
SME in Germany's maritime industry: innovation, internationalisation and employment

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Abstract: This paper provides some results from an empirical survey of Small- and Medium-sized Enterprises (SME) in the German maritime industry, an industry in which SME demonstrate higher-than-average innovation activity. Contrary to the overall development in the maritime industry, innovations in SME have also triggered employment. Innovation and internationalisation frequently go hand in hand. The main barriers for SME with respect to the realisation of their innovative potential and their capacity to create employment include the lacking access to external finance. Together with non-available distribution channels, funding is also an obstacle to internationalisation.

Keywords: maritime industry; shipbuilding industry; Germany; small- and medium-sized enterprise; SME; innovation; internationalisation; employment; employment effects of innovation.

Reference to this paper should be made as follows: Bass, H-H. and Ernst-Siebert, R. (2007) 'SME in Germany's maritime industry: innovation, internationalisation and employment', *Int. J. Globalisation and Small Business*, Vol. 2, No. 1, pp.15–33.

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1 Introduction

In a rapidly changing world economy, ‘the ability [of enterprises] to adjust’ (in B. Balassa’s terminology) is pivotal for the economic success of sectors, regions and countries. Moreover, as first argued by the New Growth Theory (Romer), the ability to continuous innovation has become a key factor in the global competition of high-income regions in order to acquire the additional factors of production and the new value adding processes which are necessary to keep an economy on a sustainable growth path. There is, however, a strong normative conviction in most societies that a high and sustainable rising standard of living should be based on the highest possible rate of employment, not only to guarantee the utilisation of economic resources to their fullest extent, but also to ensure a broad participation in a society’s wealth without having to resort to transfer payments. This view is clearly expressed, for instance, in such important policy documents as the European Commission’s Lisbon Strategy and its Social Agenda, respectively.

Small- and Medium-sized Enterprises (SME) seem to be the ideal vehicle to promote both goals – sustainable innovation-based economic growth *and* employment creation – without trade-offs, given, as frequently assumed, the high flexibility as well as the relatively labour-intensive mode of production in SME. However, the issue as to how realistic these expectations are is anything but resolved. Despite experience with a plethora of SME promotion programmes it is also still debated as to which specific policy measures are really suitable to guarantee undistorted competition by compensating firm-size specific disadvantages, such as the SME’s restricted access to public resources. To what extent SME act independently in internationalisation processes or whether they only function as suppliers in global value chains, dominated by large-scale transnational enterprises, is also an open question. Without doubt, the current wave of internationalisation is accelerating the diffusion of innovation across industries. Yet it is unclear whether SME are driven by globalisation or whether they are a driving force in this process.

This paper will provide some results from an empirical survey to enrich the ongoing discussion, focusing on innovation and internationalisation in SME in the German maritime industry – one of the leading industries in the recent phase of globalisation, an industry which underwent tremendous organisational changes during the last decade and due to the industry’s relevance in innovation and for employment, a target industry for Germany’s industrial policy. In our survey we considered enterprises which either employ less than 250 employees or have a turnover of less than 50 m Euro.¹

This paper is structured as follows: Section 2 of this paper provides a literature review and introduces the design of our research, Section 3 provides some basic facts regarding the German maritime industry, Section 4 presents some results of our survey, while Section 5 draws the conclusion.

2 Literature review and research design

In economic theory it is standard knowledge that a firm’s size incorporates both specific advantages and disadvantages (Thurik, 1996; You, 1995): an obvious advantage of large-scale enterprise units is seen in the usually higher internal returns to scale, while high internal coordination costs constitute a definite disadvantage. On the other hand, in

terms of flexibility, smaller units are expected to be at an advantage – as long as this compensates the probable disadvantages of unsystematic management behaviour. How do these fundamental factors influence, firstly, innovation potential and secondly, the employment effects of innovation?

2.1 Firm-size specific innovation potential

In the mid-20th century, J.A. Schumpeter and J.K. Galbraith put forward the plausible hypothesis that, rather than the small start-ups as previously thought ('Schumpeter mark I'), large firms, due to their more adequate access to financial resources, would possess a higher innovative potential in the new stage of capitalism ('Schumpeter mark II' or Schumpeter-Galbraith-Hypothesis). In contrast, various arguments have been put forward more recently as to why even today SME can play an important role in regional and national innovation processes (for an early overview see Dodgson and Rothwell, 1994). Three such arguments appear to be most convincing in the light of recent research: the lesser importance of routines, the lesser importance of path-dependency in technological development and the lesser importance of the principal-agent problem.

- 1 Pavitt et al. (1987) argue that SME are less bound by routine and thus their management possesses a higher subjective willingness to develop and use innovations. Of course, this cannot be generalised and may only be applied to a very specific subgroup of SME (Smallbone et al., 2003). Nevertheless, it seems plausible that the short and direct communication channels do not only contribute in many such enterprises to a high ability to adjust to changing business environments, but also contribute to greater flexibility in internal learning processes (KfW, 2003, 2004) and thus to a higher inclination to innovation.
- 2 The fact that larger firms normally have faster access to technical improvements does not necessarily imply that they will actually adopt them. As innovations often threaten the market equilibrium and frequently demand a costly abandoning of technological paths, "at firm level, many smaller enterprises are inherently more flexible than larger firms, as they are less likely to be 'locked in' to existing plant, technology or organisational structures" (OECD, 2002, p.12).
- 3 A basic motive for innovation on the firm level is the prospect of generating a return on investment in innovation. In the framework of the principal-agent problem, Acs et al. (1997) identify this as a barrier to innovation in larger firms, since such innovations benefit the firm rather than the individual inventor-employee. In this regard, an advantage of SME can be seen in the union of owner, manager and developer. This renders the conjecture plausible that basic innovations (radical rather than incremental changes) are more likely to originate from SME than from large enterprises.

What do empirical studies tell us about these conjectures? Most studies actually support the older Schumpeter-Galbraith-hypothesis. For instance, a Luxembourgian study (STATEC, 1994, quoted in EUC (2002a)) shows that the frequency of innovations increases with a firm's size. Furthermore, in a sample of Italian enterprises with more than 20 employees in manufacturing industries, the Italian bureau of statistics (ISTAT, 1999, quoted in EUC (2002a)) found that 46% of small enterprises (<49 employees)

conduct some kind of innovative activity, while this was the case with 69% of the medium-sized enterprises (250–499 employees) and as many as 82% of the large ones (500+ employees). Studies in the UK (Tether, 2000; Tether and Massini, 1998; Tether et al., 1997) also support the theory of a minor role of small enterprises in innovation processes. A study by Buesa and Molero (1998, quoted in EUC (2002a)), however, arrives at different results. In their survey of Spanish enterprises in Information and Telecommunication Technology (ITT), it turned out that small enterprises devote a higher share of their expenditure to R&D than larger firms in the same industry – thus, assuming a black-box model of the innovation process (the more an enterprise spends on R&D, the higher its innovation output), smaller enterprises are more ‘innovative’ than larger ones.

This might point to an aspect which is neglected in the more general reflections on the size-specific inclination to innovate: industry-specific particularities, such as the age of an industry and the degree of its internationalisation.

There generally seems to be a positive correlation between the R&D intensity of an industry and the degree of the internationalisation of its SME (PWC, 2001). The effect may be transmitted in both directions: the integration of an SME as a supplier into a global value chain inevitably demands the adoption of the product standards (and in most cases also the process standards) of the dominant enterprise to maximise system efficiency (Kaplinsky, 2000), which not only implies the diffusion of innovation along the whole chain but also demands R&D efforts of the chain members to adapt the innovations to their own production processes. On the other hand, the SME’s own R&D provides a gateway to international markets.

Small enterprises in ‘young’ industries, such as the ITT industry, also seem to be particularly innovative. The reason may be a specific division of labour between different sizes of enterprises in some sectors across the life cycle of products. While start-up enterprises in the ITT sector introduce most new products and services, the larger firm’s overall success is not at stake in the event of the commercial failure of a single innovation. However, in the event of success the small enterprise can be merged into the large enterprise, thus providing the necessary resources to further develop this innovation (Gambardella and Torrioni, 1998). The biotech sector can also be quoted as an example in this respect: small young enterprises often introduce products, while further development and commercial exploitation is often executed by well-established large pharmaceutical enterprises (KfW, 2003, 2004).

2.2 Firm-size specific employment effects of innovation

It can generally be assumed that the employment effects of an innovation depend on its type (Peters, 2006). If a higher market share is achieved due to a new product, the input of capital and labour can be increased and the firm achieves a higher value added. The substitution of a presently marketed product by a new one can also trigger off this effect if the firm’s competitiveness can thereby be increased (employment-creating innovations). Process innovations and organisational innovations, on the other hand, normally aim at decreasing costs by reducing labour input to generate the same output (labour-saving innovations).

However, as the introduction of new products is in reality generally only possible in combination with new production processes, a systematic separation of the employment effects of different forms of innovation is empirically difficult. Nevertheless, Greenan

and Guellec (2000) could show that industries in France, where process innovations were predominant during the survey period, suffered net losses in employment, while industries in which product innovations were predominant achieved net gains in employment. Employment effects of innovation also seem to be dependent on the technological level of an industry. Blechinger and Pfeiffer (1999), using data from the manufacturing sector of OECD countries between 1970 and 1991, showed that an increase in labour productivity generally went hand in hand with a decrease in employment (with the exception of Japan, where, despite above-average productivity gains, an increase in employment was observed) – whereas for high-tech and medium-high tech industries an employment increase could be registered (see also Lettmayr et al., 1997).

A number of studies exist on the subject of firm-size specific employment effects of innovation. For instance, Cesaratto et al. (1997) analysed data from Italian SME. Innovative enterprises generated an annual employment increase of 0.28% during the survey period of 1990–1992. Non-innovative enterprises reduced their workforce in this period by 0.45% per year. This result is also supported by evidence of positive indirect employment effects of SME innovations. It should be noted, however, that the above-mentioned differences are related only to the number of employees, not to the number of hours worked. The only exceptions are SME within a range of 20–199 employees. For this group of enterprises, a positive correlation was observed between both the number of employees and the number of hours worked and the innovation activities of an enterprise. These results were confirmed by a study on SME ranging from 6 to 249 employees in Italy's manufacturing sector during the period of 1998–1999 (Unioncamere and L'Instituto B. Tagliacarte, 2000, quoted in Sheikh and Osterholzer (2001)). Innovative SME experienced an employment increase well above the SME-average. On the other hand, SME which reduced their R&D activity also reduced their workforce. A positive correlation between innovation and employment in Italian SME is also confirmed by Evangelista and Savona (2002).

The study of Blechinger et al. (1997), based on a sample of German SME, also indicates a strong positive correlation between innovation (both process and product innovation) and labour demand, the strongest increase in labour demand being observed in the subgroup of innovative small enterprises in the range of 10–199 employees. The reason for this might be that small enterprises can only increase employment in large steps relative to the existing labour force stock (which poses the immediate risk of over-staffing), while an additional employee represents only a relatively small increase for a larger enterprise.

With respect to specific industries, two further studies are of interest. Research by Lettmayr et al. (1997) on a sample of small Austrian craft businesses with up to 250 employees, shows a significant positive relation between innovation and employment across all subgroups of firm size. Although, the effects differed across the various industries, employment growth of innovative SME was always considerably above the industry's average. Pointing in the same direction, Tether and Massini (1998) showed in a survey of a small sample of British SME, which had received awards for technical advancement, a negative relation between enterprise size and employment growth for the period from 1989 to 1991.

By contrast, rather pessimistic results on employment effects of innovation are presented in Veugelers' (1999) study on Belgian SME: according to this research, innovation did not contribute to employment growth. A positive relation between

innovation and turnover, yet not between innovation and employment, is presented by Klomp and Leeuwen (2000) in a sample of Danish enterprises in manufacturing industries.

Thus, the available results of empirical research are anything but uniform. Consequently, empirical surveys should currently only be interpreted in view of their respective industries and in their national context.

2.3 *Design of the empirical survey on SME in Germany's maritime industry*

Following the above, in 2004 we conducted a survey among the SME in Germany's maritime industry. For this survey a standardised questionnaire (available from <http://www.isvw.hs-bremen.de/forschung/sme-project/questionnaire>) was applied, using mainly multiple choice questions. The questionnaire was sent to approximately 300 enterprises in the maritime industry all over Germany and was answered by roughly 50 enterprises from the maritime industry. The total number of enterprises of all sizes in this industry is estimated to be around 440.

Questions addressed in our survey included:

- 1 How 'innovative' are the SMEs of this industry and is innovation activity determined by firm size? In our questionnaire, we asked whether enterprises had carried out R&D, continuously or sporadically, we asked about the history of their R&D and inquired regarding the proportion of R&D relative to turnover and staff. In our analysis, we classified an enterprise as 'innovative' if the respondents stated that they had *initiated* activities aimed at new products, processes or organisational structures.²
- 2 Do policies further the innovation activity of SME? We inquired whether public resources had been used (answer options included among others exceptions from regulations, public statements of guarantee and investment subsidies) and whether cooperation with public institutions had been carried out (answer options included among others the use of information pools, visits to conferences and joint research). We also inquired about cooperation with other enterprises and problems perceived when carrying our R&D.
- 3 How far has the internationalisation of SME progressed and what are the barriers to further internationalisation? To what degree are SME incorporated into global value chains? In our questionnaire, we addressed the share of input bought from the three most important suppliers and output sold to the three most important customers to assess the actual degree of independency of enterprises. Other areas we covered in this field included the share of internationally conducted business and export shares as indicators of internationalisation and problems faced in internationalisation.
- 4 Are internationalisation and innovation activity statistically correlated – and what is the causal relationship?
- 5 Do innovative SME show a stronger employment growth than non-innovative SME and are there any differences between employment effects of different types of innovation? Here we asked about the actual changes in the number of employees due to changes in the products, the processes or the organisational measures applied, as well as the expectations of respondents with regard to the employment when innovating.

As these issues have to be discussed in an industry-specific context, what now follows is an overview of the German Maritime Industry.

3 An outline of the German maritime industry

Germany's maritime industry can presently be characterised by five features:

- 1 an upward trend in global demand which benefits German suppliers as well as manufacturers of small and specialised vessels (while benefiting East Asian shipyards in the standard container ship sector)
- 2 a pronounced dualism of firm size
- 3 global technological leadership of the German maritime industry in various areas
- 4 production increases without significant employment effects
- 5 the maritime industry as a target of industrial policies.

ad1 Ship transport is – in the terminology of W.W. Rostow and A.O. Hirschman – one of the leading sectors of the present globalisation process. With containerisation, that is the 'box revolution' of the 1980s and the new technical possibilities to build increasingly large vessels, sea transport costs were reduced tremendously. This triggered off a vast positive effect on upstream and downstream industries: semi-finished and consumer goods imported via sea became much cheaper (forward linkages), which accelerated global economic integration and in turn increased the demand for new vessels and thereby the demand for shipbuilding supplies such as steel, navigation electronics, etc. (backward linkages).

Hence, the annual average growth rate of maritime transport capacity is considerably larger than the growth rate of world production. Between 1990 and 2005 the tonnage of the world fleet increased by an annual average growth rate of 3.2% (computed with data from VSM, 2006) – while world GDP in constant prices at market exchange rates annually increased by 2.6% in this period (computed with data from IMF, 2006). The large lot sizes in ship building and the discontinuous flow in orders, however, lead to a high volatility in capacity utilisation of shipyards.

ad2 While large-scale enterprises dominate in Germany's shipbuilding industry, suppliers are usually small- and medium-sized companies. The German shipbuilding industry currently employs 23,000 employees in about 40 enterprises; the supplying industry employs another 70,000 employees in around 400 enterprises (VSM, 2006) – which corresponds to an average firm size of 175 employees in supplying industries and 575 employees in shipbuilding. Both industries are considered here to constitute the 'maritime industry' in a narrower sense – while in the wider sense it includes shipping, off-shore energy generation and others, amounting to a total of 220,000 employees (Flottenkommando, 2005, 2006).

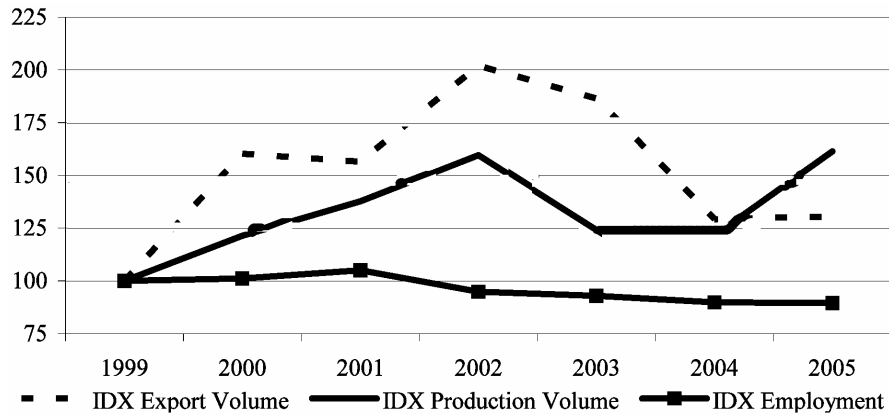
ad3 The combination of high unit labour costs and technological leadership of the German maritime industry has led to a new international division of labour: first, large-scale container vessel construction (6000 TEU – 20-foot [Container] Equivalent

Unit – and over) has been transferred from European to Korean and Chinese shipyards. The East Asian yards, however, order their engines, navigation and measurement systems, electronics, etc. from Germany (and other European countries). Secondly, due to its high level of technical competence, the international competitiveness of the German maritime industry has increased considerably in various subsectors since the 1990s, especially in the fields of special-purpose and sport vessels, that is, in products where production is knowledge-intensive rather than labour-intensive. This can be shown by the Revealed Comparative Advantage (RCA) indicator, that is, the weight of a subsector in exports from one country relative to the weight of this subsector in world trade. For instance, the German RCA for yachts (Standard International Trade Classification (SITC) – 79312), normally built in small shipyards, more than doubled from 0.7 (i.e. below average weight in 1995) to 1.5 (i.e. above average weight in 2003).

ad4 Between 1990 and 2000 – due in part to the above mentioned production shifts to Asia – a considerable employment decrease in German ship construction took place. The number of employees in enterprises belonging to corporate groups (1990, p.12 yards) decreased from approximately 43,000 to approximately 14,000 (–67%) (IGM, 2003). During the same period the eight medium-sized yards faced an employment reduction of formerly 8000 to 5000 employees (–38%) and 21 small unionised yards saw another reduction from 4000 to 2000 employees (–50 %) (non-unionised small enterprises not covered by these data) – amounting to 21,000 in all recorded enterprises in 2000. A different data source shows the overall decline in labour force in shipbuilding to be from a slightly less biased 25,900 in 2000 to 22,900 in 2005 (VSM, 2004, 2005; no size-specific data available from this source).

Whereas, both production and exports of the German ship construction industry have increased since 2000, no positive employment effects can be recognised (see Figure 1): ‘jobless growth’ or non-neutral technical progress (i.e. increases in capital intensity, labour productivity and capital-output ratio). In other words, in spite of healthy developments in production and exports, the overall employment dynamics are poor. It should be noted, however, that any analysis of employment effects is constrained by the relatively poor data quality, since the increasing number of employees of subcontractors is not included and detailed figures regarding the supply industry are not available. Estimated figures, however, indicate a fairly stable level of employment in the supply industry segment in contrast to the shipbuilding segment.

ad5 The maritime industry is a target for industrial policy. Instruments include ‘hard’ measures, such as subsidies, especially in the form of tax privileges for ships registered in Germany (not actual profits but relatively low ‘hypothetical’ profits fixed according to the size of ship as the tax base) and subsidies for investment in shipbuilding-related innovation (up to 20% of the investment). Furthermore, various ‘soft’ measures exist, such as informal coordination by ‘Maritime Conferences’ and other forms of dialogue between politics and industry. The German government’s Report on Subsidies states that a sum of 54 m Euro was spent on the maritime industries by the Federal Government in 2005 (excluding fishing and transport), while the independent Kiel University Report on Subsidies estimates for the same year 58 m Euro of federal subsidies for the maritime industry, with an additional 67 m Euro of subsidies being provided by the federal states (Laender) and the communities (Bundesregierung, 2006; Institut für Weltwirtschaft, 2006).

Figure 1 Indices of production, exports and employment in Germany's shipbuilding industry, 1999–2005

Source: Own computation with data from Flottenkommando (various issues).

4 Results of the survey on SME in the German maritime industry

In the following, the results of the survey are presented in three subsections: innovation, internationalisation and employment changes by innovation.

4.1 Innovations

According to our survey, 82% of SMEs in our sample of the German maritime industry are engaged in the research and development of new products, production processes and organisational structures. Of SME active in R&D, 44% have been continuously engaged in innovation projects, 56% sporadically. An analysis of the different areas of innovation activity shows that in the maritime industry technical innovations predominate (see Table 1).

Table 1 Areas of innovation in SME in Germany's maritime industry (sample), 2003

Innovation area*	Percentage (%)
Technical products	84
Production processes	21
Organisational structures	16
Other areas	14
Non-technical products	–

*Multiple answers permitted.

Source: Own Survey (2004).

It is interesting to compare these figures with those of other industries. A comprehensive survey of all manufacturing industries in all enterprise size-classes in Germany (ZEW, 2006) gives a figure of 60% of enterprises active in R&D. The figures of both

surveys, however, are probably to some extent upward biased, as non-innovative enterprises can be expected to be reluctant to answer questionnaires on innovative activities.

The average total R&D expenditure of R&D-active SMEs in the maritime industry amounts to 5.6% of turnover (see Table 2), which is slightly above the 5% average of all R&D active enterprises in the German manufacturing industries (ZEW, 2006).

Table 2 Expenditure on R&D in percent of turnover in SME in Germany's maritime industry (sample), 2003

	<i>n</i>	<i>Mean</i>	<i>SD</i>
Enterprises of sample active in R&D	32	5.6	6.4
o/w firms with permanent R&D	16	6.0	5.3
o/w firms with sporadic R&D	16	5.2	7.6

Source: Own survey (2004).

In all subgroups arranged according to turnover figures, the overwhelming majority of maritime SME are innovative. However, the ability to steadily allocate funds to research and development is mainly determined by the size of the annual turnover of an enterprise: whereas only a quarter of the smaller enterprises (annual turnover less than 10 m Euro) in our survey of the maritime industry were permanently engaged in the development of innovations, half of the small- enterprises only sporadically engaged in innovation projects. Of the medium-sized enterprises (annual turnover 10–50 m Euro) almost 60% are permanently engaged in innovation activity, while almost 30% are sporadically involved in innovation projects.

Maritime SME active in R&D use additional public resources to virtually the same extent for their innovation projects or otherwise rely exclusively on their own resources for innovative activity. Obviously, either barriers exist for maritime SME to obtain access to the subsidies for innovation in shipbuilding or the enterprises are not eligible for the programmes or the funding terms are unsuitable for the SME. This result is even more astonishing as 59% of the responding enterprises named financial barriers, such as amortisation periods or access to external finance, as a constraint on their R&D activity.

It seems that public resources should contribute to an increasing continuity of R&D processes in SME. However, this is obviously not the case, as, when it comes to drawing from public funds, there appears to be no marked difference between enterprises either continuously or sporadically engaged in R&D projects. Nor does there seem to be a direct link between a greater continuity in innovation processes and interbusiness cooperation of SME. This is shown in Table 3: there are as many firms which can be characterised as individualists as there are firms where innovations are the result of (targeted) interenterprise teamwork.

Another point of interest is the diffusion of innovation in the course of integration into value chains. As an indicator of the extent of an enterprise's integration into a supply chain, we chose the upstream and downstream concentration of its business partners. According to this measurement method, the strength of vertical integration is not relevant for the degree of innovative activity of an SME in the German maritime industry (see Table 4). Probably, although not verifiable by our data, even the reverse argument holds true, namely that more diffusion of innovation is likely by the light, but diverse

involvement of suppliers across *different* value chains: 80% of ship construction suppliers also serve non-maritime markets and thus function as a 'hinge' for innovation (Nürnberg, 2005).

Table 3 Research cooperation of SME in Germany's maritime industry (sample), 2003

Number of firms	Research cooperation		Total
	Yes	No	
Permanent R&D	9	7	16
Sporadic R&D	8	15	23
Total	17	22	39

Source: Own survey (2004).

Table 4 Innovation and vertical integration of SME in Germany's maritime industry (sample), 2003

Number of firms	<25%	25–50%	51–75%	75+ %	Total
<i>Share of component supplies being sourced from three major business partners</i>					
Permanent R&D	12	3	–	–	15
Sporadic R&D	13	2	4	1	20
No R&D	6	2	–	1	9
Total	31	7	4	2	44
<i>Share of sales to three major business partners</i>					
Permanent R&D	10	4	–	1	15
Sporadic R&D	12	4	6	1	23
No R&D	4	4	–	1	9
Total	26	12	6	3	47

Source: Own survey (2004).

4.2 Internationalisation

To a considerable degree, SME in the maritime industry are internationalised. This can be measured by the export share of their turnover, which is 40% – as compared, for instance to logistics (14%) and environmental technology (31%) – industries which we covered in a different survey. Furthermore, three out of four SME in the maritime industry sample define an international orientation as part of their business strategy for the future. The export ratio of enterprises engaged in German ship construction, without any further distinction in firm size, was 83% in 2003 (VSM, 2004, 2005).

However, the internationalisation of SME has apparently not been easy. A lack of distribution channels was identified by all three branches under survey as the major problem in internationalisation, followed by language barriers, financial problems and a lack of market knowledge. In the maritime industry 40% of the enterprises surveyed named the lack of distribution channels, 30% language barriers and 25% lack of funds to have been and to remain the major constraint.

The hypothesis that internationalisation and innovation activity are two aspects of the same process, can be validated for the German maritime industry. As given in Table 5, however, SME serving only the domestic market also appear to be active in innovation projects.

Table 5 R&D activity and international orientation of business in SME in Germany's maritime industry (sample), 2003

<i>Enterprises</i>	<i>Internationalisation as a part of business strategy</i>		<i>Total</i>
	<i>Yes</i>	<i>No</i>	
With R&D	32	7	39
Without R&D	6	3	9

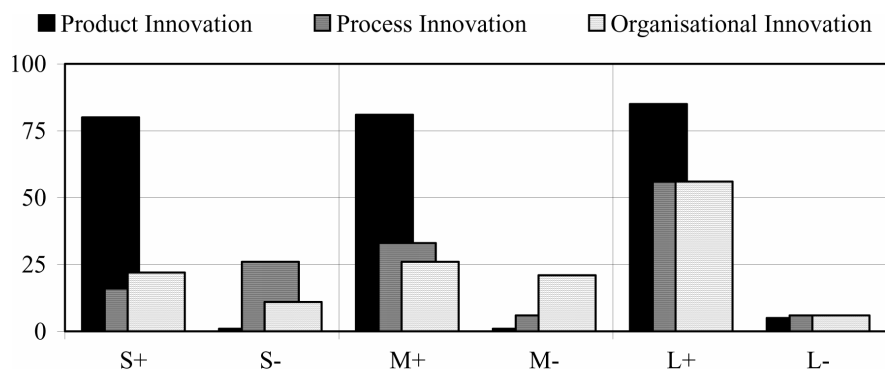
Source: Own survey (2004).

4.3 Innovation and employment

Approximately half of the SME under survey reported implications on their employment situation due to innovation. Enterprises reporting employment implications were asked for an assessment of the direction of this change – differentiating according to three kinds of innovation and three different time spans: short-term positive, short-term negative, mid-term positive, mid-term negative, long-term positive and long-term negative effects (see Figure 2).

As could be expected, product innovations in SME in the maritime industry were assessed as almost exclusively causing increases in employment. It is interesting to note, however, that process innovations and even organisational innovations were seen to increase rather than to decrease employment in an extended time span. Thus the hypothesis that innovations generally lead to a displacement of labour has to be rejected for maritime SME.

Figure 2 Estimated employment effects of innovations in German maritime SME (sample), 2003



Note: The ordinate shows the share of innovative SME having reported a change in employment due to innovations. Respondents could differentiate between S+ = short-term positive, S- = short-term negative, M+ = middle-term positive, M- = middle-term negative, L+ = long-term positive and L- = long-term negative effects.

Source: Own survey 2004

5 Conclusion

Our research provides some answers to questions on the interrelationship between innovation, internationalisation and employment changes in SME. It should be particularly emphasised that SME in the German maritime industries demonstrate a higher-than-average innovation activity in an interindustry comparison. On the one hand, this shows that an industry previously considered weak, low-tech and labour-intensive, has changed under the influence of globalisation repercussions into a modern industry which – independent of firm size – deals successfully with new technical developments and dynamic global competition. According to the data for the whole industry (see Figure 1), such changes did not have a positive effect on employment in the past. By contrast, our survey data showed that innovations in SMEs in the maritime industry triggered employment. Our survey thus validates the hypothesis for Germany's maritime industry that SME are both 'innovation engines' and 'job motors'. A trade-off between these two objectives of economic policy cannot be expected for industrial policy promoting SME in the maritime industry.

However, it is questionable whether this kind of industrial policy is legitimate in terms of the Walter-Eucken-type of 'Ordnungspolitik' – an understanding, deeply rooted in the German conception of economic policy, which proceeds from and takes as its yardstick of performance an ideal-type free market system. An evaluation of policies promoting the maritime industry is not of concern here. Nevertheless, it should be mentioned that according to our results both trigger-off-effects and taking-along-effects of public funding are possible. On the other hand, some promotional instruments do not appear appropriate for SME in this industry, manifesting policy failures, both alpha errors (whether aided or not, supported companies would still innovate at above-average levels and create employment) and beta errors (non-supported enterprises could contribute more than average to the achievement of policy objectives if supported).

Furthermore, the survey shows that innovation and internationalisation go hand in hand. It seems that a causal relationship between these two developments cannot be constructed: innovative enterprises increasingly need international markets, in the same way as international markets demand innovative enterprises. However, given the extent of Germany's integration in the world economy, firms in the domestic market also face intensive competition for technological leadership.

Regarding the barriers for SME with respect to the realisation of their innovative potential and their capacity to create employment, it appears that (according to the companies' statements) the lacking access to external finance plays an important role. Together with non-available distribution channels and language skills, funding is an obstacle to internationalisation. The mobilisation of venture capital might be a possibility, but is not common in German SME, neither on the demand nor the supply side, suggesting the diagnosis of market failure.

Acknowledgements

The authors are grateful for the very valuable comments of two anonymous referees.

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Notes

¹This definition is slightly broader than the European Union's present 'official' definition, which considers exceeding one of the limits as an exclusion criterion (EUC, 2003).

²This definition is somewhat broader than the one used by ZEW Mannheim, which expects 'a completed innovation project within the last three years before the survey period' (Peters, 2006; our emphasis). We believe our definition to be more feasible, since in SME it often proves difficult to differentiate between regular production activity and a well-defined innovation project (see EUC, 2002b).