

# KNOWLEDGE-INTENSIVE STRATEGIES IN LOW-TECH SECTORS DURING THE CRISIS: THE CASE OF THE GREEK WOOD AND FURNITURE SECTOR

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## ABSTRACT

The paper explores the strategies used by Greek wood and furniture firms during the crisis under the lens of the newly developed notion of knowledge intensiveness. A field research of 394 firms contacted in 2012 revealed that in spite globalization and crisis the sector remains rather passive with limited effort to develop innovation. The majority of these firms are introvert with low cost and differentiation to be considered their main but rather weak strategies, since according to managers their competitive advantages are easy to imitate. Still, the effect of customer loyalty, size and exports is significant. Wood and furniture firms should try to become more knowledge-intensive, build capabilities, seek knowledge all along the value chain and place technology and collaborative efforts at the heart of their competitive advantage. This seems to be the best way to confront both crisis and globalization threats.

## 1. INTRODUCTION

During the last decade researchers have argued for the need of new strategy paradigms at firm level, based on knowledge. New theories have evolved around the notion of Knowledge-intensive entrepreneurship (KIE) which is considered a key socio-economic phenomenon that drives innovation, and economic growth enhancing the competitiveness of both firms and countries (Malerba and McKelvey, 2010).

So far, the debate on KIE has mainly focused on firms in high-tech sectors. To date, little attention has been paid to firms that belong to so-called low-tech, traditional and mature

industrial sectors. However, a small but increasing stream of empirical research has indicated the importance of KIE in these sectors as well (e.g. Karagouni and Kalesi, 2010).

The crisis revealed certain pre-crisis weaknesses of some countries (e.g. Greece and some southern and eastern European countries), sectors (e.g. traditional mature sectors such as textiles and furniture) and types of strategies (e.g. low-cost) and innovations (e.g. financial innovations). Future prospects for innovation in these countries and industries will greatly depend on their disengagement from current and adoption of novel approaches which turn more around knowledge.

The paper has been structured as follows. After a short description of the relevant theoretical framework, the Greek wood and furniture sector is described as the object of the survey. The following units present the results and the relevant discussion exploring the factors that affect innovative performance of these firms in crisis period and providing a clear mapping of the characteristics of the specific ecosystem.

## **2. THEORETICAL BACKGROUND**

Current theoretical and empirical research enhances the role that traditional sectors still play in modern and vulnerable economies and directs importance of innovation outside R&D-intensive fields (Robertson et al. 2009; Hirsch-Kreinsen and Schwinge, 2011). A new research stream (Smith, 2008; Hirsch-Kreinsen et. al, 2003; Karagouni and Caloghirou, 2013) focuses on low-technology industries claiming that besides their strong path-dependency they can be knowledge-intensive, develop knowledge-based innovation and invest in trans-sectoral knowledge seeking and learning (Hirsch-Kreinsen and Schwinge, 2011). According to Smith (2008) "Growth within the less glamorous, traditional sectors is certainly innovation-based and moreover it rests on cognitively complex and deep knowledge bases, which from time to time are subject to discontinuous change". Recent empirical research confirms that low-tech firms which became knowledge-intensive managed to improve their competitiveness by repositioning within the product supply chain (Schwinge and Kreinsen, 2012; Karagouni et al., 2012) and following market niche strategies. They further engaged export-oriented strategies in addition to this strategic orientation towards knowledge creation and innovation, especially in cases of limited domestic markets (Schwinge and Kreinsen, 2012).

Thus low-tech firms tend to develop different kinds of competitive advantage in order to address competition within their vulnerable and mature markets. Besides the well-known and mostly-used cost-leadership, they turn to differentiation and innovation. They engage mainly in new product development and frequent changes or improvements of process

technologies (Hirsch-Kreinsen 2008a, Robertson and Smith 2008, Robertson et al. 2009). While a very small percentage of individual low-tech firms develop R&D activities, the majority apply mainly open innovation (Hirsch-Kreinsen and Jacobson, 2008; Likar et al., 2008). Process, organizational and marketing innovations are more common (Heidenreich, 2009), while product innovations are in their majority incremental (Bender, 2004). A significant feature of low-tech innovation is the engagement of many stakeholders all along the value chain in open innovation. Suppliers are of utmost relevance in this context, since low-tech firms rely heavily on raw material, machine and equipment technological advances (Bender, 2004; Heidenreich 2009). In this context LMT firms are widely termed as “supplier-dominated firms” referring to Pavitt’s taxonomy of sectoral innovation modes (Heidenreich 2009; Robertson et al. 2003). While in-house R&D is not a crucial strategy element in low-tech sectors, firms can create innovation by becoming knowledge-intensive. Both literature and empirical findings (Gupta and McDaniel, 2002; Hirsch-Kreinsen, 2008; Schwinge and Hirsch-Kreinsen, 2012) show that accumulated knowledge can support a new way of combining inputs or resources based on exploitative learning processes, increase effectiveness and create sustainable competitive advantage. *Knowledge intensity* refers to external and/or internal ‘knowledge seeking activities’, ‘initial knowledge capital’ and relevant ‘human capital’ (Caloghirou et al., 2012). Knowledge-intensive low-tech firms seek mainly new technical and practical knowledge linking external knowledge with the firm-specific knowledge base (Bender and Laestadius 2005; Medanoça 2009; Robertson and Smith 2008) relying on training and highly qualified personnel skills.

According to this knowledge-oriented perspective, knowledge and competencies of “human capital” are valuable firm assets due to their firm-specific, socially complex, and path-dependent characteristics (Collins and Clark, 2003; Wright et al., 2001). Innovation is usually connected to motivation and ability of human capital to develop creative and innovative approaches. Human resource management’s role is crucial in nurturing the necessary conditions for this task. Firms use strategic HR practices, such as training, performance appraisal, and compensation, as means to motivate employees' knowledge bases and their creative thinking (Chen and Huang, 2009).

Globalization and trade liberalization in combination with the global financial and public debt crisis that countries are now experiencing have created vulnerable and volatile environments. Mature industries are subject to major changes but cumulative knowledge and its creative combinations can provide novel options to companies in order to survive

(Protogerou and Karagouni, 2012). All the above indicate that knowledge-oriented strategies may play an important role in the enhancement of low-tech companies' performance and competitiveness by creating and sustaining strong competitive advantages.

### **3. WOODWORKING AND FURNITURE SECTORS**

#### ***3.1. Industry structure***

The wood product manufacturing industries or woodworking industries include the production of sawn wood, wood-based panels, joinery and carpentry materials, containers packaging and other wooden articles. The furniture industry is part of the down-stream value chain activities of this sector including other material as well. It is essentially an assembling industry, which employs various raw materials ranging from wood and wood-based panels to metals, plastics, textile, leather and glass. There are many different types of furniture with very different uses.

Woodworking and furniture industries are two vital, sustainable, innovative and eco-compatible sectors, with a turnover in 2009 of around €198 billion, an added value of around €60 billion and an employment rate of 2.1 million people in more than 300 000 companies (EU-27, Eurostat, 2012). The vast majority are SMEs, with the wood-based panel sub-sector and a handful of sawmills to be the exception. The furniture industry accounts for nearly half of this turnover, followed by the production of construction elements (19.3%), sawmilling (13.9%) and panel production (9.2%). The majority of furniture producers are micro-enterprises (less than 10 employees).

The sector faces growing competition from low-cost, emerging economies and a growing number of technical trade barriers. Furthermore, the furniture sector is not only facing difficulties in accessing wood as a raw material, but also a dramatic rise in the price of materials such as leather, plastics natural fibres and petroleum derivatives. The general financial and economic crisis has had a major impact on the entire sector: between 2008 and 2009 65000 companies shut down and turnover decreased by more than 20% (eu.enterprise.sectors).

#### ***3.2. Sector Dynamics and the role of Innovation***

Woodworking companies are considered innovative and knowledge-intensive (Smith, 1999; Hirsche-Kreinsen and Scwinge, 2010) demonstrating a continuous development of processes. Companies in the sector have built in high-quality innovation systems for both products and processes and excellent sectoral research and technological development knowledge centers.

Global machinery manufacturers, suppliers, the chemical industry, Universities and independent research centers develop synergies assisting the advancement of process and product developments. Innovations turn around engineered wood products, wooden composites, novel fittings and other wooden products.

Furniture companies are less knowledge-intensive or innovative regarding technical innovation. Investments in internal R&D processes are very low to non-existent, very few firms engage in radical breakthrough technologies and hardly any firm protects its intellectual property through patents. The sources of technological changes are often found outside the sector, for example, in the wood processing machinery, IT services, high-speed automation and manufacturing logistics, paints and lacquer (Poliacov et al., 2009).

Knowledge evolves mainly around aesthetic, design and fashion related issues and focuses on creativity and strong image building. Yet, process and product innovation is evident in the undertaking of lengthy processes of restructuring and modernization, development of sustainable production methods and novel business models (e.g. modular design). Major factors of competitiveness for the sector consist of research and innovation along the whole value chain (Figure 1) and mainly material and fittings, skills and quality, design and added value, knowledge and know-how, together with better access to third country markets.

## **4. THE WOODWORKING AND FURNITURE SECTORS IN GREECE**

### ***4.1. Industry structure***

Woodworking and furniture industries play a significant role in Greek economy, with a turnover in 2008 of around €2 billion, an added value of around €1 billion and an employment rate of 35.000 people in more than 15.000 companies (Eurostat, 2009). The vast majority is micro-companies, with the wood-based panel sub-sector and sawmills to be the exception.

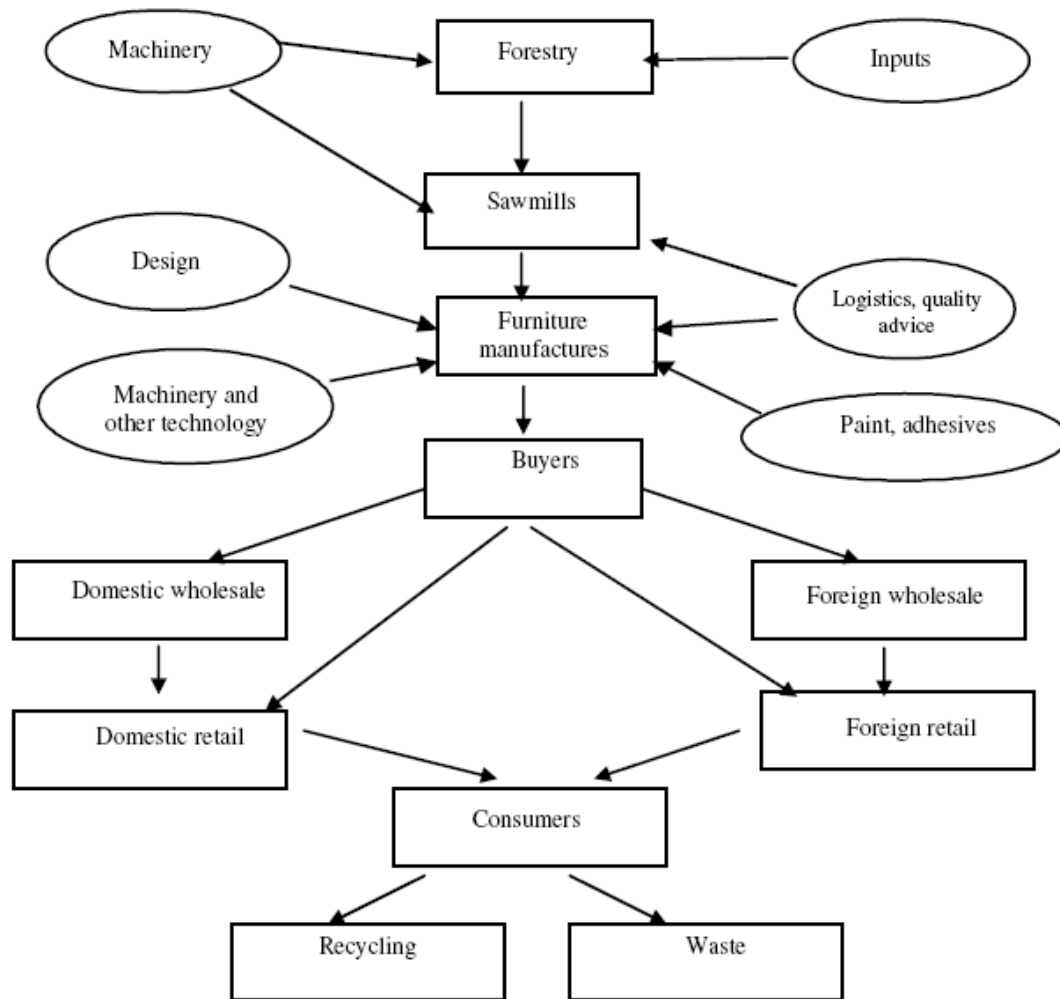
The sector is mature, highly fragmented and labour-intensive with many firms operating in a 'craft' production mode. 66% of the firms are less than 30 years old and cover mainly the domestic market, as exports are rather insignificant.

The industry faces growing competition from low-cost, emerging economies and a growing number of technical trade barriers. Decreasing production in absolute numbers was combined with the increasing number of trendy products from Italy and Spain, cheaper products from Turkey, China and India and different approaches such as of IKEA. Furthermore, it faces difficulties in accessing wood as a raw material and a dramatic rise in the price of materials such as leather, plastics natural fibres and petroleum derivatives (Tringkas et al., 2012). The general financial and economic crisis has had a major impact on the entire sector: In 2008 most companies had losses of profits (56.8%) or even damage (27.3%). Regarding the furniture sector, the production volume decreased by 47% among 2009-2011, and further by around 30% in 2012 (EL.STAT).

### *3.2. Sector Dynamics and the role of Innovation*

Greek wood and furniture companies are not considered as innovative even with the Schumpeterian concept of innovation. Recent research (Karagouni et al., 2010), which covered wood and furniture companies in the region of Thessaly, Greece, indicated that only an 18% of firms in the sample developed some incremental innovation. Improvements of existing products and purchase of process innovation are the main innovation activities. Advancement of existing and development of new equipment (AMT), the import of design systems (CAD), the application of CIM and MRP, as well as the pilot use of new or improved raw material or semi-finished products are further innovations pursued by Greek wood and furniture manufacturers. A network of international machinery manufacturers and suppliers play a significant role in research and development advances regarding mainly medium and large organizations (Tringkas et al., 2012). Furniture companies invest on differentiation through the development of aesthetic value and fashion. Yet, design is still underdeveloped while process innovation refers more often to restructuring and modernization.

Figure 1 Wood furniture value chain



Source: UNIDO

Major weaknesses of both sectors regard the lack of specialized technical personnel, overall organization and quality control while entrepreneurs' educational level is rather low (Likar et al., 2008). The last five years the sectoral context starts changing by becoming more knowledge-intensive. New entrepreneurs or successors have a high educational level and turn to research, innovation and knowledge management.

## 5. EMPIRICAL PART

### *Methodology and measures*

The survey was undertaken during the summer of 2012 in Greece (crisis period). The field research was conducted through personal telephone interviews with the aid of CATI (Computer Administered Telephone Interviewing). The original sample came from almost

2.296 SMEs which belong to the sectoral ecosystem of wood and furniture manufacturing and wholesale trade. The reason for including also trade firms in the sample is that at least in Greece they are very much linked with the manufacturing companies they collaborate. Thus, they could be considered as an integral part of the specific ecosystem. More specifically in the analysis we have included firms belonging to the following NACE Rev 1 sectors

- Sector 20 Manufacture of wood and of products of wood and cork, except furniture;
- Sector 36.1: Manufacture of furniture
- Sector 51.53 : Wholesale of wood, construction materials and sanitary equipment

The analysis consists of two parts. At the first stage we run an OLS regression, in order to understand the factors that affect innovative performance of these firms. At the second stage we try to build a typology of the examined firms by implementing cluster analysis and by using the variables that turned out to be significant. This provides a clear mapping of the characteristics of the specific sectoral ecosystem.

The first step in the analysis was to try to identify the factors that affect innovative performance of the firms. More specifically, the variables / measures that will be in the analysis are the following:

As dependent variable (variable INN) we use the number of product and/or process innovations that were introduced by the firm during the last three years.

As independent variables, that is elements that we believe that they might affect innovative performance, we use the following:

**COST\_LEAD:** Cost leadership measures whether the firm has a cost competitive advantage. It takes the value of 1 if the firm charges significantly higher than competition and scales up to 7 if the firm holds a significant cost advantage compared to all competitors. Due to the recession in the Greek economy and constrains from the domestic market, there is an urgent need for reducing prices. Therefore firms must find a way to re-organize their resources, to undertake process innovation. We expect firms that are cost leaders to innovate to a greater extent than those that they might offer more expensive products. However, the opposite could also hold, as successful product innovation may lead also to higher value added products, which should be priced with a mark up from the usual competition.

**DIFF\_LEAD:** differentiation leadership measures whether the firm has a competitive advantage based on differentiation. It takes the value of 1 if the firm's products do not differentiate significantly compared to competition and scales up to 7 if the firm holds a significant differentiation advantage compared to all competitors. A positive sign is expected here, as in order to differentiate firms must constantly innovate.



CR\_DES This variable is a measure of the difficulty of the competitors to copy the competitive advantage of the firm. It takes the value of 1 if the competitors can easily recognize and copy the competitive advantages of the firm and scales up to 7 if the competitors can hardly recognize and copy these competitive advantages.

MAN\_GR: It measures the management's commitment to achieve specific targets in relation to the company's growth. It takes the value of 1 if the managers are more interested in the typical everyday administrative tasks than having a strategic vision for the future and scales up to 7 if the managers are strongly motivated and committed to achieving specific growth targets.

CUST\_LY: It is a measure of the customers' loyalty. It takes the value of 1 if the customers buy products / services randomly and have no preference in brand name and scales up to 7 if the majority of the customers buy regularly the company's products and show a strong preference to the specific brand name. A high degree of customer's loyalty means that firms are not under pressure from the demand for innovation.

SPEC: This variable measures the firm's workforce of qualified personnel. It takes the value of 1 if only a small percentage of the firm's staff is highly qualified and scales up to 7 if the firm occupies specialized scientific staff in most of its departments and levels. A positive sign is expected here.

ICT: It measures whether or not a firm uses new technologies and tries to integrate ICTs. It takes the value of 1 if there is no effort to adapt to the new conditions by incorporating new ICT and scales up to 7 when the firm has a strong lead compared to its competitors to incorporate new ICTs. A positive sign is expected here, as firms that follow the latest developments on ICTs and try to integrate new technologies in their processes are more eager to change and especially process innovation.

CULT: This variable measures whether the business environment and culture encourages employees to take initiatives and propose new ideas. An evaluation of 1 means that no initiative or risk is allowed and any failures are unacceptable. On the other hand the value of 7 means that there are official processes that encourage the initiative and risk and potential failures to use as learning experience for the future.

BON: It measures whether there is any system of reward and recognition for successful ideas and innovation. It takes the value of 1 if neither formal nor informal recognition nor reward is available and scales up to 7 if there is a well established formal system of reward and recognition of staff suggesting ideas and successful innovations.

RD firms' spending takes the value of 1 if there are no R&D expenses and scales up to 7 if the company is a leader in its sector in relation to the R&D expenses (turnover rate greater than 10%).

COLL: It is a measure of the degree to which firms participate in research projects. It takes the value of 1 if the firm has not participated in any research program over the last 5 years and scales up to 7 if participating in R&D collaborations is a strategic choice of the firm.

SIZE: It measures the size of the firms in terms of employment. It takes the values of 1 for micro firms, 2 for small firms, 3 for medium sized firms

EXP: The exporting activity of the firm. It takes the value of 1, if the firm is not exporting and scales up to 7 if the firm is exporting more than 60% of its sales

EXP\*SIZE: It is an interaction term of exports and size. We are able to capture the joint effect of the two variables.

SEC: It is a dummy variable taking the value of 1 for manufacturing firms and 2 for trade firms

### *Sample descriptive*

In terms of size, the vast majority, almost 3 out of 4, are micro firms that employ less than 9 employees. Only 3.6% of the firms, 11 manufacturing and 3 from the trading sector are medium sized. In terms of location of headquarters, 60% are located in the two main cities (regions of Greece), whereas another 40% is located in various other regions of the periphery of Greece

Table 1: Size of the firms

Number of employees	Number of firms	%	<i>Manufacturing</i>	<i>Trade</i>
<=9	287	72,8	228	59
10_49	93	23,6	82	11
50 - 249	14	3,6	11	3
Total	394	100	321	73

The vast majority of firms do not export. A 15% presents some exporting activity but this is not an important part of their sales, as it represents less than 10% of their turnover. On the other hand there are 28 firms (7%), mostly manufacturing that they seem to export more than 20% of their sales

## 6. RESULTS AND DISCUSSION

Firms have evaluated at a 1-7 Likert scale the degree to which their competitive advantage is related with cost. While 9.6% of the firms responded with a 7, indicating cost leadership, more than half the sample responded with at least 5, indicating that they perceive themselves as cost leaders. On the other hand there are a 10% of firms that they feel they are significantly more expensive from competition, focusing probably on other niche markets with higher value added products.

Table 2: Cost competitive advantage: Degree to which competitive advantage is related with cost

Value (Likert scale 1-7)	1	2	3	4	5	6	7	TOTAL
Number of firms	23	18	29	99	146	41	38	394
%	5,8	4,6	7,4	25,1	37,1	10,4	9,6	100,0

1: The firm charges very high prices for its main products

7: The firm holds a significant cost competitive advantage

Almost 20% of the firms believe that the main source of their competitive advantage is diversification (rated 6-7 in the Likert scale). Another 20% lie at the other end of the spectrum, indicating those firms which are not significantly diversified from competitors.

Table 3: Diversification advantage: Degree to which competitive advantage is related with diversified products / services?

Value (Likert scale 1-7)	1	2	3	4	5	6	7	TOTAL
Number of firms	3	10	68	78	159	26	50	394
%	0,8	2,5	17,3	19,8	40,4	6,6	12,7	100,0

1: The products / services have quality / operational disadvantages among most other competitors

7: Firm's products/ services are largely differentiated from those of competitors

Almost half of the sample believes that their competitive advantage is rather easy to be imitated, so actually they do not possess a unique characteristic. On the other hand 20% seem to hold that rare sources of advantage or the capital requirements for this are too high.

Table 4: Imitation effect: How easy if for competitors to duplicate the competitive advantage of firms

Value (Likert scale 1-7)	1	2	3	4	5	6	7	TOTAL
Number of firms	68	47	84	52	59	26	58	394
%	17,3	11,9	21,3	13,2	15,0	6,6	14,7	100,0

1: It's easy for competitors to recognize and track the sources of competitive advantage of the firm

7: Competitors are difficult to recognize and reproduce the sources of competitive advantage of the firm. The capital requirements and manpower for this to happen is significant.

Another interesting topic that was explored in the survey was whether day to day management and business activity is the main concern of the managers-owners of the company. It is well expected for managers to do that, however sometimes and especially in micro firms, strategic planning and specific growth targets may not be at the heart of the business activity. Indeed, a 40% of the sample responded with 1 to 3 in the Likert scale indicating that they lack this strategic vision for the future, as making end meets.

Table 5: Managers' commitment to specific growth targets

Value (Likert scale 1-7)	1	2	3	4	5	6	7	TOTAL
Number of firms	117	11	32	49	78	6	101	394
%	29,7	2,8	8,1	12,4	19,8	1,5	25,6	100,0

1: Managers are mostly interested in day to day administrative tasks, lacking a strategic vision for the future

7: The managers are strongly motivated and committed to achieving specific growth targets

Furthermore, the customers' loyalty in the examined firms was also explored. Almost 40% believe that they have a relatively loyal customer base that is customers that they show a strong preference to the specific brands (products / services). This can be a disincentive for innovation, as firms are not under pressure from the demand for innovation.

Table 6: Degree of customer loyalty

Value (Likert scale 1-7)	1	2	3	4	5	6	7	TOTAL
Number of firms	40	4	30	40	127	41	112	394
%	10,2	1,0	7,6	10,2	32,2	10,4	28,4	100,0

1: Insignificant: Customers are usually random and have no specific preferences in brands

7: Very large: the vast majority of customer buys regularly the company's products and exhibit a strong preference to the specific brand

Less than 10% of the sample has a significant lead compared to competitors in terms of ICTs integration. More than half of the sample is rather a slow adopter of ICTs.

Table 7: ICT usage: Degree to which firm integrates ICTs

Value (Likert scale 1-7)	1	2	3	4	5	6	7	TOTAL
Number of firms	72	34	74	36	140	10	28	394
%	18,3	8,6	18,8	9,1	35,5	2,5	7,1	100,0

1: There is no attempt to adapt to the new technological conditions by incorporating new ICTs.

7: The firm has a strong lead compared to its competitors to incorporate new ICTs

Some factors of the internal environment of the firms were also examined in the survey aiming at identifying whether the business culture promotes risk taking or awards new ideas. A 30% of the firms have responded with at least 5 in the specific Likert scale, indicating those firms that seem to allow for such risk taking. On the other hand when firms are asked about formal award mechanisms of processes for recognition to the employees that suggest ideas or take initiative to promote innovation, then less than 10% responds positively (at least 5 in the Likert scale). So the perception of an environment that encourages risk taking initiative is not actually formally integrated in the business environment.

Table 8: Internal environment: The degree to which business culture encourages employees to take initiative and propose new ideas, allowing the risk of possible failure

Value (Likert scale 1-7)	1	2	3	4	5	6	7	TOTAL
Number of firms	114	13	93	44	96	11	23	394
%	28,9	3,3	23,6	11,2	24,4	2,8	5,8	100,0

1: No initiative and risk is allowed

7: There are official processes that encourage the initiative and risk, and potential failures are used as learning for the future.

Table 9: Award mechanisms: Degree to which there are systems of reward and recognition for ideas and successful innovation

Value (Lincert scale 1-7)	1	2	3	4	5	6	7	TOTAL
Number of firms	197		162		29		6	394
%	50,0		41,1		7,4		1,5	100,0

1-2. There are no formal nor informal recognition and reward mechanisms

7. There are well established formal processes of reward and recognition of staff suggesting ideas

In terms of R&D expenses more than 75% of firms do not spend any money on R&D.

As it was expected this traditional sector is not R&D intensive and any innovation stems from non R&D innovation.

Table 10: R&D expenses: level of R&D spending

Value (Lincert scale 1-7)	1	2	3	4	5	6	7	TOTAL
Number of firms	285	17	45	13	27	1	6	394
%	72,3	4,3	11,4	3,3	6,9	,3	1,5	100,0

1: No R&D expenses

7: The firm is a leader in its sector in relation to R&D (above 10% of sales)

Participating in collaborative R&D projects, at least publicly funded could be an alternative for those that do not want or simply cannot commit resources. However, the vast majority of firms has not participated in any R&D collaborative agreement during the last 5 years. Only 33 firms have responded with a 5 to 7 in the 1-7 Likert scale, indicating the most R&D intensive firms of the specific ecosystem.

Table 11: R&D collaboration: Degree of participation in research projects / collaborations relating to your business over the last five years?

Value (Lincert scale 1-7)	1	2	3	4	5	6	7	TOTAL
Number of firms	356	5			16	12	5	394
%	90,4	1,3			4,1	3,0	1,3	100,0

1: No R&D collaboration whatsoever

7: Yes, it is a main feature of the firm's strategy

All the above variables were included in an OLS regression. Results are presented in the following Table 12. The difference between Model 1 and Model 2 lies only in the use of the interaction term linking exports with size. Furthermore, a separate analysis was undertaken in the two main sectors, manufacturing and trade.

Regression results show that the effect of size and exports is significant, indicating that firms that export – mainly the larger ones – seem to innovate more. This of course may be explained by both directions: in order to be able to export, firms need to constantly innovate. But on the other hand, exporting activity may also trigger a more intense effort for innovation, as competition is more intense in international markets, therefore maintaining a market position requires the development of capabilities to innovate. It should also be noticed that in the trade sector, size is negatively related with innovation, although at a  $p < 10\%$  level.

Furthermore, cost leadership is positively correlated with innovation. However this result is strongly related with manufacturing firms, as in the trade subsample the factor is not significant.

Management commitment to specific growth targets is also positively related with innovation, although at a low significant level, as the result is significant only to firm from the trade sector.

Customers' loyalty or switching costs is the factor that is mostly significant for the whole sample and both subsamples. It turns out that despite the fact that most of the surveyed firms have committed customers, this is not a disincentive to innovate, but on the contrary is related with innovativeness. This might be explained by the idea of innovation risk. Since in order to innovate firms have to commit human and economic resources, the fact that they already enjoy a relative secure client base allows for investing in innovation.

Table 12: Degree of innovation:

	Total Sample Model 1	Total Sample Model 2	Manufacturing	Trade
EXP	0.14* (0.079)		0.22** (0.09)	-0.26 (0.19)
SIZE	0.16 (0.17)		0.274 (0.1814661)	-0.87* (0.47)
EXP*SIZE		0.078** (0.036)		
COST_LEAD	0.164** (0.064)	0.166*** (0.064)	0.135** (0.070)	0.295 (0.1830)
diflead	0.0136 (0.076)	0.0173 (0.075)	0.003 (0.083)	0.348 (0.2236)
crdes	0.0286 (0.048)	0.030 (0.048)	0.009 (0.055)	0.095 (0.1049)
mangr	0.0718* (0.040)	0.072* (0.040)	0.048 (0.0445)	0.234** (0.1104)
swcost	0.235*** (0.058)	0.234*** (0.0578)	0.230*** (0.0646)	0.07 (0.1511)
spec	0.098 (0.07)	0.100 (0.076)	0.143 (0.089)	-0.07 (0.1658)
ict	0.21*** (0.06)	0.21*** (0.0630)	0.165** (0.069)	0.41*** (0.1577)
cult	0.11* (0.06)	0.1082* (0.061)	0.135** (0.069)	-0.043 (0.1505)
bon	0.091 (0.08)	0.091 (0.080)	0.085 (0.089)	0.315 (0.2118)
rd	0.298*** (0.074)	0.3052*** (0.074)	0.287*** (0.080)	0.446* (0.244)
coll	-0.000 (0.07)	-0.0056 (0.074)	0.020 (0.080)	-0.2209 (0.2910)
constant term	-1.54***	-1.33***	-1.460**	-2.0922*



	(0.57)	(0.512)	(0.645)	(1.270)
Adjusted R-squared	0.3218	0.3235	0.3273	0.3684
F statistic	14.32***	15.45***	12.12***	4.00***
No of obs	394	394	321	73

Notes: \* significant at the  $p < 10\%$  level, \*\* significant at the  $p < 5\%$ , \*\*\* significant at the  $p < 1\%$ .

Standard errors are reported in parentheses.

A business environment that strongly encourages initiatives and risk taking, and where potential failures are used as learning experience for the future is also related with innovation. But this is more important for manufacturing rather than trade firms

Finally, R&D is - as expected - positively related with innovation, however as it was described earlier it affects only a very small part of the sample. All other variables used in the equation turned out insignificant

At the next step of the analysis, we use the significant variables to perform cluster analysis.

Results reinforce the presence of three clusters as given in Table 13.

	Firm characteristics	Innovative performance
Cluster A: Laggers	No outsourcing Limited use of Internet by the personnel Limited use of employees performance indicators No relationships with other actors in the value chain (suppliers / clients)	63% no innovation or product / process improvement
Cluster B Building capabilities	System of wages is highly appreciated by employees Significant training of the personnel Highly skilled personnel (same extent as firms from cluster C) Significant efforts to reward innovative ideas and risk taking	34% no innovation or product / process improvement
Cluster C: The established	Intensive effort for vertical integration	12% no innovation or product / process improvement

	Firm characteristics	Innovative performance
ones''	Technology at the heart of their competitive advantage, mostly collaborative R&D Intensive marketing activities Highly skilled personnel	

Cluster A include 125 firms and is dominated by 85% of micro firms, which are in any case the vast majority of the sample. Cluster B includes 149 firms and although 78% are micro firms, a 20% of them are small (10-49). Finally cluster C includes 120 firms, and only 54% are micro firms, whereas 38% are small, and 7.5% are medium firms. So actually there is clear size distinction in the 3 clusters.

From the above table, it is evident that cluster C – which includes most of the small and medium sized firms of the sample - is the better performing set of firms. It includes firms that can be characterized as more aggressive in the market with significant efforts to innovate and gain market shares from competition and constantly building a strong competitive advantage. Looking at the actual identity of these firms, this group represents the most established firms of the sectors, with a traditional position in the market. They have surpassed a crucial viability test and they try to grow by using all the right tools and mechanisms, although they commit limited resources to R&D.

On the other hand, cluster B seems to be more concerned with establishing a position in the market and building internal capabilities. They are in the process of integrating technology; they have invested in raising the educational level of the personnel and generally they try to align internal business processes with market developments. They are possibly more non-R&D innovators, at least those that actually innovate.

Cluster A is the worst performing set of firms. These firms seem to lag in all aspects of business development and not only on innovation. Their viability over the next 2-3 years seems to be highly questioned, as they are not in a course of building any sort of capabilities. Some defensive strategies of reducing costs are taking place, but nothing is certain on whether it could be sustainable.

## 7. CONCLUSIONS

The paper reveals some typologies of wood and furniture firms based on their strategic orientation towards innovation and knowledge creation. More precisely the study explored the factors that affect innovative performance of these firms in crisis period and provided a clear mapping of the characteristics of the specific ecosystem. The majority of these firms (3/4) are introvert, as they focus only on internal demand. These cannot be considered as knowledge-intensive or innovative. There is however a group of extrovert firms that seem to be able to export, although to a limited number of markets. These firms – despite the fact that they are also family run – are more innovative than the rest.

An interesting finding was that innovation is significantly connected to cost leadership. The common belief for the sector so far was that differentiation and creativity were the driving forces of competitive advantage. Yet human resource practices are under-developed since formal processes towards risk taking and innovative ideas are rather scarce. Therefore, the perception of an environment that encourages risk taking initiative is not actually formally integrated in the business environment.

In spite the fact that one should expect some stronger reaction towards globalization and economic crisis, the wood and furniture industry seems to remain rather passive with limited effort to network and outsource, to use ICT or explore and activate other linkages along the value chain. Some firms try to build capabilities in order to address markets focusing mainly on Human Resources. Bigger companies try to become more knowledge-intensive, seeking knowledge all along the value chain and placing technology and collaborative efforts at the heart of their competitive advantage. This seems to be the best way to confront both crisis and globalization threats.

The study indicates that the wood and furniture industry in Greece faces in its majority survival problems, since it seems unable to correspond to changes and new market behaviours. False assumptions on cost leadership and a focus on day to day management and business activity combined with old-fashioned ways on human-resource management do not allow for the development of sustainable competitive advantages.

In order to improve competitiveness and viability, wood and furniture firms must find ways to re-organize their resources renew strategies and turn to advanced product/process innovation instead of mere improvements or imitations. Managers should try to turn to exports developing all necessary networks for both new product development and promotion. Entrepreneurial and managerial teams should realize the importance of possessing and further cultivating a suitable internal environment by building specific

capabilities' set and further cultivating them. A business environment that strongly encourages initiatives and risk taking and where potential failures are used as learning experience for the future can support innovation.

Furthermore, specific efforts should be made regarding the enhancement of the sector's innovation system at least at regional or national level as well as the role of non-business innovation actors, along with institutional and financial support towards the sector's enterprises. Policy makers should develop more targeted innovation policies to encourage relative entrepreneurial and knowledge-intensive strategies taking into consideration all the above characteristics of the examined firms.

Our findings verify relevant theory and empirical research; competitiveness seems to be related to export-oriented strategies in addition to a strategic orientation towards knowledge creation and innovation. Knowledge-intensive wood and furniture firms are typical low-tech cases which seek mainly new technical and practical knowledge and engaged in frequent changes or improvements of process technologies. Human resource management's role has been proved to be crucial in nurturing the necessary conditions for innovation even with its wide sense.

The above research covers a specific time period. Further research is suggested in post-crisis period to compare the effects of knowledge-intensive and other types of strategies on survival and economic performance. Furthermore, this research can be extended to explore different kinds of strategies in relation to innovative performance and competitive advantage such as the resource-based view and the Dynamic Capabilities Framework. Another suggestion should be to extend the research in other low-tech sectors and compare their reaction to crisis and the strategies and competitive advantages they develop in order to survive in today's vulnerable mature markets.

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