

The Hidden Champions-

The Danish industrial motor of growth

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1. The Danish Hidden Champions- industrial export successes

1.1. Introduction - the Danish hidden champions

”The hidden champions – Danish industrial export successes” provides an in-depth analysis of small and medium sized Danish manufacturing companies with between 50 and 500 employees. The companies covered by the analysis have been in operation for more than 10 years. They are in general characterised by successful performance and robustness during high growth periods as well as in period of crises. These companies constitute the Danish industrial middle class – a parallel to the German *mittelstand*¹. The German *mittelstand* refers to a broad category of highly successful exporting SMEs, typically privately owned.

These companies have received a lot of international interest in recent years, as OECD countries are looking to new ways of revitalising industrial policies to fully exploit technological advances and the effects of globalisation and developments in emerging markets. There has also been focus on manufacturing, since in Denmark² and the EU³ and among OECD countries there is increasing recognition of the close relationship between manufacturing, service, and trade. In addition, manufacturing industries are also the point of departure for developing products and solutions that target global challenges such as climate and environment, water supplies, food safety, health, and sustainable energy. The innovation strategy "Denmark - a nation of solutions" (FIVU 2012) emphasises the need for coherence between innovation efforts, the enterprises that are to implement knowledge through research development, and innovation, and the opportunities for growth that are Denmark's competitive edge.

In the Danish context there is a class of companies similar to the German *mittelstand*. Approximately 1/3 of these Danish companies are export leaders in their respective export markets. As such they represent a dynamic, yet often unrecognised, growth motor in Danish industry. Despite their relative success, these companies seldom make the headlines in media – hence the expression "hidden champions.” The other 2/3 of the analysed Danish companies are less export-oriented but still show a solid performance. In the analysis they are called core companies.

This analysis is inspired by research conducted on the German *mittelstand* (hidden champions). The analysis is situated in a broader policy effort to improve the framework conditions for advanced manufacturing firms in Denmark. The focus of the analysis of the Danish hidden champions has been to:

- analyse the economic performance of the Danish hidden champions and the “core companies” compared to that of the manufacturing sector in Denmark as a whole;
- analyse the development strategies adopted by the Danish hidden champions in response in internal and external pressures in order to identify critical success factors;
- analyse how and to which extent the hidden champions make strategic use of the opportunities in the changing global value chains⁴.
- provide new empirical evidence about what it takes to further develop these advanced manufacturing enterprises in Denmark as a source of growth and job creation.

¹<http://www.gtai.de/GTAI/Content/EN/Meta/Events/Invest/2012/Reviews/Powerhouse/Downloads/presentation-chicago-gtai-german-mittelstand-bremer-121025.pdf>

² <http://www.danmarksvaekstraad.dk/tema>

³ <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2006:303E:0646:0650:DA:PDF>

⁴ See http://ec.europa.eu/enterprise/sectors/ict/key_technologies/ for further information and links to relevant reports.

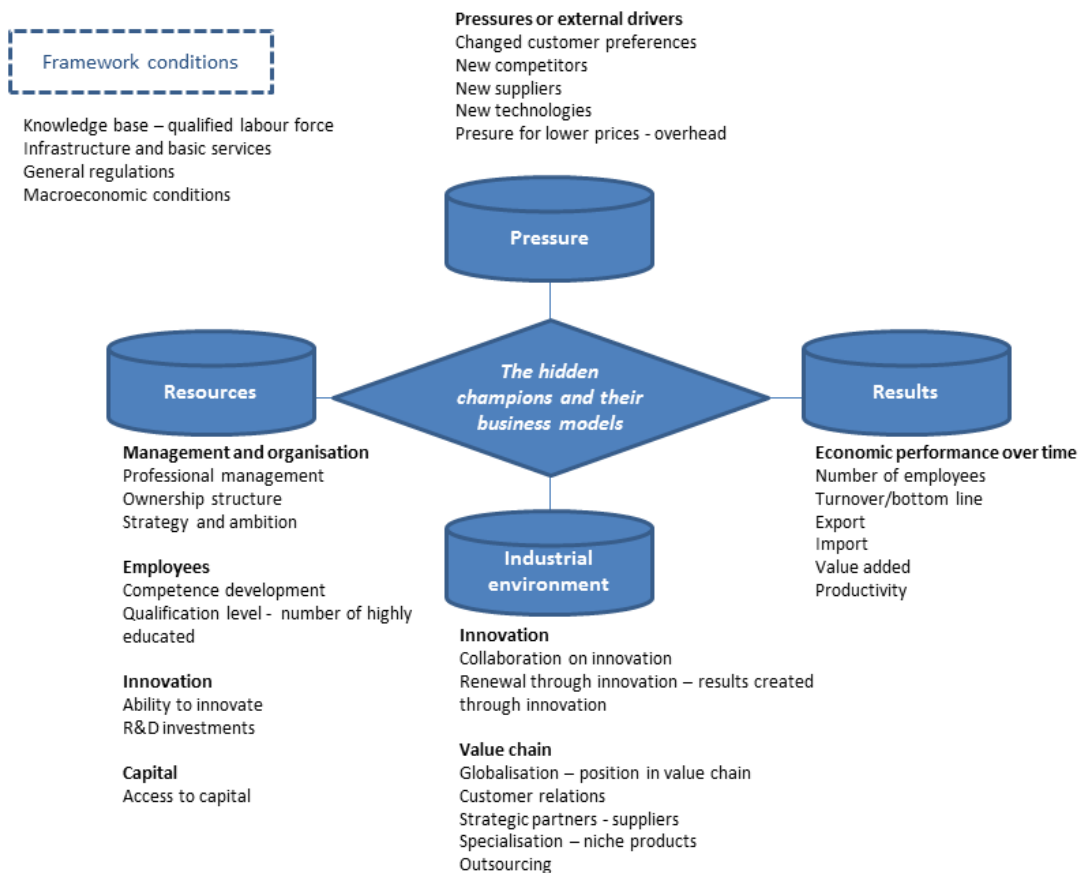
We hope that the study will contribute to renewed interest and understanding of the economic importance of advanced manufacturing in Denmark and that it will increase awareness about the interdependency between advanced manufacturing and knowledge and technology intensive services, which can further inform future policy priorities.

1.1.1. Methodological approach

Since the goal of the analysis has been to provide new insights into the factors that shape the hidden champions' opportunities and business strategies, an analytical model has been developed that takes into account internal and external conditions at the micro level and in the wider business environment. The factors that influence the performance of manufacturing companies increasingly extend beyond traditional production inputs such as the cost of labour and natural resources, which is why the model includes micro and macro perspectives, as illustrated in figure 1 below:

- **Pressure:** The external environment is dynamic and characterised by an increasing degree of uncertainty resulting in rapidly changing external pressures on manufacturing enterprises and their ability to navigate in complexity (EU, DG Enterprise, 2009, McKinsey 2012). These pressures may stem from uncertainty regarding business opportunities stemming from new technologies, diversity in market demands for example regarding environmental or energy sustainability, emerging new competitors or suppliers, and legislative requirements. The ability to correctly interpret and act on these pressures may position a company in the sweet spot of the value chain - or if the opposite have serious consequences for the competitiveness of an enterprise.
- **The industrial environment:** Enterprise development occurs through interplay with the outside world. The quality of an enterprise's external relations and its agility within the industrial environment are central to its development and its competitive position. Globally, there are some trends that suggest that while many manufacturing firms for years have operated on low-cost value chain considerations, some manufacturing companies are beginning to reassess total factor costs and capabilities in more sophisticated ways. Proximity to and interaction with universities and institutes such as GTS (Advanced Technology Group) may constitute a critical asset; the same applies to capabilities developed through interaction with advanced customers and suppliers.
- **Resources:** The quality of external relations is increasingly a part of these resources, and digitisation enables task decomposition and supports collaboration on development and knowledge sharing across enterprises' organisational and geographical boundaries (Lakhani & Tushman 2012).
- **Business model:** In the end, the business model is decisive for how the enterprise synthesises internal resources and external conditions and assets into a decision about what is to be produced, how, and where. Due to the development in global value chains, a manufacturing firm attempting to improve its performance in the market needs to be well-equipped to understand the value chain and its own position in the value chain. A change in any firm's business model within the value chain means that the resource configuration and hence strategic positioning of the whole value chain may change. The closer the relationship is with key customers and suppliers the greater chances are that the manufacturing firm will learn not *about* the market, but *with* the market, which is central to reducing risks.
- **Results:** Success is not merely a question of the right strategy in relation to the market and the technological development within an industry or the recent launch of a new product. Economic results over time such as turnover, number of employees, export, productivity, and solvency provide indications of whether an enterprise also has the ability to grow and renew.

Figure 1: Overall analytic framework



Source: Danish Technological Institute

1.1.2. Data sources

The analysis builds on several data sources.

- Data from Statistics Denmark: data extraction about enterprises' economic performance (company statistics) and on their research, development, and innovation activities. The data are from 2010 (the most recent year available) and typically cover a 10 year period.
- Data from 2002 to 2012 on manufacturing enterprises' use of innovation measures managed by the Danish Agency for Science, Technology and Innovation. The data are provided by the Danish Agency for Science, Technology and Innovation.
- Data on manufacturing enterprises' use of GTS (Advanced Technology Group⁵) services from 2009 to 2011. This refers to the purchase of GTS services by manufacturing enterprises during this period. The data are supplied by the GTS secretariat.
- A survey of all small and medium-sized manufacturing enterprises carried out by Jysk Analyse A/S in January 2013 with a 61% response rate.
- In-depth interviews with 20 enterprises (cases).

The statistical data make use of enterprises' CVR (Central Business Register) identification number. It is therefore possible under the auspices of Statistics Denmark to establish a unique and

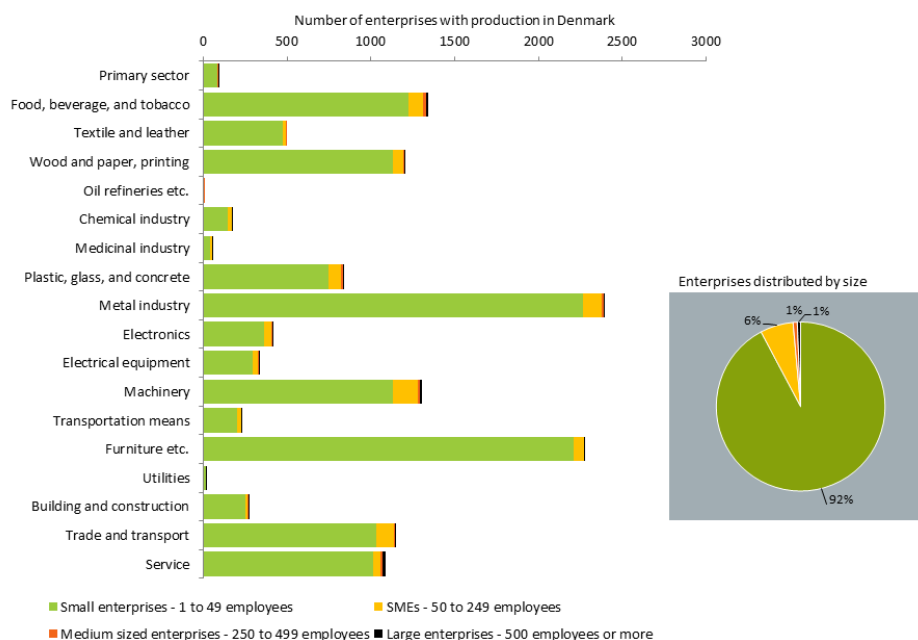
⁵ <http://www.teknologiportalen.dk/EN/About+GTS?i=1>

comprehensive database comprising statistical data from the questionnaire survey, from the Danish Agency for Science, Technology and Innovation, from the GTS secretariat, and from Statistics Denmark's database - for example company statistics and R&D and innovation statistics. This has enabled the statistical comparison of the hidden champions, the core companies, and all other Danish manufacturing enterprises.

1.2. A statistical overview

In 2010 there were 14,973 enterprises in the Danish manufacturing sector; 11,751 were registered as manufacturing⁶, and 3,122 were registered in other branches but also as a manufacturing enterprise. The other sectors with manufacturing enterprises are the primary sector, utilities, building and construction, trade and transport, and service, as seen in figure 2. A broad definition is thus used in the questionnaire survey, since enterprises' business models are not necessarily synchronous with statistical definitions of sectors. There can for example be cases of trade companies that over time have developed production activities.

Figure 2: Danish manufacturing enterprises 2010, distributed by sector, number of enterprises, and size



Source: Statistics Denmark FIRM2010 database. Enterprises without size specification are not included in the graphic.

There are fewer than 50 employees in over 90% of the enterprises, and over 500 employees in 0.6% as seen in the figure above. In 2010 there were - regardless of enterprise age - 975 enterprises with between 50 and 500 employees, which is the size category of the hidden champions. There were 866 enterprises with 50-249 employees, and 109 enterprises with 250-499 employees.

1.2.1. Relative performance of Danish hidden champions and core companies

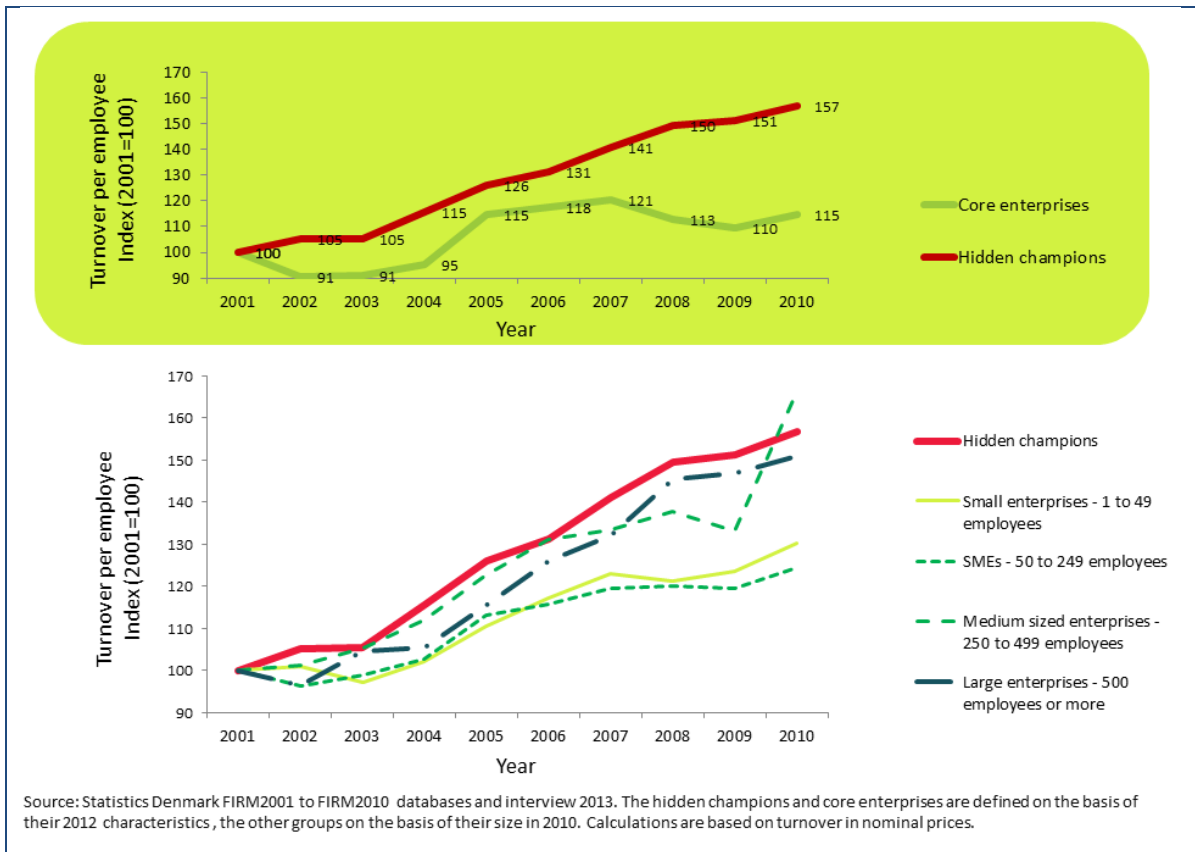
The hidden champions have a relatively greater rate of turnover growth than the core enterprises. Turnover (nominal value) in the hidden champions was 1.3 million DKK (174,400 EUR) per employee in 2001, and was 2.1 million DKK (281,700 EUR) per employee in 2010. Turnover in the

⁶ The data in the following that refer to all manufacturing enterprises in Denmark are based on the data from Statistics Denmark - that is, the figure of 11,751.

core enterprises included in the questionnaire survey was 1.8 million DKK (241,480 EUR) per employee in 2001, and 2.1 million DKK (281,700 EUR) per employee in 2010.

The hidden champions thus had a much higher growth rate in turnover per employee than the core enterprises, as shown in figure 3 below. Core enterprises with 250-499 employees had, however, a more rapid growth in turnover per employee towards the end of the period.

Figure 3: Turnover per employee, 2001-2010 (index)



The export share of turnover grew for the hidden champions throughout the period. In 2001 export accounted for 57% of turnover, and in 2010 export accounted for 67% of turnover.

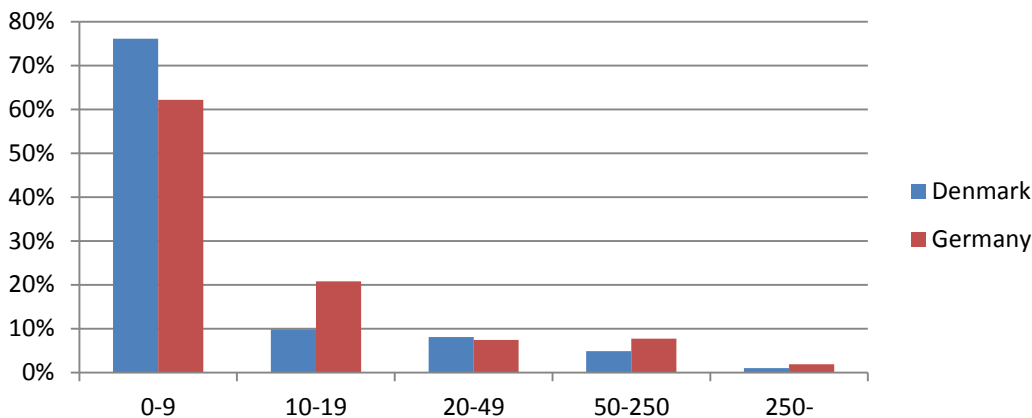
1.2.2. The German and the Danish hidden champions - a snapshot

Much has been written about the German *mittelstand* (hidden champions) and the role these companies play in the German economy. In the wake of the crisis policy makers also outside the EU have tried to understand their hidden success factors. The German industrial *mittelstand* alone accounts for about one quarter of German exports, and the German *mittelstand* is composed of about 1300 firms⁷.

Figure 4 below provides an overview of the distribution of manufacturing companies by size in Denmark and in Germany.

Figure 4: Manufacturing enterprises distributed by size (number of employees), Denmark and Germany, 2010

⁷ http://www.rieti.go.jp/en/special/p_a_w/018.html



Source: Eurostat

1.2.3. Economic performance

Given the success of the German *mittelstand*, a comparison of German medium-size manufacturing enterprises with between 50 and 250 employees and the Danish equivalent is therefore interesting. As table 1 below shows, the Danish enterprises have higher turnover and productivity:

Table 1: Comparison of Danish and German medium-sized manufacturing enterprises. Selected key economic performance indicators for manufacturing enterprises with between 20 and 250 employees, 2010.

	Average turnover (million DKK)	Productivity (DKK)	Average number of employees
Denmark	185.1	572,007	103.0
Germany	148.2	408,117	105.4

Note: productivity = value added per employee

Source: Eurostat

1.2.4. The impact of globalisation

Specialisation and international market orientation require the hidden champions to adapt to structural changes brought about by increasingly globalised production. Production is distinctly organised in global value chains based on where it can find the most favourable conditions for competitive positioning (OECD 2012a).

Global value chains are certainly a window of opportunity for hidden champions to focus on high-value products that can lead to internationalisation and growth (OECD 2011). However, global valued chains also create new conditions for work processes and growth. These can present challenges for enterprises that are already international in scope, and for those primarily operating in Danish domestic markets:

- *Increased competition and narrower supplier networks within global value chains.* Global producers to the end user market are continually reducing the number of sub-suppliers and replacing them with system suppliers as part of their global *supply chain management* strategies to reduce transaction expenses and create greater supply security enabled by digital technologies (Millard et al. 2012).
- *Greater product and service integration.* As sub-suppliers become system suppliers, they tend to have a much closer competence-based relation to the lead firm in the value chain. The more complex the information and knowledge exchanging processes are, the more

strategically the systems supplier will be positioned in critical high-value production processes relating to design and development.

- *Intensified technological development.* The demand for technological advances is becoming a central factor for the individual sub-supplier, particularly pertaining to automation technologies and to technologies that can embed new functionalities or lead to new product-service configurations.
- *Focus on global talent.* Competitive dynamics are creating demand for qualified employees. Increased levels of education permit value-creating production process and R&D to be localised outside of Denmark⁸. In a Danish context the recent Danish strategy for innovation in higher education⁹ and the vocational centres of excellence within manufacturing¹⁰ are examples of policy measures to counterbalance the cost-quality human capital ratio (Shapiro, Lauritzen, Resen 2012).

Global value chains thus present new opportunities to develop important strategic collaborative relationships (as system suppliers or advanced sub-suppliers) with larger global enterprises (Millard et al. 2012). Sub-suppliers often combine production and service in close collaboration with their customers, and thus often follow their customers in their global expansion efforts.

Danish manufacturing growth enterprises are typically characterised by holistic and yet highly focused business models building on close customer relations as a key source of innovation and embedded services as product differentiation strategy. Together, these increase the potential for becoming a system supplier. An additional characteristic is the interdependency between pilot production and an iterative practice- and problem-based innovation phase which can quickly market small tailored production runs. These growth enterprises have often trimmed production and organised production processes so that they are built on delegated responsibility and autonomy as a basis for high performance skilled and semi-skilled employees who actively contribute to process and product improvements (Reglab 2012; Shapiro and Helms 2011; Kraka 2013).

1.3. **Management and capital**

Controlled growth with focus on earnings and solvency is the basis for the hidden champions' investment strategies. It is debatable whether choice or necessity leads to this conservative investment strategy, which is more or less the same as that of the core enterprises, cf. figure 5 below.

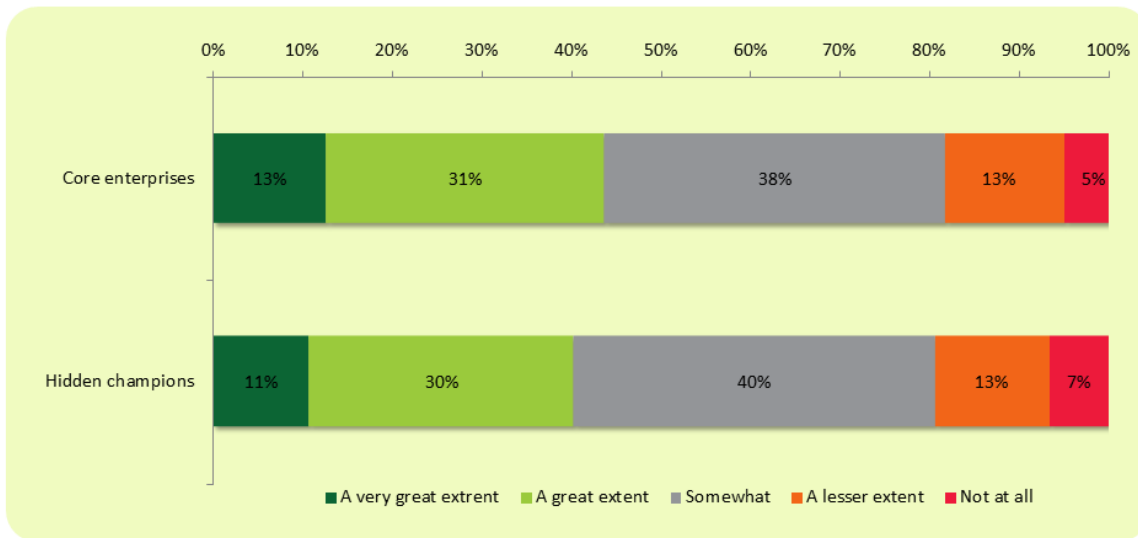
On the one hand, some of the hidden champions maintain that they are clearly not *first movers* when it comes to investment in new technology; there must be a clear business case first. On the other hand, most of the hidden champions have an ambitious strategy with focus on entry into new distant growth markets, and this requires capital. As figure 5 below shows, 41% of the hidden champions believe they to a very great extent or a great extent have a conservative investment strategy, and for the core companies this figure is 43%. Only 7% of the hidden champions believe this is not at all the case.

Figure 5: To what extent does the enterprise have a conservative investment strategy?

⁸<http://www.scanbalt.org/files/graphics/ScanBalt%20member%20documents/For%20all%20members/danish-science-innovation-education.pdf>

⁹ Schliecher- Lisbon Council - Præsentation af OECD-analysen PIAAC, foreløbige resultater

¹⁰ <http://www.industriensuddannelser.dk/tema/euxoghoejniveau/euxoghoejniveauforvirksomheder/>



Source: Survey of enterprises over 10 years old with 50-500 employees.
 N for the hidden champions and the core enterprises is respectively 153 and 330.

One of the reasons for success of the German *mittelstand* has been access to development capital. This is far from the case for Danish SMEs with market-based growth ambitions. In 2012 the Danish government introduced an investment window for the rest of 2012 and for all of 2013.

The investment window will in this period provide a rebate if a company invests in new production technology, equipment or machinery, permitting an extra 15% depreciation allowance. A company that purchases equipment for DKK 1 million thus can write off an extra DKK 150,000. There are still no assessments of the actual effects of this initiative.

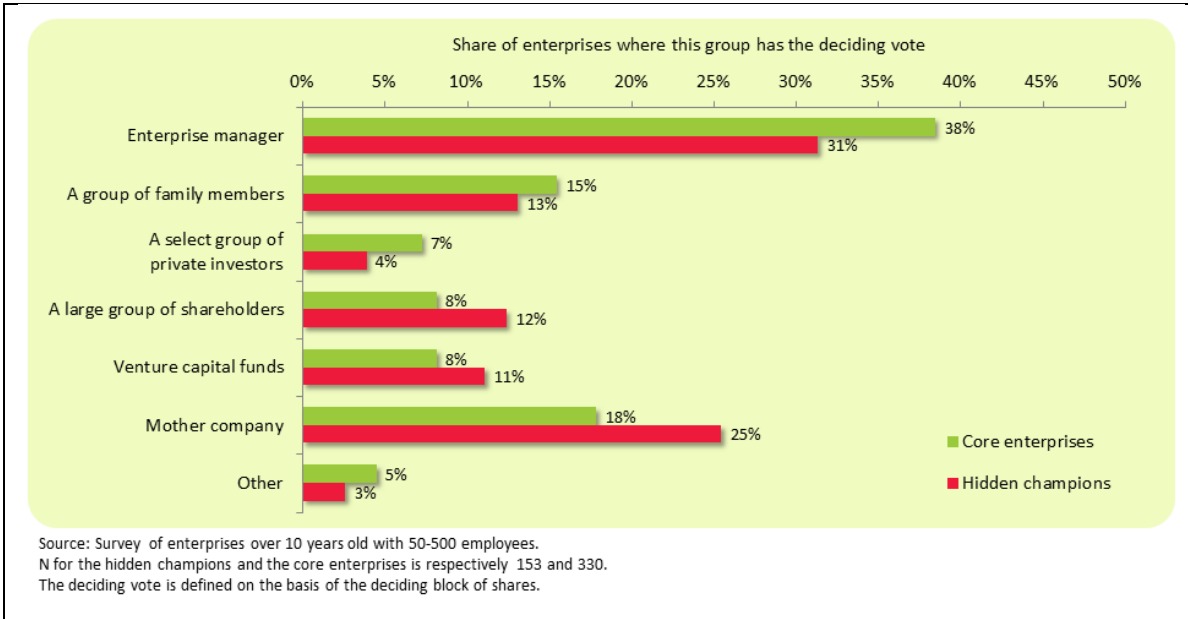
In recent years, large Danish enterprises have invested more abroad than in Denmark. Copenhagen Economics has carried out an analysis that estimates that there currently is an investment gap of DKK 50 billion compared to the historic trend from the start of the 1990s through 2003 that contributed to long-term growth and assured employment in Danish manufacturing. In addition, investments in Germany are a bit higher than the historic trend, and Swedish investments are approaching the historic trend for the first time since 1995 (Copenhagen Economics 2012).

There is a danger that lack of investment will lead to worn out or antiquated production machinery. This will hinder the use of breakthrough robot and automation technologies, and in turn have consequences for Danish productivity and international competitive position compared to Sweden and Germany, which both have the ability for advanced small-series and ramp-up production, and have a better investment climate.

1.4. Changes in ownership

A greater number of hidden champions than core enterprises have stockholders, venture capital firms, or other enterprises that have a deciding vote on operations and strategies, cf. figure 6 below.

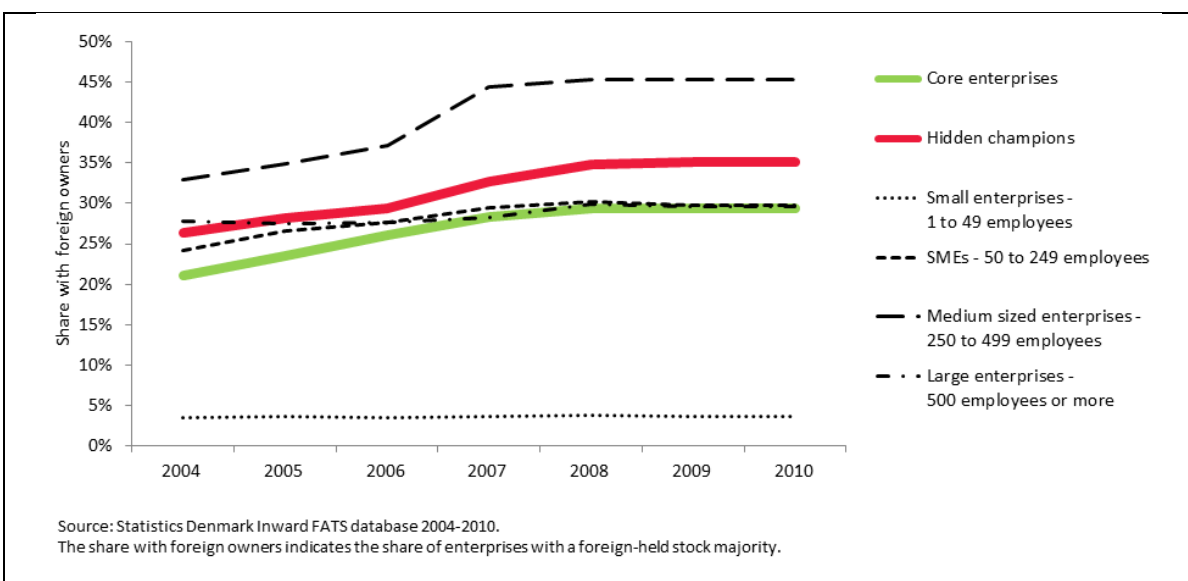
Figure 6: Decision making in enterprises



On the one hand, owner and family-run enterprises retain a level of autonomy that can result in unique strength through agility. On the other hand, there is the admittedly difficult task of attracting venture capital, even for an enterprise that is healthy and needs the capital for increased professionalisation, investment in new production machinery, or market growth. This is especially so regarding entry into distant markets. Some of the hidden champions that have experienced ownership changes say that they have thus gained access to a global market organisation which has been a crucial growth factor, and at the same time they have succeeded in maintaining their special organisational innovation-DNA.

Relatively more of the hidden champions have from 2004 to 2010 been acquired by new international owners compared to small enterprises and to core enterprises, cf. figure 7. Growth of this tendency has flattened out, however, since 2008.

Figure 7: Share of foreign owned enterprises, 1999-2010

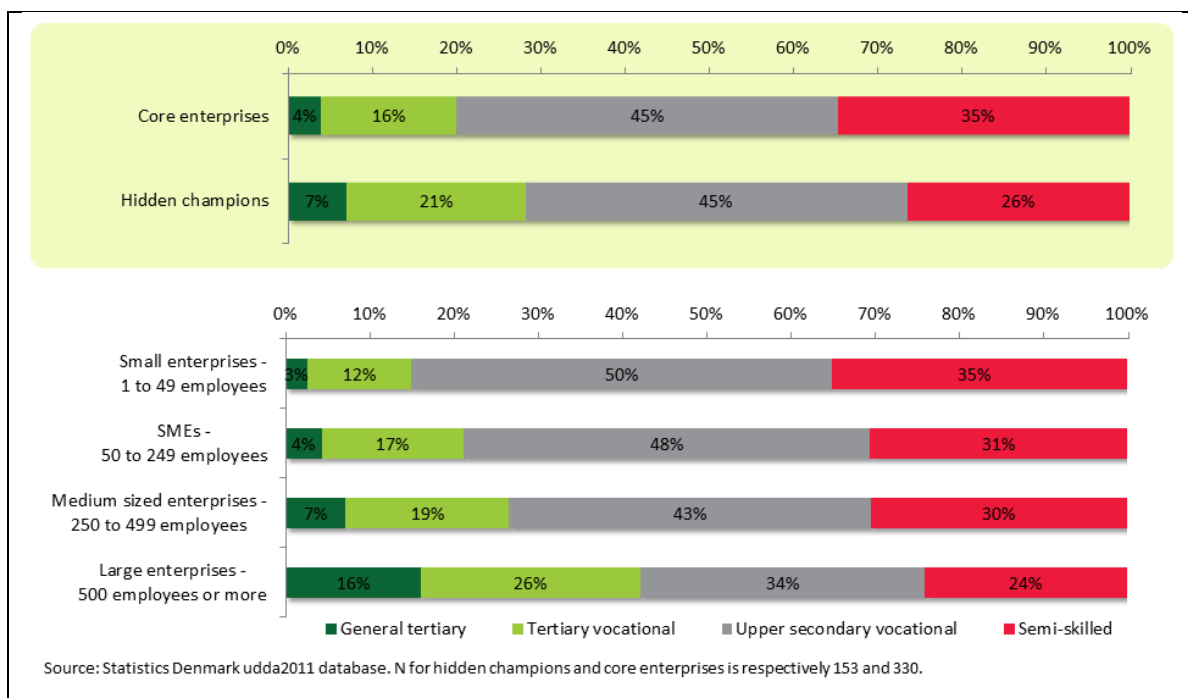


Being bought up can be a danger for hidden champions, since their success is often founded in a strong enterprise culture characterised by a high level of autonomy and integrative work organisation practices, also at the shop floor level, enabled by direct links between owners and employers. This gives an agility that can be difficult to maintain as part of a larger enterprise with more complex management and decision-making structures, particularly if the mother company is located in a geography characterised by quite different work organisation practices and traditions at the shop floor level.

1.5. Competence base

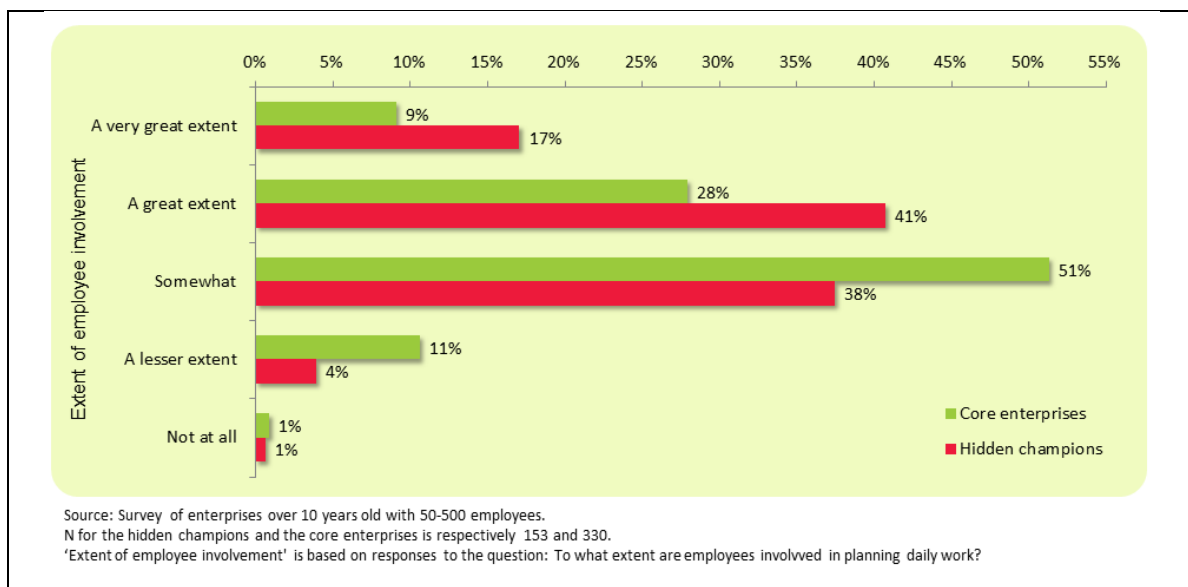
Several analyses explain the success of the manufacturing industry with increased hiring of employees with higher education backgrounds (Copenhagen Economics 2011, DEA 2010). It is therefore interesting to note that there is very little difference in formal education qualifications between employees in hidden champions and core enterprises; 28% of hidden champion employees have a general tertiary qualification or a tertiary vocational qualification, while 20% of core enterprise employees have these qualifications. The largest group of hidden champion employees are skilled (upper secondary vocational qualification) and semi-skilled, as seen in figure 8. In this context it should be noted that Denmark has a dual vocational system somewhat similar to the German, and a comprehensive adult education and training system. The greatest difference between hidden champions and core enterprises is in the share of semi-skilled; 28% of hidden champion employees are semi-skilled, while 35% of core enterprise employees are semi-skilled.

Figure 8: Employee qualification levels



58% of the hidden champions have work organisation practices characterised by employee involvement to a very great extent or a great extent. Almost all of the hidden champions have a management philosophy which to some extent is based on employee involvement and the delegation of responsibilities, cf. the figure below. There are notable differences between hidden champions and core enterprises; only 37% of core enterprises have a management style based to a very great extent or a great extent on employee involvement, as seen in figure 9.

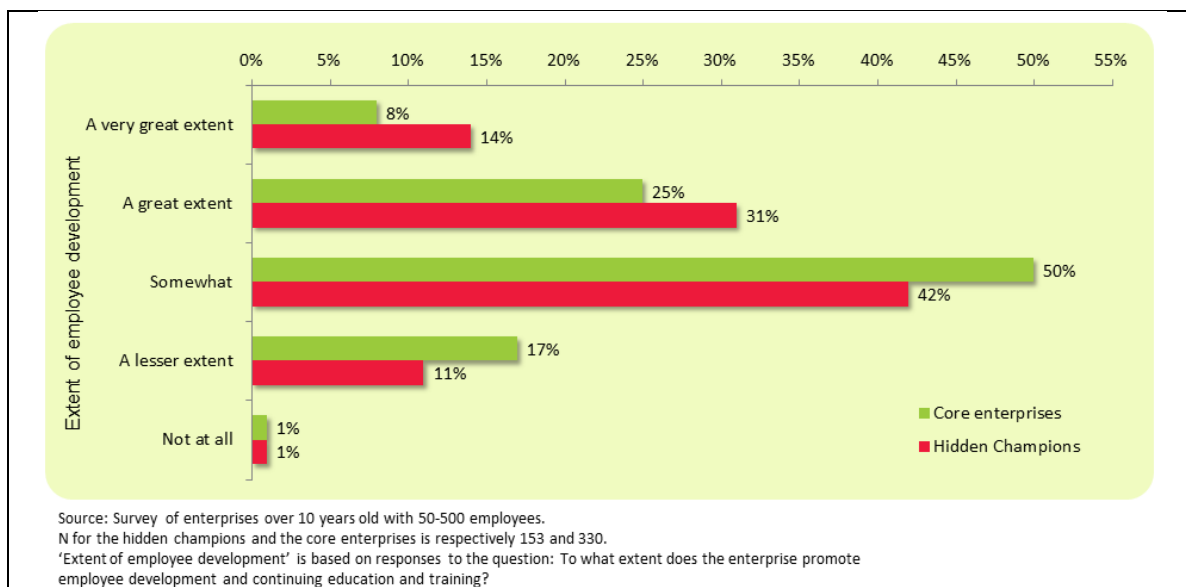
Figure 9: Employee involvement in daily work organisation



Recent educational policies have increased the emphasis on innovation as a key competence embedded in curriculum. Upper secondary vocational education, adult continuing education and training, and vocationally-oriented short and medium cycle higher education are well positioned to integrated innovation competences with professional skills due to their competence- and outcome-based curricula. The new Danish innovation strategy has led to a renewed focus on innovation in higher education.¹¹ In adult continued education and training and in youth vocationally-oriented education and training there have been a range of pilot initiatives to promote innovation as a key competence. Although innovative practices are emerging, it remains a challenge in the educational sector to bring these innovations to scale as seen in other countries (Shapiro and Devine 2013). As figure 10 shows, education and training of the workforce is a prioritised activity both for the hidden champions and the core companies.

Figure 10: To what extent does the enterprise promote employee development and continuing education and training?

¹¹ <http://fivu.dk/aktuelt/temaer/innovationsstrategi>



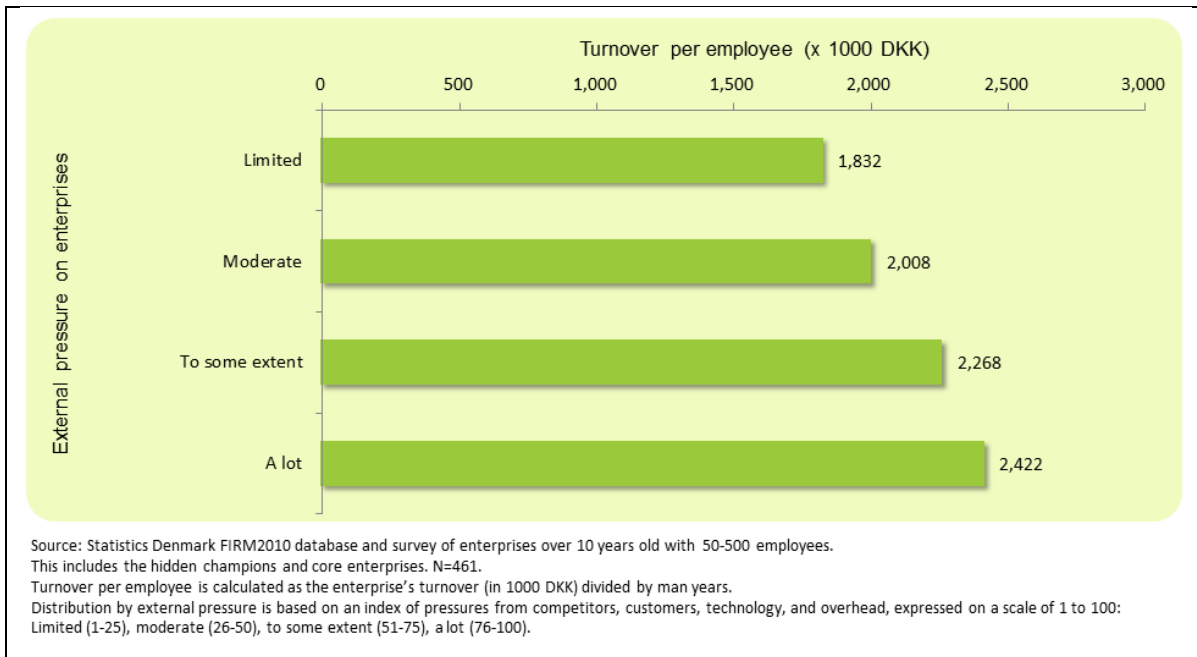
Training models that allow employees to reflect on existing practices and find new avenues to authentic work based challenges allow employees in practice to acquire the knowledge, skills, and competences to contribute to on-going process and product innovations. Even though continuing education and training and employee development can take place in many ways, figure 10 shows that 45% of the hidden champions promote employee development and continuing education to a very great or to a great extent, where the corresponding figure for core enterprises is 33%. One way of creating greater cohesion between formal and work-based learning is to use digital teaching materials. There has been a decline in enrolment in adult continuing education and training (AMU) since the onset of the economic crisis; it is therefore important for the vocational education system as well as the continuing education and training system to be further developed in terms of content, infrastructure, and organisational and pedagogical models so that they match the demands and needs of the Danish hidden champions. This could involve regrouping of enterprises in supplier chains, mobile fab labs to provide access to up-to-date technology platforms, and digitally supported courseware. Improved policy coordination between economic growth policies and education and labour market policies is crucial, and must furthermore take into account that the core workforce in many industries including manufacturing is composed of the skilled and the semi-skilled workforce. The innovation strategy for higher education therefore needs to be followed up by a similar strategic framework for upper secondary vocational education and continuing adult education and training.

1.6. *Adaptation strategies*

The hidden champions are skilled at proactively adapting in order to meet external challenges. It is therefore relevant to examine the link between external pressures and economic performance. As figure 11 below shows, external pressures influence turnover per employee. The higher the external pressure is perceived to be, the better the firm tend to perform. These findings correlate with the previous large-scale longitudinal empirical study, DISKO, headed by professor Bengt-Åke Lundvall at Aalborg University. The study found that external competitive pressures led firms to adopt practices that improved their functional flexibility.¹²

¹² [http://vbn.aau.dk/da/projects/det-danske-innovationssystem-disko\(988b05a9-ec4c-4463-ae61-ca08fa051a91\).html](http://vbn.aau.dk/da/projects/det-danske-innovationssystem-disko(988b05a9-ec4c-4463-ae61-ca08fa051a91).html)

Figure 11: External pressure influence on turnover per employee (x 1000 DKK)

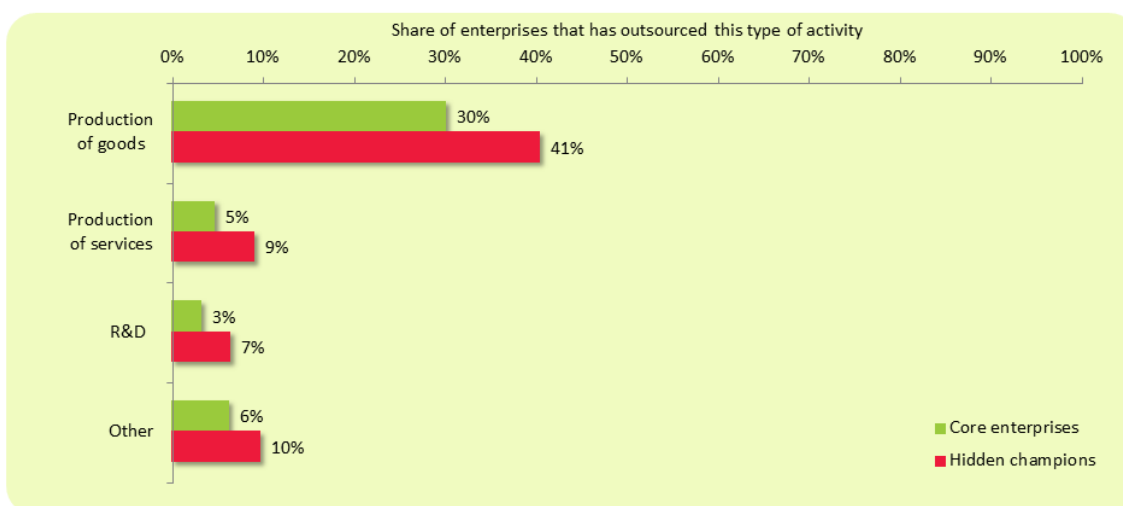


1.6.1. Sourcing

Global Sourcing has been in policy focus for the last decade. One concern is the impact outsourcing has on job loss. Another issue is whether outsourcing of production negatively influences knowledge intensive activities, as manufacturing and development in many cases are strongly intertwined.

As figure 12 below shows, it is in particular manufacturing activities that have been outsourced, and very often to cut costs. Sourcing of R&D should also be noted.

Figure 12: Share of enterprises that has outsourced production within the past three years, distributed by activity



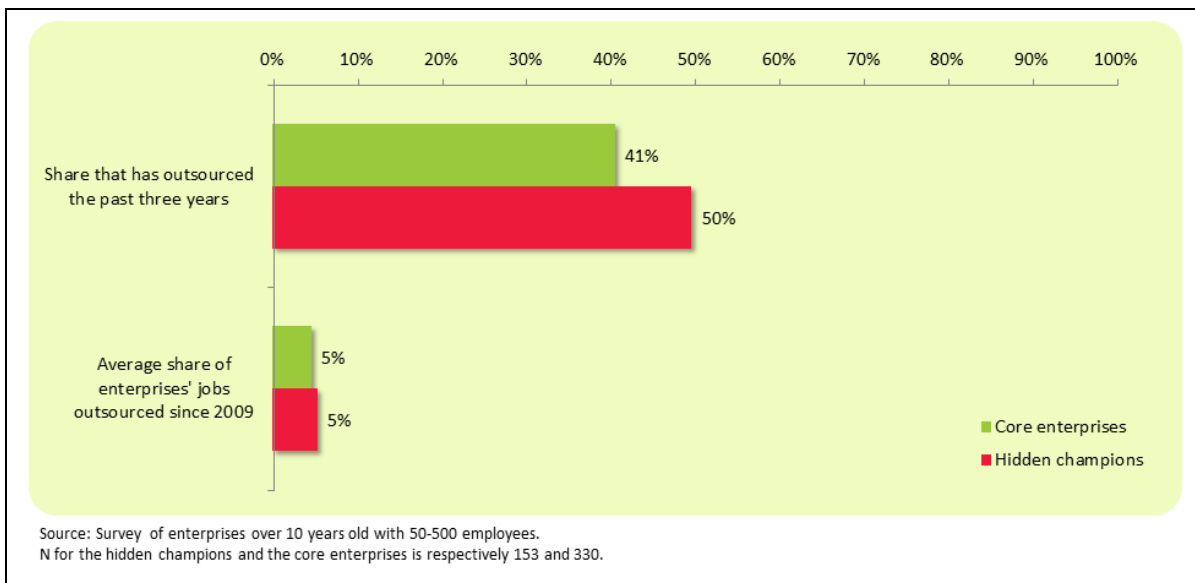
Source: Survey of enterprises over 10 years old with 50-500 employees. N for the hidden champions and the core enterprises is respectively 153 and 330.

The case studies however show that the picture is a bit more complex than statistics suggest.

First of all sourcing figures also comprise companies that have chosen to outsource low-value production but have kept pilot production in Denmark due to the iterations between manufacturing and development with key customers. There is also a tendency for outsourcing of R&D in fact to represent a multi-locational sourcing strategy to be close to customers in key markets.

The past decades have seen a tendency for ramp-up production, specialised production, and component assembly to remain in Denmark, as these activities represent enterprise core competences. The hidden champions have followed this tendency; while 50% have outsourced production, only 5% of hidden champion jobs have been outsourced, cf. figure 13 below.

Figure 13: Share of enterprises that has outsourced production within the past three years



1.6.2. The hidden champions' approach to innovation - key elements

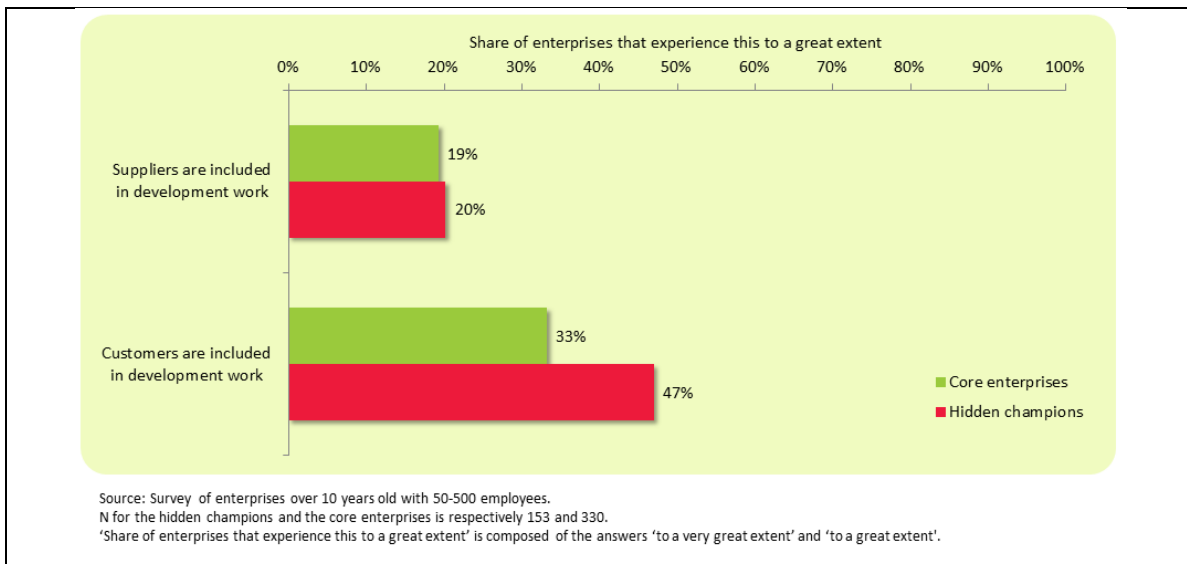
An analysis of behavioural characteristics of the hidden champions shows substantial overlaps with the German *mittelstand* companies, although the academic literature on the German *mittelstand* has tended to conclude that these types of companies are very specific to Germany and its wider value systems.

The key characteristics of the hidden champions in Denmark are:

- Extremely ambitious goals regarding market leadership and growth
- Quality through interplay and product development with customers
- Deep, rather than broad market focus as key to specialisation and value creation
- Design
- The links between production and R&D as iterative and mutually dependent processes.
- Employees and customers as sources of innovation
- Customer-tailored solutions where product, service, and functional design are unified
- Supply consistency
- Integrative work organisation practices
- Where a clear business case can be made, investment in and optimisation of the capital stock through technology.

The hidden champions all concur that their success is based on knowing customers well so that they can sell customer-tailored solutions where pre-sales, service, and after-sales form an integrated product and where high quality is customer-defined. The hidden champions involve customers in development work to a greater extent than core enterprises do, respectively 47% and 33%, cf. figure 14. A number of enterprises pursue multiple strategies to reach the individual consumer. There is only a moderate difference in the two groups' involvement of suppliers in development.

Figure 14: Customer and supplier involvement in development



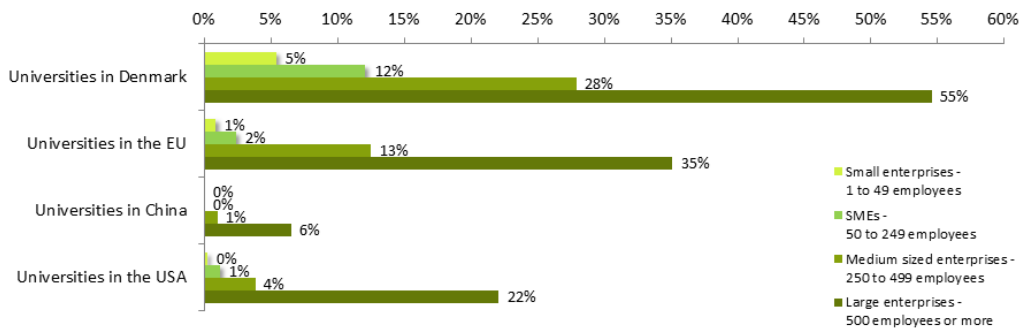
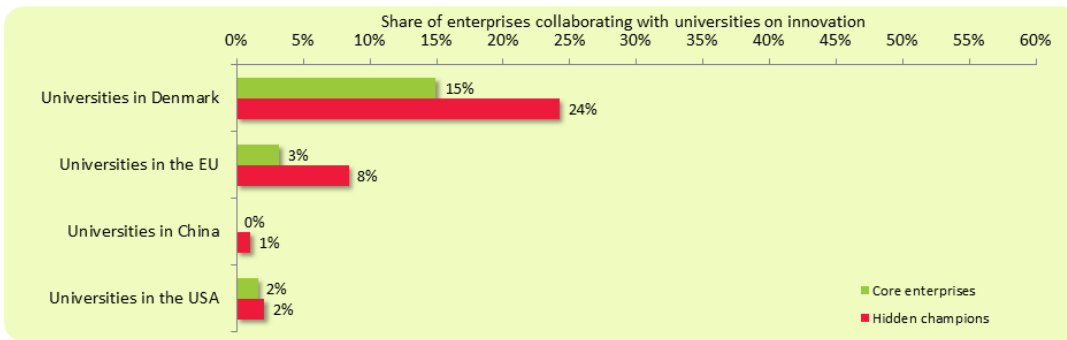
Some of the enterprises have begun to upgrade the skills base of their sales staff so that they can better detect changing end-user preferences.

1.7. Interaction with formal innovation systems

The hidden champions' strategy is to a very great extent based on involving customers in product development and adjustment. This is partially reflected in the hidden champions' interaction with innovation systems. Customers, and to a lesser extent suppliers, are the most important sources of innovation, more so than formal innovations systems such as universities, GTS (Advanced Technology Group) institutes, or regional business promotion stakeholders.

The hidden champions collaborate with universities more than core enterprises do (respectively almost 25% and 15%), cf. figure 15. It is interesting to note that there is a growing level of interaction with foreign universities, also outside the EU, although the overall level of interaction with foreign universities remains moderate.

Figure 15: Share of enterprises collaborating with universities on innovation



Source: Statistics Denmark FUI2010 database. The database is based on a questionnaire which does not completely match the groups in this survey. Match for hidden champions and core enterprises is respectively 95 and 187. Collaboration on innovation is assessed from enterprise answers about whom they collaborated with on innovation in 2010.

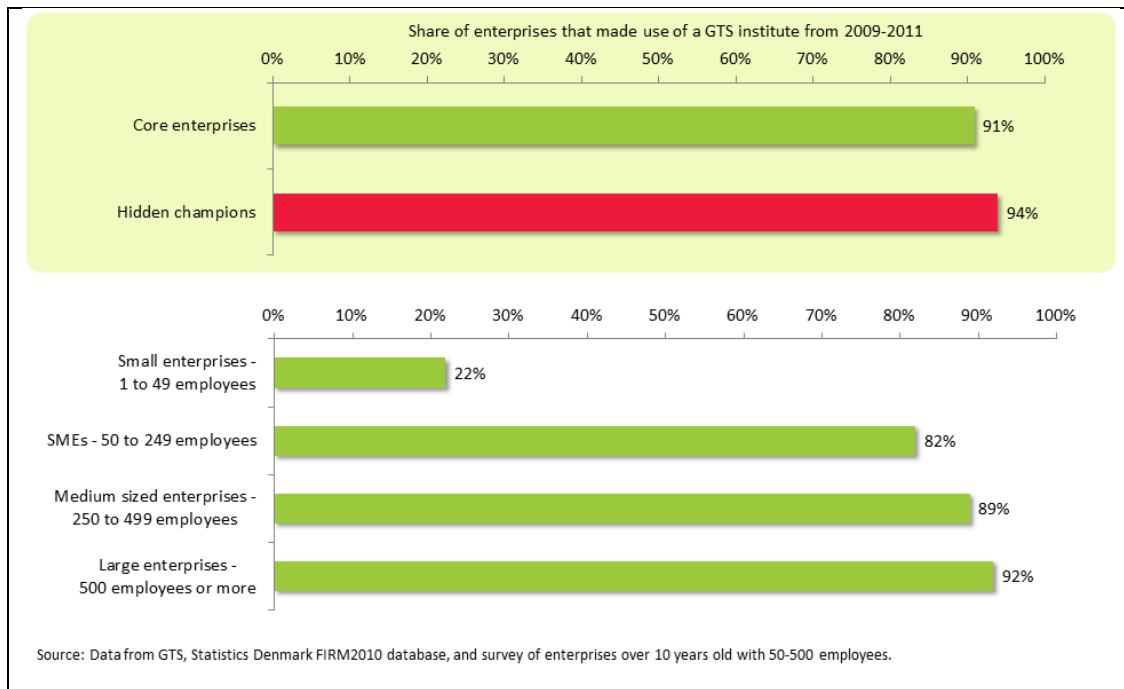
Hidden champions made use of GTS an average of 6.6 times in the 2009-2011 period. The corresponding figure for core enterprises is 5.4, cf. figure 16. The pattern is that the bigger the enterprise, the more interaction.

Figure 16: Enterprise use of the GTS system - average for the 2009-2011 period



Figure 17 below shows that almost all of the hidden champions made use of a GTS institute from 2009-2011, which is quite impressive. It should be noted that the case studies suggest that the use of GTS is primarily related to operational activities such as tests and certifications, whereas collaboration on R&D and innovation activities is ad-hoc both when it comes to universities and GTS institutes. Several of the case companies emphasise that without public funding they would not have engaged with the Danish innovation system.

Figure 17: Share of enterprises that made use of a GTS institute from 2009-2011



Since research-based innovation has become globalised with *centres of excellence* all over the world, the possibility should be considered that GTS institutes and universities can come to play a more strategic role in supporting hidden champion growth through globalised knowledge interaction. If so, then collaboration with GTS institutes and universities could become a bridgehead to global centres of excellence and to new distant markets, which increasingly are the strategic focus of the hidden champions.

There are several possible explanations for enterprises' ad hoc interaction with the formal innovation system. The following factors should be emphasised:

- Some of the hidden champions indicate that the crisis has led to such a cut in staff that there no longer are resources for development collaboration. This has been exacerbated by cautious investment strategies and by lack of venture capital.
- Some of the hidden champions have had negative experiences with the public innovation system.
- Others are not convinced that the public innovation system can lead to enough value added - improved competitive position and earnings - compared to the resources necessary for increased R&D collaboration, even if externally financed.
- Some of the hidden champions indicate that they are not familiar with the innovation system; what it can offer, and what it requires of enterprise resources and investment.

The content and form of the innovation system from the enterprise perspective too far removed from the realities of the hidden champions. As one of the hidden champions phrased it, "If it's something about innovation, it's probably not for us."

2. Key success factors

During the past years there has been major job destruction in the industrial sector in Denmark, which has at times let to dismal prophecies about the future of manufacturing in Denmark.

The analysis however shows a much more optimistic future for Danish industry. The Danish Industrial middle class - and in particular the hidden champions - have shown a solid performance the past 10 years also in turbulent periods characterised by crisis and sluggish growth. The analysis furthermore shows that in an advanced economy like the Danish, manufacturing is a critical source of productivity growth. The data and the stories of these companies demonstrate that it is possible in Denmark to successfully manage and globalise manufacturing companies, although the underlying business models and strategies pursued vary substantially. The analysis also shows that the success of these companies seem to be less dependent upon location close to the bigger cities and leading players in the innovation system, which is particularly interesting in a regional policy perspective. The manufacturing industry constitutes as such a growth factor that should not be ignored in the future prioritisation of Danish growth and innovation policies. It furthermore underlines the necessity to understand and address the interdependency between manufacturing and high value services in a much more integrative way in policy measures. In their respective markets the hidden champions demonstrate an impressive robustness. The keys to success are a growth ambition, an extreme market focus, agility, balancing consolidation and investment, the ability to form partnerships and networks, the ability to read the external environment, the autonomy and on-going development of the workforce, and their ability to continuously develop the performance of the whole organisation through involvement with and proximity to customers.

Three main pointers emerge from the analysis: strong economic performance; a continuous and strategic focus on agility and organisational performance with active involvement of employees and their skills as a source of performance improvement; and customer relationships rather than the innovation system and its actors as central to innovation performance and market orientation.

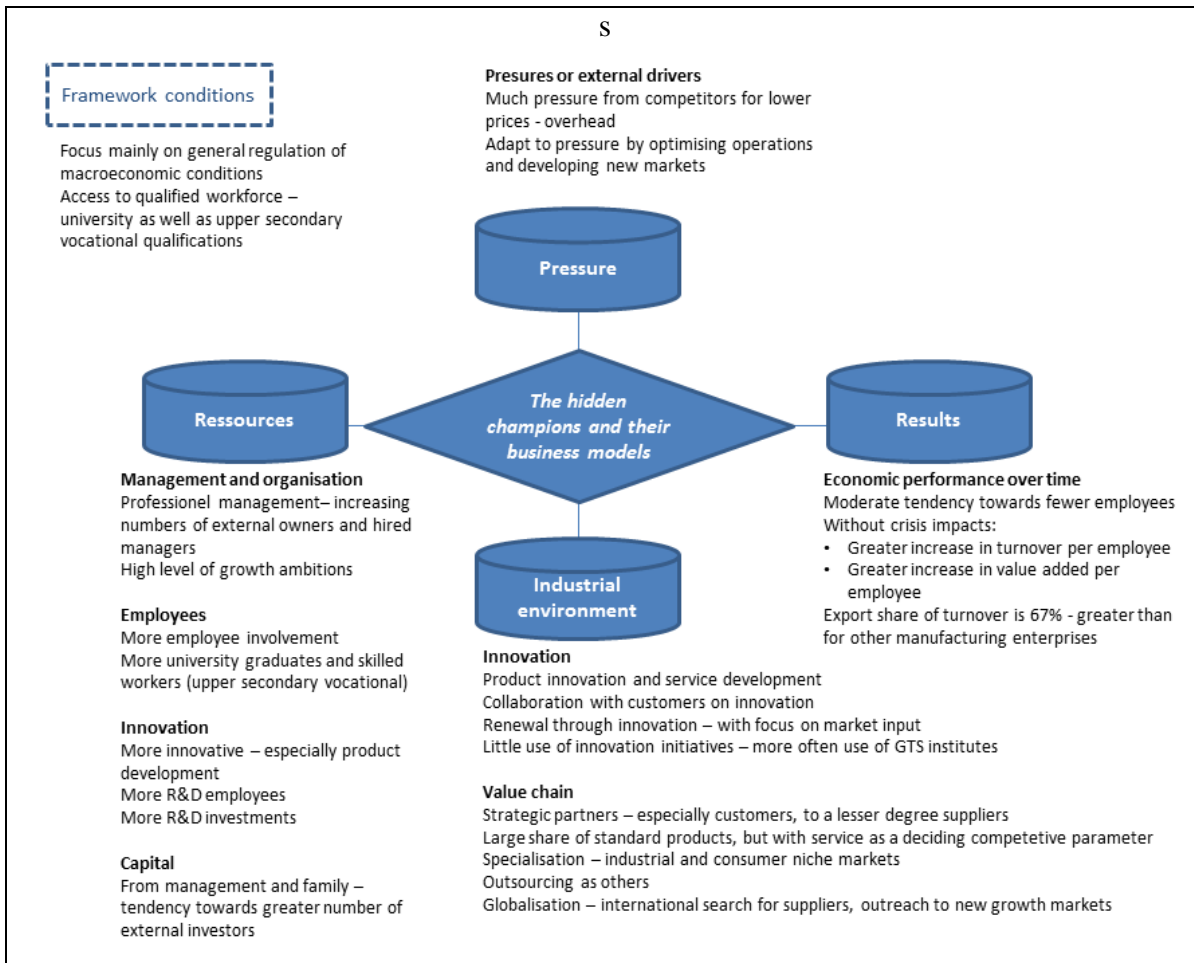
2.1. *Economic performance*

The Danish industry middle class is composed of a range of industries. It is dominated by industries that produce industrial technologies and components for the machine industries, metal industries, plastics industries, glass, and concrete. Secondly it is composed of companies that produce goods for end users within food industries, pharmaceuticals, and furniture and house appliances.

In geographic terms the companies the industrial middle class are found all over the country, with many localised in small communities away from the capital of Copenhagen and the large cities of Jutland and Funen. Proximity to knowledge institutions does not seem to be of importance. The analysis furthermore shows that a relative rural location does not seem to constitute a barrier to successful development and growth of manufacturing companies apart from at times recruitment difficulties for particular job functions. With an average of 33 years in operations there might be a certain historic inertia that has influenced localisation. Factors such as access to infrastructure and human capital must therefore be taken into consideration given the changes in markets in the last decades to ensure the future competitiveness for firms also in more rural parts of the country.

There are similarities between the hidden champions and the core companies. The hidden champions are however far more export-oriented (part of the definition); they have a higher turnover, more employees, higher productivity, and higher growth ambitions, as summarised in figure 18 below.

Figure 18: Characteristics of hidden champions' success factors



An analysis of the development since 2001 reveals:

- a 56% growth in turnover per employee from 2001 to 2010 among the hidden champions compared to a 15% growth among the core companies;
- a 46% growth of value added per employee from 2001 to 2010 among the hidden champions, compared to a 34% growth in value added among the core companies.

The economic crisis in 2008 did *not* result in a drop in turnover and value added per employee. The growth continued despite the crisis.

From an employment perspective, the crisis took its toll. Up till 2008 there was a growth in employment. From 2008 changes in the economic climate drove the industrial middle class to invest substantially in optimising processes, which resulted in lay-offs. The turnaround was in many ways enabled by a working culture traditionally building on collaboration and close communication between employers and employees. These turnaround measures have since been followed by the implementation of lean philosophies, typically based on broad job functions and a working culture where shop floor workers have substantial discretionary autonomy to contribute to improvements. The crisis has as such had negative employment effects particularly for the specialised unskilled workforce, which has also been seen in highly industrialised economies such as the German. It has on the other hand been a precondition to ensuring sufficient financial solidity for medium term competitiveness.

2.2. Organisational performance

The changing global market dynamics create constant and changing pressures on the market position of the industrial middle class. The main difference between the hidden champions and the core companies is that the hidden champions are more capable at pursuing several parallel adaptive strategies than the core companies. Those strategies comprise prioritised optimisation of processes, employee development, market development, and product development. The hidden champions pursue a mix of strategies that result in financial consolidation, which gives them the financial leverage to pursue targets with a medium to long term perspective.

The economic effects seem to be achieved in particular from process optimisation and employee development.

Process optimisation also includes outsourcing. Outsourcing is particularly seen within goods producing industries, but it should be noted that outsourcing is found across all forms of economic activity. Among the most export-oriented hidden champions there may also be gains made from outsourcing research and development, for example as a means to link into centres of excellence in global value chains. The dynamics and uncertainty of global markets and how best to tap into these given wider factors such as environmental concerns, brand value tied to CSR, and a growing scarcity of natural resources, will make it strategically more complex to assess the full range of input factors as the most globalised hidden champions make their decisions on localisation.

Employee development presents in this context a much broader agenda than simply a matter of reducing the relative weight of salary costs through optimisation and automation and through strict frameworks for wage bargaining. LEAN as an adaptive philosophy has less to do with efficiency gains through Taylorist work organisation practices. The stories of the hidden champions are narratives of a high performance culture, which builds on continuous development of employees, integrative work organisation practices characterised by a high level of autonomy, collaboration, and a strong shared work culture. Even if the hidden champions have more employees with a tertiary qualification than the core companies, it is still the skilled workers and their often tacit and experience based competences that constitute the DNA of these firms in terms of their agility and their ability to systematically capture and transform collaboration with customers and their needs and preferences into products with unique and desired properties.

As a result the price of products is not the key competitive factor, but one of the parameters of competitiveness. 57 % of the hidden champions and 68% of the core companies perceive price as a critical factor, whereas quality of service is seen as an even more important source of competitiveness for 68% of the hidden champions. To be market leading one could expect that the hidden champions were producers of specialised products; however 56 % of the turnover stems from standardised products.

The combination of the three parameters price, service, and product type indicates that the key source of competitiveness for the hidden champions is their ability to produce products in which services are embedded. These can originate as standardised products; but through the innovation process involving the customers, the final products are tailored so that they meet the need of specific customer segments and markets, produced in small series and zero series as needed and within specified time frames. The adaptation of products and their service features can entail design, training of the retailers who are going to sell the product, support services, or technological adaptation for example to comply with environmental regulations in a particular market.

The hidden champions do not have an explicit focus on innovation, and yet they have unique innovation ability. The hidden champions maintain a constant focus on "learning with the market"

as a gateway to unique value creation. The agility and market strength of the hidden champions stem from their ongoing interaction and close collaboration with customers in development processes.

The hidden champions show their inherent innovation capacity in the way they have been able to penetrate distant markets in South East Asia and South America as the growth opportunities in their traditional markets became sluggish. They debunk the myth that it is only the large Danish companies that have the resources to successfully target distant markets.

An analysis of the business model of the hidden champions shows critical elements such as:

- strong focus on changes in the market and the ability to proactively take action;
- using core competences in the way they penetrate new markets;
- Deep market focus rather than broad market focus which results in a homogenous customer base. This gives the hidden champions deep insights into their customer segment and it strengthens their core competences, enabling them to become development partner for their customers.
- embedded services in their products so that their products are sold as servitised goods and as a means to achieve customer tailorability in different markets;
- product development that builds on product adaptation in co-creation processes involving customers;
- involvement – also of shop floor workers in development, which tends to be embedded in production processes.

The management culture of the hidden champions is characterised by a lower power distance and organisational practices which counterbalance an entrepreneurial and involving culture with a constant focus on profitability. The hidden champions pursue what could be characterised as a conservative investment strategy. Their success and ability to navigate in greater uncertainty stems from an explicit growth ambition, a greater extent of employee involvement and delegation of authority, and the ability to employ and develop all employees resulting in a low turnover and a high level of employee loyalty.

2.3. *Intensity and quality in customer relationships*

The analysis shows that the competitive advantage of the hidden champions does not stem from being technological leaders.

Through the direct interaction with customers in the development, design and production of products to different market segments, the hidden champions have a constant and unique source of knowledge about their markets and developments that shape these. To some extent the same applies to their suppliers. In that sense the strategies adopted and implemented are highly demand-led and context sensitive. As a consequence the hidden champions have more employees primarily engaged in research and development than the core companies, and they tend to have a specific R&D unit more often than the core companies. Their investments in R&D represent 3% of turnover compared to 1% in the core companies. The hidden champions are R&D active and they strategically prioritise R&D.

The hidden champions' interaction with the public innovation system is less developed, particularly when it comes to the use of existing public innovation measures and the universities:

- there are few that use the existing innovation measures;
- 24 % have collaborated with a university - and emphasise that without public funding the collaboration might have been less likely;

- 9 out of 10 have made use of one of the approved technological service institutes, but it tends to be in connection with operational activities such as testing rather than as a strategic innovation partner.

Several of the company directors are sceptical about the use of the innovation system measures and some refer directly to negative experiences. Some of the points raised are that the initiatives typically span a too long time period, and they are not sufficiently focused on the outcomes and impact for the specific participating company. The result is that the cooperation with actors in the innovation system tends to be ad-hoc and to a lesser degree strategically oriented on innovation excellence.

The findings suggest that the existing mechanisms are so to speak *lost in translation*, resulting in a disconnect so that the initiatives within the innovation system do not adequately match the needs and ambitions of the hidden champions and the core companies, as these companies are globalising and are building strategic alliances. Policy measures which target the company and its extended network for example by remediating a customer/supplier element could be a way forward. Initiatives that mediate strategic international links to relevant international clusters could be a way that could ease the barriers to entry into new markets and value chains. This could also involve the opportunity for a broader use of the Danish "Innovation Assistant"¹³ scheme whereby an SME can receive financial support to hire a Danish graduate to work for up to a year on an innovation projects. The aim would be that Danish companies could apply Danish funding support for an international knowledge pilot to create international linkages around activities that are strategically prioritised at the enterprise level and funded.

¹³http://fivu.dk/en/research-and-innovation/funding-programmes-for-research-and-innovation/find-danish-funding-programmes/postgraduates-in-the-private-sector/innovation-assistant?set_language=en&cl=en

3. Manufacturing as a generator of growth

The analysis of the hidden champions shows that manufacturing companies in Denmark can be highly successful also in global and distant markets and at par with firm performance in highly industrialised economies. A comparison of firms in the German *mittelstand* with in between 50 and 250 employees and similar Danish companies shows that the Danish companies on an average have a higher turnover and a higher productivity and value added per employee than the German firms in this category. From a growth policy perspective, it is worth noticing that the relative share of companies that constitute the German industrial *mittelstand* is considerably larger than the comparative group of Danish firms.

If we assume that it is possible to spur development and growth in the Danish manufacturing industry so that the relative size of the Danish industrial mid-size companies would be similar to the German *mittelstand*, the employment effects could be in the order of 50,000 additional jobs in companies with 50-250 employees; if we include all companies with more than 250 employees, this could represent a job growth of 110,000 jobs cf. Table 2 below.

Table 2: Estimated employment effects

	Enterprise size sorted by number of employees					
	0-9	10-19	20-49	50-250	250-	Total
Number of enterprises in 2010:						
Denmark	76%	10%	8%	5%	1%	100%
Germany	62%	21%	7%	8%	2%	100%
Number of enterprises - German size categories:						
Denmark - 2010	11,965	1,553	1,271	772	157	15,718
Denmark - 2010 ("German enterprise structure")	9,774	3,265	1,169	1,212	297	15,718
Manufacturing employment:						
Denmark - 2010	28,099	21,272	38,738	79,490	126,810	294,409
Denmark - 2010 ("German enterprise structure")	22,955	44,728	35,626	124,839	239,697	467,845
Estimated growth	-5,144	23,456	-3,112	45,349	112,887	173,436

Source: Eurostat

The structural differences between the German and the Danish economy should be taken into account in order to fully assess possible employment effects of policies intended to spur growth in the relative share of Danish industrial middle class companies, and it is worth noticing that the exporting manufacturing industry also contributes to employment creation in other industries, for example transport and logistics. However, even a strong manufacturing exporting country such as Germany has seen a job loss in manufacturing of 8% in the past decade.

3.1. Enabling factors – policy pointers

The analysis of the hidden champions and their ad-hoc use of the publically supported innovation poses the question of whether the existing innovation policy instruments need to be resuscitated in order to have genuine growth effects for the hidden champions. The aim of this analysis has not been to carry out an impact assessment of the Danish innovation policy instruments. The following

considerations emerge from the interviews with the Danish industrial middle class and its views about the future of advanced manufacturing in Denmark:

Financing: Insufficient access to capital is highlighted by the hidden champions as one of the key issues to growth and development. Access to capital is a must if the hidden champions to a great extent are to engage in global distant markets, and as a precondition to future growth and employment generation. This would also include increased access to smart capital in order to have the full professional resources to strategically exploit globalisation from a knowledge sourcing and innovation perspective. An analysis at this stage of the Investment Window opportunity could give indications of its actual impact.¹⁴

The innovation systems as gateway to new applied knowledge: Customers and suppliers are increasingly sources of renewal for the hidden champions. During the past decade Denmark has fallen behind countries with a strong industry base such as Sweden and Germany when it comes to investment in advanced robot and automation technology, which are central sources of competitive advantage due to the opportunities of further flexibilisation of production and as a source of improved productivity. The analysis clearly shows that the hidden champions pursue a mix of innovation strategies, building on both technological and non-technological forms of innovation. The innovation opportunities stemming from advanced technologies should therefore not be seen in isolation. The business case needs to be spelled out taking into account the global dynamics of manufacturing and strategic moves of competitor countries, particularly because the hidden champions carefully and to a certain extent conservatively consider potential investments. If actors within the innovation system are to engage in a more strategic and continuous way with the hidden champions, approaches to collaboration need to consider technological and non-technological innovation. The innovation system actors need to take into consideration the blurring boundaries between manufacturing and services in their outreach to the hidden champions, because the hidden champions to a large extent build their market differentiation strategies on servitised products - products with a high knowledge and service content. ICT is a critical enabler of service transformation and may play an even more strategic role for the hidden champions in the future as they try to cope with increasing demands of documenting processes and products. Since a competent and autonomous workforce is a critical asset for the hidden champions, the importance of work organisation practices and innovative ways of optimal skills development and skills utilization should not be ignored as components in the strategic collaboration with the innovation system. The innovation system also needs to take into account the fact that customers and suppliers are key sources of innovation for the hidden champions. As markets globalise for the hidden champions, so does the customer and supplier base. Collaboration models that involve leading customers and suppliers will be a way of adding further value to the existing innovation model and can be a way to strengthen the position of the hidden champions and their core partners in the global value chains. The innovation system actors can to a much larger extent be a spearhead to global distant markets and centres of excellence for the industrial middle-size Danish companies by strategically linking into global clusters and networks with complementary assets. It should be explored whether the innovation centres in Munich, Shanghai, Silicon Valley, Seoul, Bangalore and São Paulo can act as a critical lever.

The strategic positioning in the global value chains: Strategic value chain positioning is primarily the task of the companies. The creation of strategic industrial relations is time and resource consuming, particularly as the hidden champions increasingly focus on distant markets. Barriers to

¹⁴ <http://www.fm.dk/nyheder/pressemeddelelser/2012/06/investeringsvindue-skaffer-job-og-ny-vaekst/>

entry are high in the distant emerging growth markets and established value chains. The innovation system could through new forms of trans-border cluster collaboration support the industrial middle class creates in creating linkages to centres of excellence and clusters with complementary assets, for example in the form of supplier-customer innovation projects. The Danish innovation centres and the Danish representations can also promote the Danish industrial base by pointing to areas that draw on the strengths of the industrial base in Denmark and respond to growing needs in the distant markets - for example within pharmaceuticals and medico technologies.

Process Optimisation: The hidden champions have a constant focus on optimisation of processes to the final delivery. These processes increase in complexity due to the defragmentation of the value chain and the globalisation of markets. Several of the hidden champions point to a growing demand for documentation in the form of certification and approval; but these demands can also be a means to speed up the process of adaptation of their core products. Digitalisation seems to be the obvious answer. As it can have major implications on work and knowledge flows it is not merely a technical solution that is needed; also organisational and skills factors must be taken into account in order not to clash with the unique work organisation practices at present. The Finnish innovation system some years ago implemented a large scale best-practice programme TYKES¹⁵, which offers a range of lessons of relevance in a Danish context.

Collaboration with the vocational colleges and the adult continuing training system: The skilled workforce is the core workforce of the hidden champions, and it is a crucial source of innovation due to its tacit insights into materials, processes and the customer base. Some of the hidden champions have had difficulties recruiting skilled employees with the mix of competences needed. In a forward perspective it is of paramount importance that the vocational education system can attract talent with the motivation and personal capacity to complete an advanced vocational manufacturing qualification. Recently a new tri-partite accord has been reached regarding renewal of the upper secondary vocational education system. In the implementation of the accord the effects in terms of changing enrolment patterns must be monitored closely. The globalisation of the Danish manufacturing base and the particular patterns of innovation of the successful industrial companies make complex demands on the Danish vocational education system. This must be reflected in the technological infrastructure available, in teachers' qualifications, and in the curriculum and more specifically in the horizontal collaboration in the innovation system in order to ensure a comprehensive renewal of the vocational offer including continuing vocational training with focus on advanced manufacturing of the future in globalised markets.

The hidden champions have ambitious growth aspirations - and the same is true for many of the core companies. Fulfilling these ambitions is crucial to sustaining growth and to future creation of manufacturing jobs and of service jobs derived from the manufacturing base. Insufficient access to flexible capital and to global technological and market knowhow may constitute a potential growth barrier – particularly if the mid-sized manufacturing enterprises are to build and further strengthen their strategic positions in global distant markets and value chains.

¹⁵ <http://www.tekes.fi/en/community/a/482/b/1344?name=The+largest+workplace+development+programme+in+Finland>

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