in their ownership, which means that these enterprises do not receive additional resources from larger parent companies, which would invalidate the characteristics associated with their smallness (Minbaeva et al., 2003). Thus, henceforth the expression 'small firm' refers to manufacturing, family-owned and independent enterprises of this size.

The number of small firms changes over time, with new businesses established every year and others ceasing to operate. Their survival rate declined following the 2008 economic crisis, although

signs of recovery have recently become apparent, in Italy too (European Commission, 2016). The rate of small firms' failures is due to the fact that these companies are more vulnerable to global competition than are medium- and large-sized enterprises since facing various structural and market issues (Brown and Inman, 1993, Lee and Klassen, 2008). Thereon, small firms are often said to require improvements to their production and company processes by reducing costs and increasing their product quality and reliability. Scholars have explained how lean production can be beneficial for small enterprises as a means of improving their efficiency and competitiveness. For instance, these firms are often characterised by incorrect lead times and due dates, creating inventory waste by accumulating excessive buffer stock as well as issues in product quality and reliability. These issues can be settled by adopting principles such as just-in-time and scientific standardisation, which characterise lean production (Rawabdeh, 2005). However, previous studies have estimated that fewer than 10% of small companies are able to implement lean production processes (Saurin et al., 2011).

In spite of the socioeconomic importance of small firms and their recurrent failings in adopting the lean production model that is widely perceived to increase their competitiveness, little research has concentrated on this subject. In particular, studies are yet to elaborate an empirical model highlighting how small companies can overcome the barriers that hinder the implementation of lean production in this category of enterprises. The goal of this article consists of formulating such an empirical model by focusing on managerial agency, as well as adopting a broader perspective regarding lean production. This paper is unique in drawing from literature across various disciplines, including management, operations, human resources and employment relations. Consequently, the different types of barriers to lean production encountered by small firms are included in the elaboration of the model, ensuring the adoption of an interdisciplinary and broad view of the system. In the following section, the main barriers hindering lean production's implementation and the reasons for its low rate of adoption in small firms are highlighted.

2. THE DIFFERENT BARRIERS TO LEAN PRODUCTION IMPLEMENTATION IN SMALL FIRMS

The literature has devoted little attention to analysing the barriers and related consequences that hinder lean production implementation in small firms; exceptions such as Achanga et al., 2006, Conner, 2001, tend to adopt specific managerial and operational perspectives, and studies have generally focused on large enterprises (Bonavia and Marin, 2006, Sim and Rogers, 2008). Yet, certain features of small companies can facilitate lean production application. Small entrepreneurs exhibit a long-term orientation, which accords with lean production, whose changes require time to yield visible results (Sirmon and Hitt, 2003). At the same time, these companies can implement lean production more quickly than larger enterprises because they have fewer organisational layers, and so owner-managers can transmit their commitment at higher speed throughout the organisation (Haksever, 1996). However, to date barriers have appeared more powerful than advantages (Shah and Ward, 2003, Bhasin, 2012).

In spite of the relative lack of attention paid to the relationship between small firms and lean production, based on the literature concerning different disciplines of management, operations, human resource and employment relations it is possible to identify some studies highlighting the main obstacles to the implementation of lean production among these firms. Moreover, these studies can be reinforced by other contributions focusing on small enterprises in general. As a result of interdisciplinary analysis, the barriers to lean production implementation can be grouped into four main areas. The first two barriers are mainly drawn from the management and operations literatures, while the third and fourth barriers are particularly pertinent to scholars in the human resources and employment relations fields. Such barriers are interrelated but they can also be kept analytically separate.

The first obstacle is a lack of owner-manager commitment and leadership. Indeed, owner-managers' commitment to lean production implementation is probably the most significant prerequisite. Two

key issues can be highlighted here. First, owner-managers may lack the capabilities (in terms of knowledge) to adopt new organisational systems (Martin, 2005) such as lean production. Second, owner-managers often remain unconvinced about the positive results that lean production may yield for their enterprise. Many small entrepreneurs consider lean production as costly and time-consuming, and only beneficial for large firms given the necessity of major financial investments, which may produce uncertain results (Pettersen, 2009, Bhasin, 2012). For these reasons, owner-managers may be reluctant to engage their company in the profound changes associated with the process of lean transformation. This reluctance may be seen before deciding on starting the process of change, as well as during its implementation. Some scholars have emphasised that professional associations, business advisory networks and government agencies can promote innovation among small entrepreneurs (Wu et al., 2014). However, their actions have not brought significant results in the case of lean production implementation, and the mechanisms behind their influence over small firms still need to be analysed and explained. The issue of owner-managers' leadership is often derived from their lack of communication skills and coaching, rendering them incapable of explaining changes to workers. In this way, owner-managers may not be able to foster skills and knowledge enhancement among their managers and employees (Martin, 2005, Achanga et al., 2006).

Second, small firms are affected by resource constraints. Such constraints particularly concern interrelated aspects of knowledge and financial capabilities. In the case of knowledge, small enterprises are characterised by a lack of lean expertise, which represents an important disadvantage because lean production constitutes a complex system (Tortorella et al., 2014). This occurs owing to small firms' limited financial resources. Indeed, small enterprises may find it difficult to hire and retain managers with the ability to apply sophisticated organisational principles and design proper practices of people management (de Kok and Uhlaner 2001). The same phenomenon occurs for skilled workers (Dora et al., 2016). Therefore, small firms should rely on consultants to supplement the scarce in-house expertise, but again, such services may be considered excessively expensive

(Bhasin and Burcher, 2006). Consequently, lean techniques such as 5S, one-piece flow, Kanban and Kaizen may not be properly understood (Secchi and Camuffo, 2016). Given the lack of lean internal knowledge, training would be helpful, but investments are often limited in small firms (Della Torre and Solari, 2013). The lack of training activities in small companies relative to medium and large enterprises owe to their more limited financial resources (Anthony et al., 2005). However, this outcome also derives from the fact that training activities can entail production stoppages. Such stoppages are often appraised as an unnecessary waste of limited resources by owner-managers, especially if they are not guaranteed to yield immediate gains (Elbert, 2012). Finally, the limited availability of financial resources can result in supplying training by focusing on immediate issues without framing it within a strategic perspective (Barret, 2015).

These two barriers are largely related with managerial and operational issues. However, the resolution of these techno-managerial issues is insufficient to the successful implementation of lean production. Human resources and employment relations literature have emphasized the third and fourth barriers encountered by owner-managers, and emphasise that both hard and soft practices are critical to the application of lean systems. Hard practices refer to technical and analytical tools such as Kanban and Kaizen, while soft practices pertain to managerial principles and workers' role, such as just-in-time, quality management, scientific standardisation, continuous improvement, employee involvement and cooperative small group problem-solving (Kochan et al., 1997, Bortolotti et al., 2015).

Specifically, the third barrier is constituted by the fact that while family-owners may view themselves as being benevolent in their workings with staff, such an approach is likely to be underpinned by a unitarist perspective of the employment organisation (Fox 1966). The enterprise is viewed as a unified entity where owner-managers deem themselves the only actors with the right and understanding to design and run the company's operations (Reid and Adams, 2001). Small entrepreneurs consider their own activities as sufficient for innovations and rarely involve employees in the development of such projects. Indeed, workers' involvement is considered

unnecessary and costly (Klaas et al., 2010). These entrepreneurial views constitute a relevant barrier for lean production implementation. Certainly, they constrain employees' involvement, even though this is widely perceived as critical to improving companies' processes and policies because workers possess the tacit, practical knowledge required by firms to pursue their goals. Although their participation is viewed as controlled by managers in terms of scope, it is fundamental to realising lean production (Vallas, 2006, Vidal, 2007, Rolfsen and Langeland, 2012). In particular, workers' contributions and related practices serve to realise the principles of scientific standardisation (involving the time, sequences and materials needed for efficient and ergonomic operations that should subsequently be maintained in daily operations through the 5S technique) and continuous improvement (specifically involving workers within quality management programmes in which managers also participate) (Adler and Borys, 1996, MacDuffie, 2003). At the same time, through adopting practices of continued inputs and cooperative small group problem-solving, managers foster the development of cooperative relationships with workers who are whereby encouraged to express and share their knowledge. Such practices can assume various forms (such as Kaizen and quality circles) (Kochan et al., 1997, Tortorella et al., 2014), but they may also be limited by the unitarist perspectives of owner-managers.

Finally, the fourth barrier, the lack of union action, has received little attention in the literature. Indeed, studies have tended to avoid the subject in the case of small firms because labour organisations are often absent or weak in this category of enterprises (van Gyes, 2006). They are also opposed by owner-managers. This opposition is due to the fact that owner-managers rarely accept a presence that would imply some sharing of control and criticism (Holten and Crouch, 2014). In terms of lean production implementation, opposition towards unions and their consequent absence or weakness can be damaging for small companies. Certainly, by helping workers to express their voice, labour organisations can enable managers to re-balance excessive work intensity connected with lean production following the instrumental use of workers' inputs to increase work pace. Excessive work intensity or saturation can instigate workers' resistance

(Stewart et al., 2010, Carter et al, 2013) and/or increase the company's costs in terms of quality, occupational illnesses or safety (Pagell et al., 2014). Indeed, specific analyses concerning small enterprises have attested to the fact that unions often represent influential actors in defining the content of basic employment practices. For instance, labour organisations can stimulate improvements in basic employment conditions (Wu et al., 2014), which are related to lean production implementation. Thus, the activities of unions and industrial relations can be important and require consideration.

3. RESEARCH DESIGN AND METHOD

The research design was based on three parts that took place in 2012 and in 2013. First, a multiple case study was conducted investigating how small firms overcome barriers to lean production adoption. Case-oriented research is appropriate when exploration is required to develop an understanding of the processes and mechanisms in a company's organisation (Haddock-Millar et al, 2016). In total, five small firms were involved. All were operating in the provinces of Turin and Cuneo in the Piedmont region of Northern Italy, which was selected due to the developed characteristics of its small manufacturing firms (Cerved, 2016). A small firm successfully implementing lean production was initially involved through interviewing four key managers, comprising the owner-manager, the manager in charge of operations, the manager in charge of the health, safety and quality system and the manager responsible for one specific productive area. A union delegate was also interviewed. The information and data gathered from the interviews were integrated with a visit to the firm, lasting approximately one hour. Subsequently, in order to increase the validity of the results, another four small businesses successful in lean production implementation were involved. In such a way, it was possible to follow a logic of replication. Replication logic can serve the purpose of strengthening confidence in the validity of empirical findings when multiple cases confirm emergent data (Eisenhardt, 1989). The owner-manager along

with the key managerial figure for lean implementation if present (which occurred in two cases) were interviewed and visits to these enterprises were also conducted.

Further to questions concerning employment trends in the firm, its market situation and other practices of people management such as contingent pay systems and career mechanisms, the questions posed in the interviews pertained to the following issues: how the small enterprise overcame the main barriers to lean production implementation; the characteristics of the implementation process (such as the eventual role of consultancy firms and the departments involved); the employment practices adopted in terms of work organisation and employee involvement; and the role of unions in the process of lean application, where applicable. The enquiry into employment practices sought to understand if and how managers adopted unitarist perspectives. Thus, these questions did not aim to ascertain workers' satisfaction regarding these employment practices or their working conditions, as this would require a different research design involving employees. Interviews were voice-recorded and transcribed. Passages of interviews connected to the themes under scrutiny were identified and analysed by triangulating the information collected from different people and firms (Yin, 2009).

The case study small firms, whose main characteristics are synthesised in Table 1 where they are indicated through fictitious names as agreed with them, were required to meet five criteria to be included in the research. First, they had to mostly satisfy the criteria established by the EU for the definition of small enterprises. In two cases, firms employed slightly more than 50 workers but had a turnover below 10 million euros, thereby satisfying this important criterion (Lai et al. 2016). Second, given the sectoral characteristics of markets (Edwards et al., 2006, Grimshaw and Carrol, 2006), all of the small firms had to be active in the same sector: metal. Third, the companies had to be directly managed by an owner assuming the role of owner-manager in order to be fully considered as family-owned, as such enterprises are usually managed by family members (Arregle et al., 2007). Only in the case of Techno was a chief executive officer (who had been a manager of the firm when it was family-owned) present, as the company had only recently been acquired by a

French enterprise. At any rate, the firm had already adopted lean production prior to the acquisition. Fourth, small companies had to be independent in their ownership, meaning that they could not receive additional resources from other parent companies (Minbaeva et al., 2003). Indeed, the definition provided by the EU in terms of number of workers and turnover aims to assure such an independent character (European Commission Recommendation, 2003/1422). Fifth, unions had to be active in some of the cases. In this regard, it must be underlined that in the Italian context, the law n. 300/1970 protects union presence and activity in all workplaces employing more than 15 workers. This legislative measure facilitates the unionisation of small firms. Labour organisations were present in three cases.

<Table 1 here>

In order to identify the success achieved by these firms in the adoption of lean production, evaluations from the officials of local employers' associations, labour organisations and professional associations were collected, before the managers of the recommended firms were asked for confirmation during first contact by telephone. The evaluations focused on both lean hard and soft practices and the gains achieved through their implementation. Subsequently, owner-managers and top managers were asked to be precise about the changes and results obtained through lean implementation in different areas, in order to evaluate the effectiveness of a lean transformation (Bortolotti et al., 2015). Their claims were also verified during the visits to the firms by exploring the hard and soft practices implemented. For instance, as regards soft practices, the presence of tools demonstrating the effective adoption of quality circles (i.e. corkboards to which employee inputs and corrective actions could be attached) was verified. In two enterprises beyond the five successful firms identified, the analysis revealed that they were only implementing limited parts of lean production (with one also being part of a larger firm) and so were excluded from the study. Changes and results attesting to the successful implementation of lean production in the

small enterprises are synthesised in Table 2, where only practices and gains adopted and achieved after lean implementation are reported (indeed, firms may have already adopted certain lean techniques prior to its implementation). As expected, the adoption of lean production led to more substantial changes in smaller enterprises.

<Table 2 here>

The second part of the research consisted of interviewing three training specialists and one union official in order to further enrich the investigation. These people worked in the same territorial area under study. Thus, 16 people were interviewed for the analysis of lean implementation in small firms. Moreover, an open seminar was held to present the results, in which the small businesses involved in the research participated along with the officials of the employers' associations and labour organisations and professionals. The seminar further refined and supported the validation of the results.

Finally, through interviewing the top management, five successful lean large multinational enterprises were involved with the same research protocol in the same territorial area and sector. In total, nine managers were involved. This facilitated exploration of the potential existence of distinctive factors concerning lean implementation in large firms operating in this geographic area relative to the related literature. Such peculiarities may have comprised specific territorial characteristics in terms of human capital, knowledge and institutions. Such an extension to the research was largely motivated by the specific territorial regulations of the capitalistic system in an Italian context owing to historic cultural, political and social factors (Trigilia and Burroni, 2009, Wood et al., 2014). The lack of peculiarities seen in these enterprises in the same geographic area to some extent reinforces the potential applicability of the findings concerning small firms to other contexts (Yin, 2009).

4. EMPIRICAL FINDINGS

4.1 COMMITMENT AND LEADERSHIP

The decisive factor encouraging owner-managers to face the challenges pertaining to lean implementation was the possibility of hearing about and seeing the benefits of lean production according to other entrepreneurs with whom they had developed a social relationship. Indeed, they considered it critical to discuss with well-known and regarded 'peers' who had faced similar challenges under similar constraints. Small entrepreneurs often visited the lean plants of these colleagues and listened to his or her experiences. Having observed the compatibility of lean production with the smallness of their firm, they became convinced of stimulating organisational change:

We have met with Furniture, another small company in Turin that has already started the process of lean production implementation. They told us that they have got significant results after just one year and half from lean implementation. Thus we heard that Furniture, a small firm, had obtained good outcomes with lean production, as it occurs in large firms, whereby we decided to start. (Operations manager, Syntos).

The specific circumstances under which these social relationships developed varied. The company Basket started entertaining commercial relations with a small Japanese firm implementing lean production. Basket's owner-manager visited the plants of its commercial partner, talked deeply with peers, who subsequently visited Basket's factory to highlight how lean could improve its competitiveness. Eventually, these visits and discussions convinced Basket's owner-manager that the change was necessary. Afterwards, Basket's owner-manager was available to supply experience and support. Leaf and Techno developed their social connections with an entrepreneur within the employers' association before deciding to adopt the system. In contrast, in the case of Furniture, the

owner-manager had some knowledge of the system and attained information from other small enterprises that were applying lean production before deciding to undertake the process of change. As regards Syntos, awareness of the utility of lean production increased after speaking with Furniture's owner-manager, with whom he enjoyed good commercial and social relations.

Overall, it was apparent that commercial relationships, capabilities in terms of previous knowledge regarding lean production, and in particular already-established networks of expertise-sharing as represented by employers' associations played an important role. However, these elements were alone insufficient. In particular, employers' associations were not considered useful due to their services (such as in terms of innovation and marketing) or for the seminars they organised. Rather, they were considered useful because they facilitated the possibility of small employers meeting and developing social relationships with colleagues with expertise and experience of lean production implementation. These social connections were crucial and needed to be built by small entrepreneurs themselves. In some cases, such connections went beyond the employers' associations. A second point of relevance is that the employer's commitment had to be cultivated during the implementation process. Indeed, it could not be taken for granted even once the process of lean change had commenced. For this reason, and following the suggestion of consultants, owner-managers, top managers and consultants typically decided to start with the areas or departments where lean changes would be able to produce the greatest results in the short term.

The leadership role was also important for the adoption of lean production. In all of the case study firms, a figure with the ability to encourage and engage the management and workforce to acquire the prerequisite skills and adopt the necessary behaviours on a daily basis was required. These figures had to possess both hard and soft skills. They had to govern the lean implementation process by keeping track of the changes and monitoring the application of lean techniques on the part of the management and workers. Thus, this person had to know the company's operations intimately. At the same time, leadership figures led the lean transformation by representing the first people to adopt the required behaviours and by involving the workforce through continuous information

flows and organising specific meetings. Some owner-managers who possessed theses skills assumed the leadership role themselves, whereas in other firms, the role was covered by a member of the management selected by owner-managers owing to his or her skills and motivation.

4.2 KNOWLEDGE AND FINANCIAL CONSTRAINTS

Resource constraints were overcome in different ways. First, the employers' commitment towards lean production influenced their willingness to deploy significant resources to this objective. More specifically concerning knowledge, all of the case study firms were reliant on consultants given their lack of in-house lean expertise. Consultants played a crucial role in supplying small firms with the necessary knowledge regarding lean production. Consultations were initially based on intensive collaborative activities with owner-managers and managers, and consisted of understanding the company's processes by collecting and analysing relevant data. The areas with the greatest likelihood of seeing improvements were then selected as the first targets of lean transformation activities. At the same time, it is well-acknowledged that consultancy agencies can be expensive. Consultants were largely chosen based on two criteria. First, they had to possess a good reputation in terms of lean implementation, a perception that small employers generally derived from their social relationships with peers who had already used their services to facilitate lean change. Indeed, the small entrepreneurs who illustrated the utility of lean production to their colleagues also often recommended consultants so that it could be adopted. Second, consultants were chosen based on affordability according to the firm's resources. The fact that these consultants had been suggested by small entrepreneurs under similar resource constraints tended to render them satisfactory.

The issue of limited financial capabilities for training was tackled through the particularity of its implementation. Beyond inter-firm differences regarding the precise quantity of training supplied or the techniques/principles involved, training was organised as follows. First, a brief theoretical presentation of the lean system or techniques, a sort of know-why activity, was provided.

Subsequently owner-managers, managers and workers were placed into small, mixed groups and worked together to execute concrete activities of lean implementation (including scientific standardisation studies, Kaizen, 5S and maintenance), especially on the shop floor. Such training was deployed by envisioning an alternation between activities in the classrooms and on the shop floor, but with a predominance of the latter.

Kaizen started with a first brief part in the classroom, and then carried out practical applications and on-the-job training (CEO, Techno).

Overall, training activities were characterised by a significant practical perspective. Individuals implemented lean principles and techniques by acting on real company processes so that they could be improved; moreover, this helped save money in a situation of limited financial resources. Such training activities served other purposes, too. They were useful as a means of convincing owner-managers to invest in training, as costs related to production stoppages could be compensated by the achievement of immediate improvements in the company's processes. Moreover, the participation of owner-managers and managers in these activities, alongside workers, demonstrated their commitment to and leadership in the implementation of lean changes. Finally, resource constraints were overcome by adopting the model gradually, regardless of inter-firm differences in terms of the time periods separating one intervention from another. This helped avoid frequent production stoppages, excessive turnover losses and the deployment of managers in activities unrelated to their daily tasks. Indeed, the aim was not to simply realise a pilot project that would later lead to a comprehensive process of lean transformation. Rather, it represented a sequence of events, progressively encompassing the whole firm, which could be considered compatible with the long-term orientation characterising small enterprises.

4.3 WORKERS' AND UNITARIST PERSPECTIVES OF THE FIRM

In the case study companies, managerial practices involving workers focused on the application of lean principles of scientific standardisation and continuous improvement. These principles are interrelated. Continuous improvement may concern various subjects including machinery functioning or product quality, but it can also be applied to scientific standardisation. Employee involvement was favoured by employers who were committed to lean production and were thus willing to follow the consultants' recommendations. Moreover, the training activities outlined earlier further qualified workers' contributions.

The principle of scientific standardisation had the aim of establishing standardised, efficient times to execute working activities, and thus to reduce waste while assuring reliable product delivery to clients. This managerial principle also sought to ameliorate employees' ergonomic conditions. Changes in working operations and movements were defined by consultants and managers on the grounds of employee needs and ideas. Workers' participation, as within the activities of continuous improvement, favoured the improvement of process efficiency without compromising their ergonomic conditions, and their respect was instrumental to obtaining such participation and productivity:

Workers can certainly advance suggestions over ergonomic aspects. Ergonomics is central to the analysis of the company's processes to increase productivity, too. One of the lean principles consists of reducing excessive efforts even before waste. (Owner-manager, Spesso).

The specific revisions established in the layout and within work stations varied according to the enterprise. However, in all of these companies, employee suggestions were incorporated by consultants and managers within the process of scientific standardisation, which necessarily included scientific calculations and productivity goals. As regards continuous improvement, this principle was largely seen in the adoption of quality circles assuming the character of cooperative

small-group problem-solving activities. These circles took the form of meetings held every week for about 10-15 minutes, within which workers were able to discuss issues and advance suggestions or requests with their supervisor, and sometimes with their operations manager, too.

We have introduced a weekly meeting with warehouse and production workers to discuss and evaluate issues. They usually last 10-15 minutes. Employee involvement represents the basis for everything, things must start from the bottom. (Owner-manager, Furniture).

The accepted inputs were subsequently written on a board, to which related cards signalling the advancement of their resolution were progressively attached. Responsibility for settling issues or implementing changes belonged to specific managers, according to the type of issue or request. The attachment of cards was required to remind managers to address the issues signalled by and shared with workers, in order to avoid dissuading their future participation. In Basket and Techno, Kaizen activities were preferred to quality circles. In these companies, an area in need of change in order to improve quality, productivity or ergonomic conditions was identified by managers. They would then invite interested workers to develop a group responsible for implementing the change. Both quality circles and Kaizen were aimed at ensuring cooperation between managers and workers, with the former making sure to listen to employee inputs. Overall, employee inputs were evaluated as useful for lean activities, thus reinforcing employers' commitment to the organisational process of change.

In all of the firms examined, it was evident that these practices of employee suggestions and cooperative small-group problem-solving activities were channelled and controlled by owner-managers and managers. Therefore, owner-managers were assured that workers' involvement would not be costly and meaningless in their firms' operations. In the case of scientific standardisation, employee inputs were taken into consideration but their precise content was determined by consultants and managers because it had to be compatible with scientific calculations

and productivity goals. As regards periodical quality circles and Kaizen, managers encouraged workers to advance their requests and ideas. However, these requests and ideas had to be expressed in a short amount of time (especially in the case of quality circles) and their acceptance was conditional to managerial consensus, who then governed the process of implementation or resolution.

4.4 UNIONS AND INDUSTRIAL RELATIONS

Unions played a role in the process of lean production implementation in the two larger enterprises, Basket and Leaf. Two primary union activities emerged from the study. First, labour organisations intervened when managers were about to adopt practices that would be potentially harmful or stressful for workers. The adoption of potentially harmful practices occurred in Leaf. In this small firm, managers signed a collective agreement where respect for workers' privacy was assured when filming them while working in order to subsequently define standardised and efficient working operations.

We had to sign collective agreements (on lean production implementation [-author's note-]). Also because in order to carry out continuous improvement activities, we had to film a standard set up. (Maintenance manager, Leaf).

Moreover, through collective bargaining, unions guaranteed that registered measures of machine efficiency would be used to evaluate machines rather than individual workers operating on them, so that the latter would not be subject to continuous evaluations that might create stressful situations. In the small firm Basket, unions instead conducted periodic meetings with the owner-manager and managers on safety, in which questions related to ergonomics and workloads were discussed. In these two small firms, unions were thus active as a means of mitigating the possible deterioration of

working conditions. As a matter of fact, work intensity can become high even when safety and ergonomic conditions are first addressed. In such a way, they played a role in the successful implementation of lean production (even if this was not explicitly recognised by managers) by circumventing excessive work intensity, which would reduce participation and productivity. Moreover, unions favoured the flow of information between managers and workers. Before starting the process, unions were informed by managers about the reasons behind lean production implementation and the desired objectives and practices to be adopted. Subsequently, unions informed workers within periodic meetings, which were held as established by law. Thus, in spite of the fact that these firms are characterised by a smaller number of layers, they were able to directly reinforce the company's communication concerning lean production and thus increase the effectiveness of lean leaders. Finally, in the small company Furniture, workers joined unions following a restructuring operation that had been undertaken by the enterprise owing to an economic crisis. From that point, dialogue between management and unions focused on this subject, although it may eventually extend into basic employment conditions such as the definition of workloads.

5. DISCUSSION AND CONCLUSIONS

This study makes a novel contribution to the literature by using exploratory data to elaborate an empirical model that demonstrates how small firms can overcome the four main barriers to the successful implementation of lean production identified by the existing literature. This subject has received little attention in spite of its socioeconomic relevance and the structural/market issues of small enterprises, also because studies have focused on large firms (Shah and Ward, 2003, Bonavia and Marin, 2006, Sim and Rogers, 2008). As specified at the beginning of the paper, the small firms considered here are effective because they are run by family members and are independent in their ownership. The uniqueness of the contribution is reinforced by its analysis of different bodies of

literature, including management, operations, human resources and employment relations. All of these disciplines have examined lean production functioning mainly from different angles. Thus, by combining their insights, we have simultaneously considered different barriers and solutions to lean implementation and adopted an interdisciplinary and broad analytical perspective of the system. The resulting empirical model (synthesised in Table 3) is thus useful both to advancing academic knowledge and for social actors both inside and outside of firms who are involved in applying lean production or who intend to implement it. Given the similarity of the issues that characterise small firms across different contexts, the solutions illustrated in the empirical model may be applicable to other environments. At the same time, functional equivalents can be found between contexts. For instance, the role played by employers' associations in the Italian context can be played by more specific business advisory networks in the context of the United Kingdom (Hoque and Bacon, 2006).

<Table 3 here>

In the five case study firms, the four main barriers identified were overcome through similar actions and practices regardless of inter-firm differences. While all these actions and practices played a role, four emerged as particularly relevant as they dynamically helped overcome more than one barrier.

First, while an employer's commitment towards lean transformation needs to be nurtured in all phases of lean implementation, the initial decision is particularly relevant (Pettersen, 2009, Bhasin, 2012). It subsequently facilitates investments in terms of training and employee involvement, thus contributing to overcoming barriers of resource scarcity and unitarist perspectives. The research has shown that small entrepreneurs decide to undertake the process of lean change when another trusted colleague, such as a small entrepreneur with similar constraints and concerns, demonstrates that lean can be beneficial for the firm. Commercial relationships, capabilities in terms of previous

knowledge of the system and already-existing networks of sharing expertise represented by employers' associations, appeared useful but not sufficient. The emergent picture turned out to be more complex. All of these elements and employers' associations in particular can favour the development of social relations among small entrepreneurs, but the central role is played by relations that can also be built on the outside. Second, specific actions and policies to overcoming resource constraints are critical. Enterprises need to select competent and affordable consultants who can supply appropriate lean knowledge through social connections. Training is thus carried out with a practical perspective and by acting on real processes. These features of training help save money, strengthen the owner-managers' decisions to invest in them and facilitate employee involvement in the implementation of the system. These findings on training call for further analyses in terms of lean production. Exploration of the quality and characteristics of training rather than merely the quantity seems to be critical (Inanc et al., 2015), by overcoming the traditional separation between theoretical and practical training (Kock e Ellström, 2011), as the two can in fact be integrated.

However, these two themes were insufficient to implementing lean production; rather, successful application requires consideration of employee action in individual and collective forms. Third, practices aimed at stimulating employees' involvement were necessary, particularly for the adoption of the central lean principles of scientific standardisation and continuous improvement (Tortorella et al., 2014). The sharing of tacit knowledge on the part of workers was encouraged by managers by planning the implementation of cooperative problem-solving groups. It was also helpful to consider workers' needs, neglect of which can be detrimental for their productivity. Overall, the usefulness of employee inputs and ideas for lean activities and results encouraged owner-managers to pursue organisational change. However, activities that overcome the company's unitarist perspectives must be compatible with owner-managers' desire for control. The balance between these two possibly divergent goals may be achieved by managerial strict control of questions of time, issues and means. As a result, these features of employee involvement are significantly governed and

controlled by managers, akin to the situation often observed in several larger enterprises (Vallas, 2006).

Fourth, it is worth noting that unions are influential. Labour organisations unsurprisingly focus on basic employment conditions (Wu et al., 2015), which are essentially constituted by interventions aimed at protecting workers from excessive work intensity. However, these actions are important because they improve working conditions and (critical to the successful implementation of lean production) ensure that stressful situations of high work intensity that might compromise employees' participation and productivity do not emerge. Although in non-unionized companies, owner-managers and managers did not refer to workers' protests for high work intensity, unions certainly help avoid that such issues emerge. Furthermore, union action strengthens the effectiveness of managerial leadership actions and reminds them of the importance of industrial relations. Consequently, it cannot be assumed that unions necessarily represent a 'hollow out' in small firms (Regalia, 2018).

Overall, the results and empirical model presented constitute a relevant starting point to understand the ways in which lean production may be successfully applied in small companies. Nevertheless, this research remains exploratory. Although small firms face similar challenges, differences may exist between sectors and across institutional contexts (Edwards et al., 2006). Therefore, the model needs to be confirmed by other studies conducted in other manufacturing sectors and institutional contexts. Finally, it should be noted that this research is based on the managerial side, albeit it adopts a non-managerial approach by examining different bodies of literature as part of an interdisciplinary perspective. Thus, future research should consider and analyse the voices of employees in order to develop a greater understanding of their lean production working conditions in small enterprises.

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