

Prospects of the German Economy

Innovation Activities in the Manufacturing Sector

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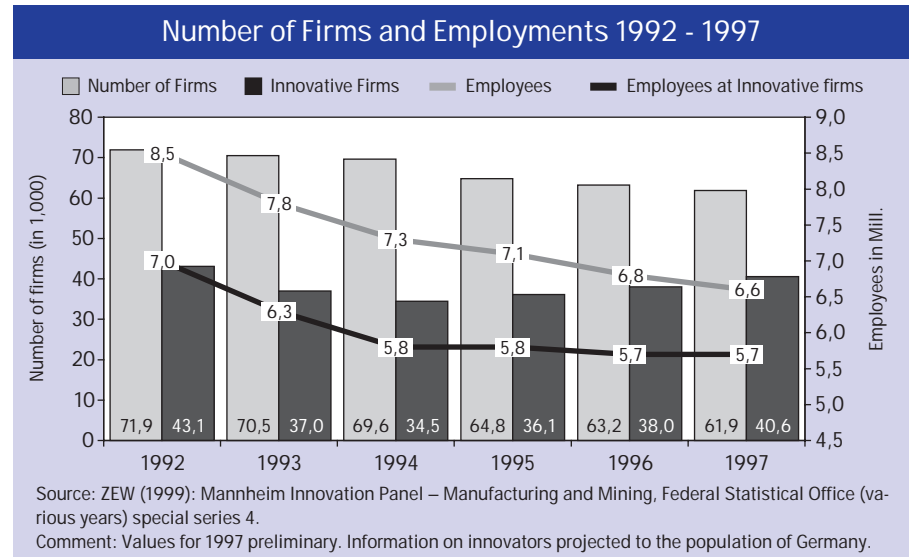
Innovation Activities of the German Economy: Manufacturing and Mining Survey 1998

Innovation activities have been further intensified in the manufacturing sector. The view that growing international competition can only be met with an ongoing improvement of the production process and steady renewal of products has gained acceptance on a broad front.

The number of innovative firms in the year 1997 has not only increased significantly in the relative sense but also in the absolute numbers. The firms have done their part to have a better standing in the international markets. However, at least in manufacturing and mining, no direct positive effects can be seen for the labour market. The employment numbers in total are still receding.

The most important results of the 1998 survey on innovation activities in manufacturing and mining are, in brief:

- ▶ The share and also the absolute number of innovative firms has, in comparison with the year before, now significantly increased to 66%.
- ▶ Innovation expenditures have increased both absolutely and also in relation to turnover. They now amount to 108 bill. DM. This corresponds to a turnover share of 5.2%.
- ▶ The success indicators for product innovations have essentially improved: the share of turnover with product innovations has increased to 39%, the



turnover share of market novelties to almost 6%.

The success indicators for process innovations have improved markedly: the share of firms with cost-reducing process innovations and also the realised cost-reducing share have increased in comparison with the preceding year.

Despite the overall positive outcome there are three areas clearly emerging in German manufacturing and mining having difficulties in keeping up.

- ▶ Innovation expenditures of firms coming from lesser R&D-oriented industrial sectors are stagnating. Since it is here in particular where lesser quali-

fied people belonging to the problem group of the labour market can still find work, innovation policy must not lose touch with these sectors.

- ▶ The innovation expenditures of the traditional, medium-sized firms with 200 to 500 employees are stagnating. But it is exactly these firms which have belonged to the pillars of the German economy for years.

In the firms belonging to the new Länder, product innovations are dropping off in favour of process innovations. The cost pressure forces firms to rationalise further. Negative effects for the East German labour market cannot be excluded.

Development and Structure of Innovation Activities

Innovation activities have been gaining further importance in manufacturing and mining. After a low in 1994, the share of innovative firms has been rising continually and has now reached 66%. The number of innovative firms has also risen absolutely, crossing the mark of 40 000 firms in 1997 for the first time since 1992. Still, one should not fail to mention that the clear rise in the share of innovative firms can essentially be brought back to the dwindling number of firms in manufacturing and mining. Manufacturing and mining are fur-

Innovation Indicators 1997

Share of Firms with	Share 1997	Changes compared to	
		1996	1995
Innovations	66	6	10
Product Innovations	62	6	11
Process Innovations	58	10	12
Market Novelties	24	2	0
Cost reduction	40	6	12
Turnover Share in %	Share 1997	Changes compared to	
		1996	1995
Product Innovations	39.0	3.0	0.3
Market Novelties	5.9	2.1	1.1
Cost reduction	6.5	0.3	2.1

Source: ZEW (1999): Mannheim Innovation Panel – Manufacturing and Mining.
Comment: Shares in Percent, Changes in Percentage Points. Values for 1997 preliminary. All information on innovators projected on the population in Germany.

R&D-Intensity

Firms with very high R&D-intensity are firms from sectors (according to the three digit WZ93-Code of the Federal Statistical Office) with an average share of turnover spent on R&D of at least 8%. Amongst others, the pharmaceutical, communication engineering and the aerospace industries belong to these sectors. Firms with high R&D-intensity are made up of firms coming from sectors with an average share of turnover spent on R&D of at least 3% and less than 8%. Amongst others, parts of the chemical industry, motor manufacturing industry, mechanical engineering and electrical engineering belong to these sectors. Firms with low R&D-intensity are firms from sectors with an average share of turnover spent on R&D of less than 3%. Amongst others, the textile industry, the food & beverages industry and the metal industry belong to these sectors.

Product and Process Innovations

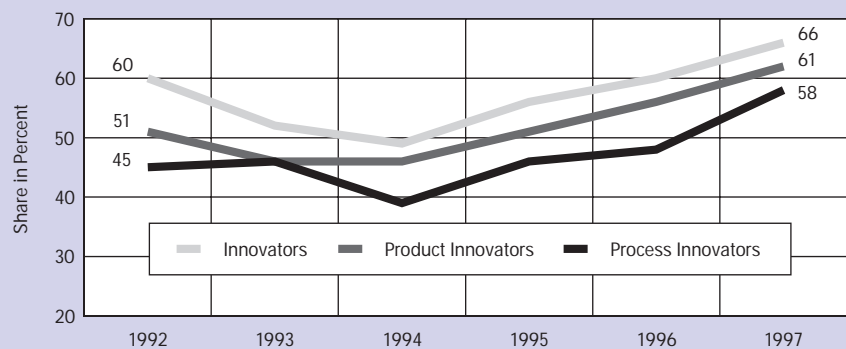
Innovators are firms which within a past 3-year time period have successfully accomplished at least one innovation project. An innovation has been implemented, if it has been introduced on the market or used within a production process. Innovations consist of product and process innovations. It does not depend on whether or not another firm has already introduced the innovation. What counts is only the firm's view.

Product innovations are new or significantly improved products which a firm has introduced on the market. Purely aesthetic modifications of products are not considered as product innovations.

Process innovation comprises new or significantly improved production technology and process engineering introduced to the firm. New production processes sold to other firms are considered as product innovations.

The definitions and differentiations correspond to those of the OECD which were fixed in the so called OSLO-Manual.

Innovation Activities 1992 to 1997



Source: ZEW (1999): Mannheim Innovation Panel – Manufacturing and Mining.

Comment: Values for 1997 preliminary. All information projected on the population in Germany.

ther losing importance in the economy as a whole. It is primarily the non-innovative firms which retire from economic activity.

The share of innovators in sectors with high or very high R&D-intensity is naturally very high. In these sectors it amounts to almost 80%. But also in sectors with low R&D-intensity an innovator share of over 60% is achieved, in comparison to less than 50% in 1994. The meaning of this rise becomes evident when one keeps in mind that 4 out of 5 firms and 3 out of 5 employees of the manufacturing industry come from sectors which are traditionally considered to be not so R&D-intensive.

In some of these sectors with low R&D-intensity, though, the rise can solely be brought back to a high rate of mortality of non-innovative firms. Within a span of 5 years, the number of firms in this area has gone down by 15% and the number of employees by almost 25%.

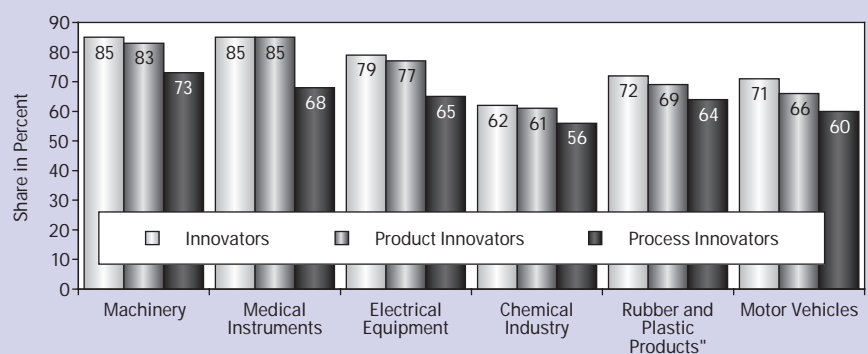
Product as well as process innovations are over proportionally involved due to a rise in the share of innovators. The rise in the total share of innovators

underestimates the actual rise in innovation activity. Firms, which realized only product innovation up to now, also start to renew their production processes, and firms, which carried out only process innovations until now, start to introduce new or significantly improved products onto the market now, too.

The share of product innovators amounts to more than 60% for 1997. Approximately 38 000 firms of the manufacturing and mining industry introduced new or improved products to the market. In the sectors mechanical and medical engineering, this share amounts to over 80%. Since 1992, the share there has risen by over 25% points. The increase is also clear in other sectors, such as electrical engineering.

The share of process innovators, likewise, is drawing near to the 60% mark. From 1996 to 1997 it has clearly risen a great deal, by 10% points, that means just about 6 000 firms to some 36 000 firms. The most distinct increases begin to emerge in the sectors already mentioned: mechanical, medical and electrical engineering. But also in the chemical

Innovation Activities in Selected Sectors



Source: ZEW (1999): Mannheim Innovation Panel – Manufacturing and Mining.

Comment: Values for 1997 preliminary. All information projected on the population in Germany.

and rubber and plastic industry, as well as in the motor manufacturing industry, in the last year under review in particular, the shares of firms with new or improved production technologies have clearly risen.

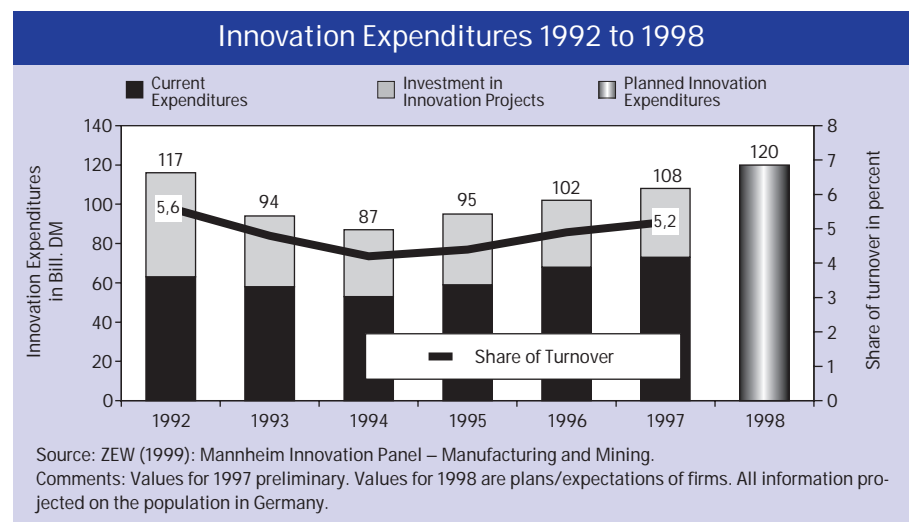
The employment of innovative firms in manufacturing and mining has, in contrast to the trend of the entire sector, stabilised to a large extent. For 1997, 5.7 million people find employment in these firms, about as many as in the previous year, but still a good 1.2 million less than in 1992. At least for the innovative firms, a break seems to have been put on the employment decline. A total of 87% of all employees work for innovative firms in 1997. In 1994 they still made up less than 80%.

For a couple of years employment with product innovators has remained stable, fluctuating around the mark of about 5.4 million people. Employment with process innovators is on the other hand increasing again for the first time since 1992. As many as 5.3 million people work in firms which have renewed or improved their production processes. One must still wait, however, to see whether this is a sign for the fact that process innovations are not necessarily accompanied by a decline in employment, or whether one should expect further falls in employment.

Development and Structure of Innovation Expenditures

The intensity of innovation activities has risen in 1997. Innovation expenditures amount to approximately 108 bill. DM. This corresponds to a rise of just about 6% compared to the previous year and a rise of almost 14% when compared to 1995. This rise corresponds to that of the R&D-expenditures to a certain extent. According to calculations obtained from the SV-Wissenschaftsstatistik, between 1995 and 1997 the R&D-expenditures have risen by just under 12%.

The innovation expenditures have also risen once corrected for the growth in turnover. The turnover share of innovation expenditures comes to about 5.2% in 1997. This turns out to be the highest value reached since the innovation activities slump at the beginning of the 1990s. When compared to the previous year, the turnover share of innovation expenditures has risen by about 0.3%



points, compared to 1995 by about 0.8% points.

According to the plans made by the firms, the innovation expenditures in 1998 have risen by a further 11% to just under 120 bill. DM. However, the last years have shown the plan data to be not very reliable indicators for actual development.

The rise in innovation expenditures can be traced back exclusively to the rise in current innovation expenditures. The current expenditures amount to around 73 bill. DM in the year 1997. This corresponds to well over two thirds of the total innovation expenditures. Invested innovation expenditures have been stagnating at a level of about 34 bill. DM since 1993. The share of investments in total innovation expenditures has thus sunk to less than one third.

The development of innovation expenditures is driven especially by innovation activities of big firms. In 1997 they contribute more than 81 bill. DM to the total expenditures. With regard to 1995 this corresponds to a growth of 25%. Of the total expenditures of the big firms, about 60 bill. DM are allotted to current expenditures. The invested innovation expenditures of big firms have been stagnating at around 20 bill. DM for years.

The highest rise in innovation expenditures is recorded in firms with very high R&D intensity. Since 1994, the innovation expenditures have more than doubled and amount to about 34 bill. DM in 1997. This corresponds to a turnover share from innovation expenditures of over 20%. Firms from high-technology industries have picked up from the slump most quickly with their innovation

activities. By now not only the current, but also the invested innovation expenditures have climbed far above the initial level at the beginning of the '90s. According to the plans of the firms, innovation expenditures are going to rise once again by over 10% in 1998.

Also, the innovation expenditures of firms with high R&D-intensity have recovered noticeably and now amount to a good 40 bill. DM, more than at the beginning of the '90s. In comparison with 1995, the innovation expenditures have risen by over 10%. According to firms' plans, this development has continued throughout 1998. A further rise of innovation expenditures by about 10% to a good 44 bill. DM is to be expected. The turnover share of innovation expenditures has risen, too, and now with 5.7% amounts to about as much as at the beginning of the '90s.

Innovation expenditures

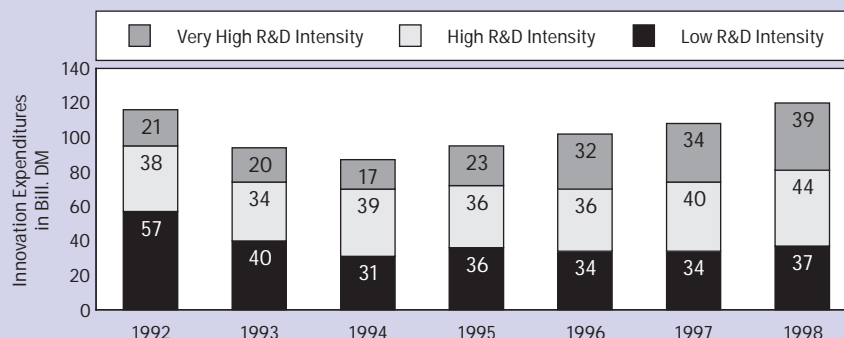
Innovation expenditures refer to the expenditures for ongoing, completed and aborted projects within a year. They can be broken down into current expenditures (personnel and material expenditures etc.) and expenses for investments.

To this belong expenditures for research and experimental development, machines and equipment, acquisition of external technology, industrial design and other product preparations, staff training and continual professional education as well as market tests and activities in connection with the launching of new or significantly improved products, as long as these expenditures are directly linked to an innovation project.

The development of innovation expenditures of firms with low R&D intensity, especially the consumer goods, give cause for concern. Their innovation expenditures have not risen and still amount to only around 34 bill. DM despite a growing share of innovative firms. This is less than one third of the total innovation expenditures in manufacturing and mining, even though these industrial branches represent 4 out of 5 firms and 3 out of 5 of the total number of employees.

The turnover share of innovation expenditures has been stagnating at around 2.8% for years. However, firms with low R&D-intensity have planned to project their innovation activities by about 2.8% to just under 37 bill. DM in 1998. In the past, though, the actual realised values regularly remain below those which were expected.

Innovation Expenditures according to R&D-Intensity of the Sector 1992 to 1998



Source: ZEW (1999): Mannheim Innovation Panel – Manufacturing and Mining.

Comments: Values for 1997 preliminary. Values for 1998 are plans/expectations of firms. All information projected on the population in Germany.

The lacking rise in invested innovation expenditures for the entirety of manufacturing and mining can be particularly brought back to the continuous fall

in innovative investments of firms from the consumer goods industry. This was not compensated by the rise in investments of other sectors.

Innovation Indicators for Manufacturing and Mining

	1992		1993		1994		1995		1996		1997	
	absolute	in %	absolute	in %	absolute	in %	absolute	in %	absolute	in %	absolute	in %
Firms	71,900	100	70,547	100	69,628	100	64,793	100	63,209	100	61,912	100
<i>amongst those:</i>												
– Innovators	43,103	60 100	37,003	52 100	34,463	49 100	36,117	56 100	38,026	60 100	40,618	66 100
<i>amongst those:</i>												
– Product Innovators	36,384	51 84	32,626	46 88	32,327	46 94	32,793	51 91	35,481	56 93	38,398	62 95
– Process Innovators	32,025	45 74	32,403	46 88	27,181	39 79	29,584	46 82	30,328	48 80	36,162	58 89
Employees (in 1.000)	8,534	100	7,796	100	7,287	100	7,100	100	6,804	100	6,633	100
<i>amongst those:</i>												
– Innovators	6,988	82 100	6,293	81 100	5,776	79 100	5,825	82 100	5,681	83 100	5,749	87 100
<i>amongst those:</i>												
– Product Innovators	6,565	77 94	5,815	75 92	5,474	75 95	5,503	78 94	5,374	79 95	5,551	84 97
– Process Innovators	6,021	71 86	5,746	74 91	5,118	70 89	5,185	73 89	4,971	73 88	5,276	80 92
Innovation Expenditures (in Bill. DM)	116	100	94	100	87	100	95	100	102	100	108	100
Share of turnover in % <i>under them</i>	5.6		4.8		4.2		4.4		4.9		5.2	
– Current Innovation Expenditures	63	54	58	62	53	61	59	62	68	67	73	68
– Investment for Innovations	53	46	36	38	34	39	36	38	34	33	35	32
Share of Firms with (Information in %)												
– Market Novelties	–		–		22.0		24.7		22.6		24.3	
– Cost Reduction	–		32.3		24.5		28.2		34.4		40.2	
Share of Turnover with (Information in %)												
– Market Novelties	–		–		5.1		4.8		3.8		5.9	
– Product Novelties	37.0		38.2		38.0		38.7		36.0		39.0	
Share of Reduced Costs (Information in %)	–		7.1		4.1		4.4		6.2		6.5	

Source: ZEW (1999): Mannheim Innovation Panel – Manufacturing and Mining.

Comments: Values for 1997 preliminary. Turnover share of product innovations for 1996 and 1997 only to a limited extent comparable to previous years. Market novelties prior to 1994 not surveyed, cost reductions not surveyed prior to 1993. All information projected on the population in Germany.

Frame Population and Extrapolation

The results of the ZEW-Innovation Survey are stratifiedly projected on population of all firms with at least 5 employees of manufacturing and mining in the Federal Republic of Germany after the differentiation of the economic sector classification WZ93 of the Federal Statistical Office. Sector, firm size (employment number) and region (old and new Länder) serve as stratification characteristics.

The details of the population (number of firms and employees as well as turnover) until 1996 are based on publications of the Federal Statistical Office and estimates of the ZEW on the number of small firms. The information from 1997 onwards are based on the extrapolation of the frame population and are preliminary.

Development and Structure of Innovation Success

The stronger market orientation of innovation expenditures, which shows itself in a faster growth of innovation expenditures in comparison to the R&D-expenditures, has led to turnover volume shares of product innovations rising by 3% points to about 39% for 1997 when compared to the previous year.

It can be seen that the turnover share of product innovations takes a different course in time from that of innovation expenditures. The turnover share has thus not fallen after the downturn in economic activity in 1993 but risen further. First of all, this is due to the fact that success in innovation only appears with a delay in time. On the other side, product innovations have been able to hold their ground relatively better during the economic low than elder products. The apparent fall from 1995 to 1996 can be brought back to a change in the questionnaire from 1996 onwards, due to the European harmonisation of the innovation surveys. Indeed, from 1995 to 1996 the share of volume trade seems to have risen, too.

The rise in turnover shares is solely borne by firms of the investment goods industry with high or very high R&D-intensity. The turnover shares of product innovations in sectors with high R&D-intensity have, for example, has risen by

almost 7% points to over 55%, whereas the turnover share in sectors with low R&D-intensity have been lying constantly at a reasonable 28%.

While the share of product innovators is steadily increasing in the course of time, the development of firm shares with market novelties is less evident. The shares vary between 22% and 25% and have risen again slightly to 24% in 1997, after falling between 1995 and 1996. Particularly in firms from sectors with very high R&D-intensity, the values vary considerably, since it is exactly the products of high technology which are subject to a very long development time. Market introductions in this case also demand a relatively long prior run. The turnover share of market novelties with goods from high technology therefore strongly depends on the moment of market introduction.

The values of a single year can only be regarded as a kind of snapshot - they cannot act as a valid indicator for actual performance. A trend may only be anticipated. In industries of strong importance to Germany with high R&D-intensity, a slight rise in the share of firms with market novelties can be seen over time.

Similar to the share of firms with market novelties, the turnover share of market novelties is unstable in the course of time. They vary between about 4% and 6%. In 1997, the turnover share of market novelties rose by about 2% points to almost 6%, after it had dropped slightly in 1995 and 1996, respectively. The reaction of the turnover share of market novelties to the fall in innovation expenditures resulting from the slump in eco-

Turnover Share of Product Innovations

The turnover share of product innovations refers to turnover for the year concerned due to innovations within a past 3-year time period. The measurement of turnover shares before 1996 is set more widely here and contains turnover with improved but not necessarily significantly improved products. The values reported before 1996 can therefore be considered as too high.

Market Novelties

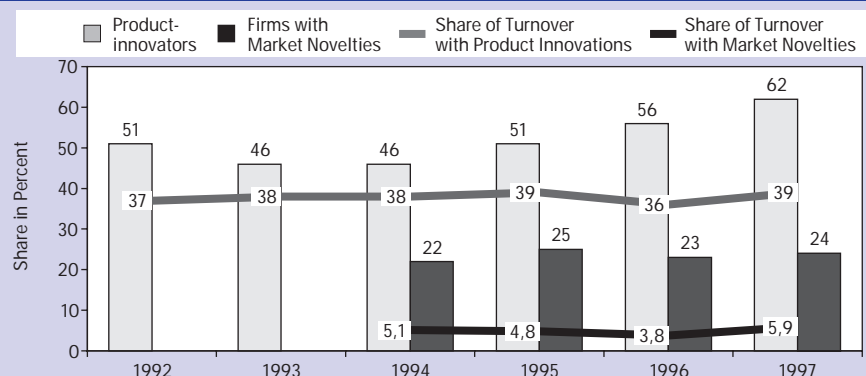
Market novelties are new or significantly improved products a firm has introduced on the market which were new not only for the enterprise but also for the enterprise's market. The relevant market is defined according to the view of the firm. Market novelties prior to 1994 were not ascertained. Turnover share of market novelties refer to the turnover for the year concerned due to market novelties of the respective last three years.

conomic activity has come with a slight time lag and has picked up with a corresponding delay only.

In R&D-intensive sectors the turnover share is clearly higher than in the total of mining and manufacturing. In 1997 the share of firms from sectors with high R&D-intensity comes to 8.7% in contrast to 5.4% for the previous year.

Process innovations do not necessarily have to be accompanied by a rationalisation in the production, since new production processes can also be a logical

Product Innovations 1992 to 1997



Source: ZEW (1999): Mannheim Innovation Panel – Manufacturing and Mining.

Comments: Values for 1997 preliminary. Turnover share of product innovation for 1996 and 1997 only to a limited extent comparable to previous years. Market novelties prior to 1994 not surveyed. All information projected on the population in Germany.

Share of Cost Reduction through Process Innovation

Cost-reducing process innovations refer to process innovations that have led to a reduction in average costs. Cost-reducing shares refer to the costs of the previous year, which were brought down by cost-reducing innovations within a three year time period.

result of product innovations or the fulfilment of judicial requirements, for example within the context of environmental legislation. The share of cost-reducing process innovations is hence a better indicator for process innovations with an underlying rationalisation motive.

In 1997 the share of firms with cost-reducing process innovations amounts to approximately 40%. This share has continuously risen since 1994. About two thirds of the process innovations are accompanied by cost reductions for the last year.

The share of cost reduction has in turn greatly risen, especially in R&D-intensive sectors, namely by about 15% points within one year to what is now over 50%. Also in sectors with low R&D-intensity, the share has risen by almost 10% to almost 37%.

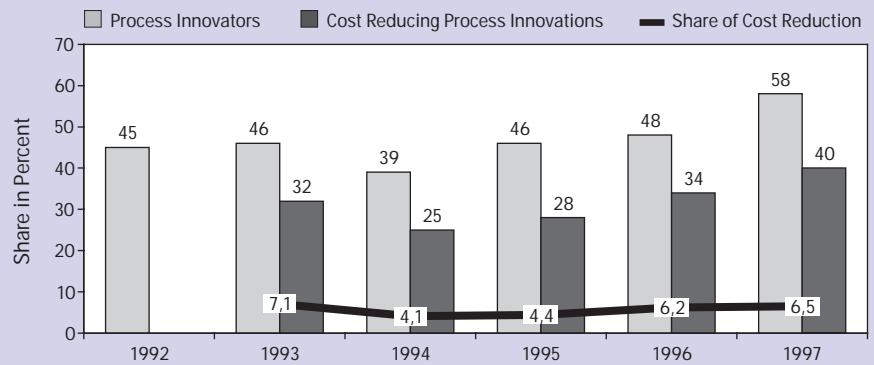
The share of costs saved through process innovation has, in comparison with the previous year, increased by 0.3% points for 1997 and in comparison with 1995 by more than 2.0% points to a value of 6.5%. This corresponds to the value for 1993 in some way. Since 1994, the share of cost reduction has been rising continuously.

Innovation Activities of Small and Medium-sized Enterprises

The share of small and medium-sized enterprises (SMEs) has declined to the same extent as the total number of firms in manufacturing and mining. Whereas in 1992 almost 70 000 SMEs existed, now in 1997 there are only a little more than 60 000. The share of SMEs from the total number of firms remains stable at approximately 97%.

Even the number of employees in SMEs has declined considerably in the time period observed, from almost 4.0 to just about 3.3 million. The SMEs have still gained relatively in importance for employment. The share of employees in

Process Innovations 1992 - 1997



Source: ZEW (1999): Mannheim Innovation Panel – Manufacturing and Mining.

Comments: Values for 1997 preliminary. Cost reductions for 1992 not surveyed. All information projected on the population in Germany.

SMEs has risen from a good 45% to just about 50% within the same time period.

The growing importance of innovation activities in the manufacturing industry measured as the share of innovative firms is carried especially by the SMEs, whilst the innovation activities of larger firms have remained stable at a very high level. The share of innovative SMEs now amounts to 65%, that is even 6% points more than in 1992.

Just as in the sector as a whole, the number of innovative SMEs is also rising continuously in absolute terms and now lies at just about 39 000 firms. Compared to the low in 1994, this constitutes an increase of more than 6 000 firms. Of these 39 000 firms, just about 37 000 have been able to introduce product innovations into the market. The share of product innovating SMEs has thereby risen to more than 60%. A little less than 35 000 firms have been able to realise process innovations. This corresponds to a share of process innovating SMEs of 57%. Analogous to the total of the manufacturing and mining industry, within the period of one year the share of process innovations has risen by 10% points.

The slight rise in employment in innovative SMEs which one was able to notice between 1994 and 1996 has, for the time being, come to a standstill. Employment in innovative SMEs is stagnating at a good 2.5 million persons.

In spite of the significantly increasing number of innovative firms, the innovation expenditures of SMEs are now even in reversal. In 1997 they amount to about 27 bill. DM. Compared with the previous year this corresponds to a decline of about 4% and compared to 1995, one

of 13%. According to the expectations of firms, even in 1998 no essential rise in innovation expenditures has taken place. The diagnosed rise of the total innovation expenditure can solely be brought back to the increased expenditure of larger firms. The drop in innovation expenditures remains, if one corrects it for the development in turnover. The turnover share of innovation expenditures from SMEs has for 1997 fallen to 3.3%, compared with 3.4% for the previous year.

The share of innovation expenditures should be brought back less to the small firms - whose innovation activities in the course of time occur rather discontinuously anyway - than to medium-sized firms, that is firms with 200-500

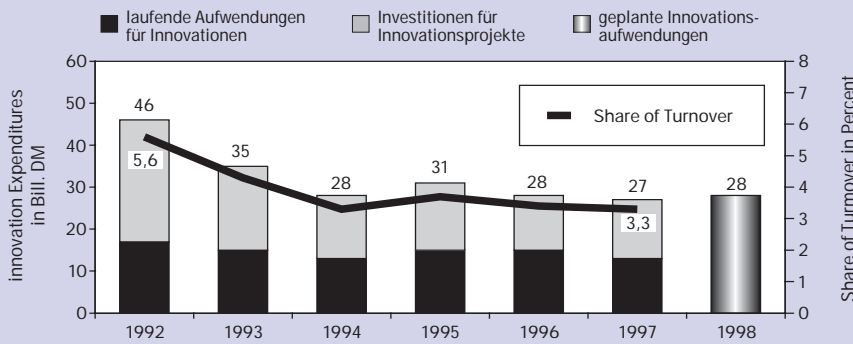
SMEs

Small and medium sized enterprises (SMEs) are firms with at least 5 and less than 500 employees.

Due to their relatively large number SMEs are dominant for all shares which refer to the number of firms. Large firms on the other hand are dominant for all shares which refer to DM amounts due to the large financial volume. Employment figures depend on both groups.

employees. Whereas the innovation expenditure of firms with less than 200 employees remained relatively constant in the last couple of years, the innovation expenditures of SMEs with more than 200 employees have declined by about 10% to a good 34 bill. DM within a period of one year. According to firm expectations, no substantial rise has occurred for 1998.

Innovation Expenditures of Small and Medium Sized Firms 1992 to 1998



Source: ZEW (1999): Mannheim Innovation Panel – Manufacturing and Mining.

Comments: Values for 1997 preliminary. Values for 1998 are plans/expectations of firms. All information projected on the population of SMEs in Germany.

In spite of an increasing share of product innovations, the turnover share of product innovations in small firms has slightly decreased in 1997 compared to the previous year – in contrast to total

manufacturing and mining in its entirety. After a continuous rise to over 32% the share has fallen again to under 30%. This drop can be brought back to a corresponding fall of turnover shares

from SMEs in sectors with low R&D-intensity, especially in the consumer goods industry.

The share of the SME with market novelties has risen by around 1.5% points to 23% in 1997 compared to the preceding year. However, these shares vary so much in the course of time that tendencies are difficult to recognise. The turnover share of market novelties have also risen slightly in 1997 compared to the preceding years, by around 0.7% points to almost 4.5%. Here an upward trend can be drawn out after three years of relatively constant shares. In all, both firm as well as turnover shares of the SMEs remain slightly under those of total manufacturing and mining.

The share of firms with cost-reducing process innovations has in 1997 again markedly increased by more than 5% points to almost 40%. The shares have

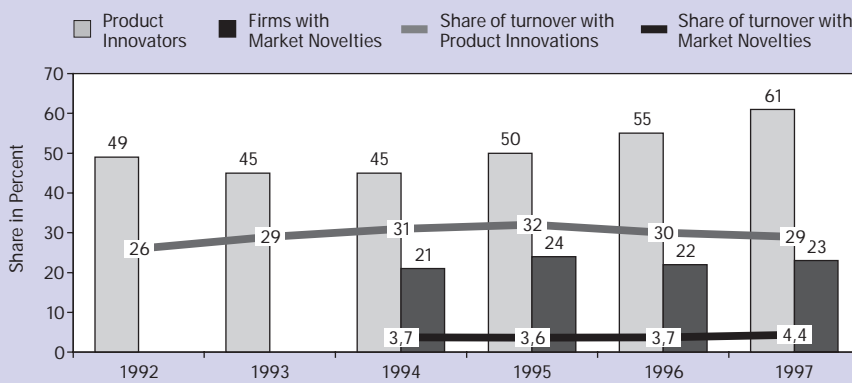
Innovation Indicators for Manufacturing and Mining - Small and Medium Sized Firms

	1992		1993		1994		1995		1996		1997	
	absolute	in %	absolute	in %	absolute	in %	absolute	in %	absolute	in %	absolute	in %
Firms	69,628	100	68,494	100	67,721	100	62,815	100	61,339	100	60,124	100
amongst those:												
– Innovators	41,139	59	35,239	51	32,804	48	34,443	55	36,423	59	38,949	65
amongst those:												
– Product Innovators	34,453	49	30,918	45	30,690	45	31,119	50	33,907	55	36,751	61
– Process Innovators	30,267	43	30,763	45	25,668	38	28,012	45	28,868	47	34,514	57
Employees (in 1.000)	3,823	100	3,637	100	3,565	100	3,423	100	3,340	100	3,265	100
amongst those:												
– Innovators	2,597	68	2,462	68	2,367	66	2,481	72	2,545	76	2,530	77
amongst those:												
– Product Innovators	2,261	59	2,176	60	2,241	63	2,273	66	2,340	70	2,394	73
– Process Innovators	1,922	50	2,119	58	1,978	55	2,051	60	2,054	61	2,278	70
Innovation Expenditures (in Bill. DM)	46	100	35	100	28	100	31	100	28	100	27	100
Share of Turnover in % under them	5.6		4.3		3.3		3.7		3.3		3.3	
– Current Innovation Expenditures	17	37	15	44	13	47	15	47	15	53	13	47
– Investment for Innovations	29	63	20	56	15	53	16	53	13	47	14	53
Share of Firms with (Information in %)												
– Market Novelties	–		–		21.1		23.7		21.5		23.1	
– Cost Reduction	–		31.2		23.4		27.2		33.6		39.2	
Share of Turnover with (Information in %)												
– Market Novelties	–		–		3.7		3.6		3.7		4.4	
– Product Innovations	26.1		28.9		30.9		32.3		30.3		29.3	
Share of reduced Costs (Information in %)	–		4.6		3.6		3.6		4.7		4.7	

Source: ZEW (1999): Mannheim Innovation Panel – Manufacturing and Mining.

Comments: Values for 1997 preliminary. Turnover share of product innovations for 1996 and 1997 only to a limited extent comparable to previous years. Market novelties prior to 1994 not surveyed, cost reductions not surveyed prior to 1993. All information projected on the population of SMEs in Germany.

Product Innovations of Small and Medium Sized Firms 1992 to 1998



Source: ZEW (1999): Mannheim Innovation Panel – Manufacturing and Mining.
 Comments: Values for 1997 preliminary. Turnover share of product innovation for 1996 and 1997 only to a limited extent comparable to previous years. Market novelties prior to 1994 not surveyed. All information projected on the population of SMEs in Germany.

been rising continuously since 1994, remaining only slightly under those of total manufacturing and mining. The rise is especially prominent in firms from sectors with high R&D-intensity. Here it comes to well over 50%. The share of cost reduction, however, still lies below the average of the manufacturing industry and has been stagnating in 1997 at 4.7%.

Innovation Activities in the new Länder

The amount of firms from manufacturing and mining in the new Länder is, at the present moment, not declining anymore. In contrast to the development for the whole of Germany, the number of firms rose in 1996 by around 4% to about 8 200 when compared to the preceding year. If the development of the firm numbers continues in the individual sectors and size classes, then for 1997 they amounted to an estimated

8 700. This corresponds to a share of a good 14% of all firms in the manufacturing industry in Germany. Of these firms, more than 98% are SMEs. The share of SMEs amongst the total number of firms is slightly higher in the new Länder than in the old ones.

Even though the number of firms is growing, the number of employees is slipping further. In 1996, the number of employees fell by a good 3% compared with the preceding year, to just about 550 000. This corresponds to a share of less than 10% of the overall employment in manufacturing and mining in Germany. Should the development of the firm number continue in individual sectors and size classes, employment per firm being constant, a small rise in the number of employees might be possible in the observed sector of the economy, to just about 560 000.

The share of innovative firms in the new Länder is still subject to relatively large fluctuations over time. In 1996 it

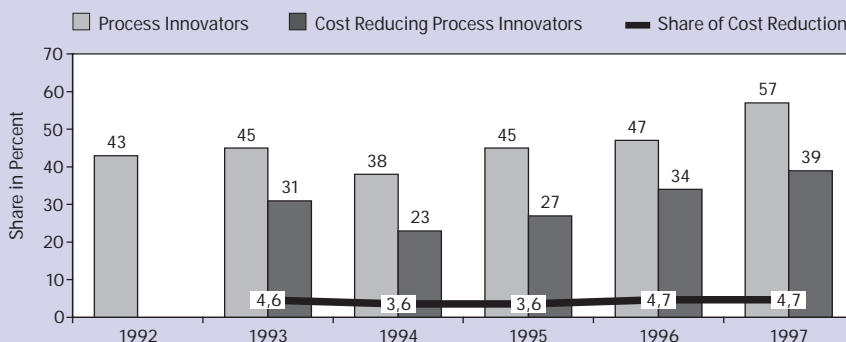
rose by a good 8% points to approximately 68% in comparison to the preceding year. For 1997, however, the innovators share has fallen to about 64%. This, though, can be attributed to overestimating the development of the total amount of firm numbers in the new Länder: the number of innovative firms has only slightly fallen by a little over 1% to a good 5 500 compared with the previous year. However, it can be presumed that the share of innovators will not lie above the one for the whole of Germany, as was the case in the past years.

Particularly, compared with the previous year, a decline of 6% points can be observed in the share of product innovating firms, to a little more than 60%. In absolute numbers this corresponds to a decline of 200 firms to less than 5 300. The shares as well as total numbers, however, still lie significantly over the values for 1994 and 1995. The share of product innovating firms roughly corresponds to that of the old Länder.

The share of process innovating firms in turn has visibly risen again. The share now lies at a good 55%, about 3% points higher than the past year. In absolute numbers, this corresponds to a rise of 500 to 600 firms to a good 4 800.

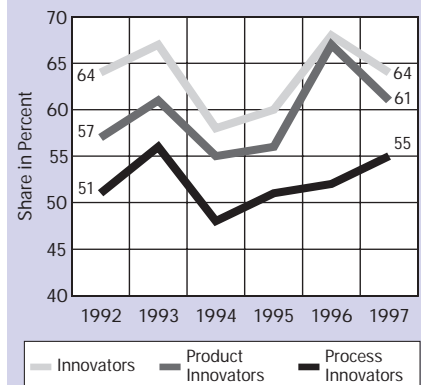
The share of employment of innovative firms continues to stand at about 75% as in the past year. This is a visibly smaller share than in the old Länder. In the new Länder still a quarter of the employees work in non-innovative firms. In particular, the employment share of product innovators lags behind that of the old Länder by just about 20% points at

Process Innovations of Small and Medium Sized Firms 1992 to 1997



Source: ZEW (1999): Mannheim Innovation Panel – Manufacturing and Mining.
 Comments: Values for 1997 preliminary. Cost reductions for 1992 not surveyed. All information projected on the population of SMEs in Germany.

Innovation Activity in the New Länder



Source: ZEW (1999): Mannheim Innovation Panel – Manufacturing and Mining.
 Comment: Values for 1997 preliminary. All information projected on the population in the New Länder in Germany.

around 66%, while the employment share of process innovators at around 64% corresponds to that of the old Länder.

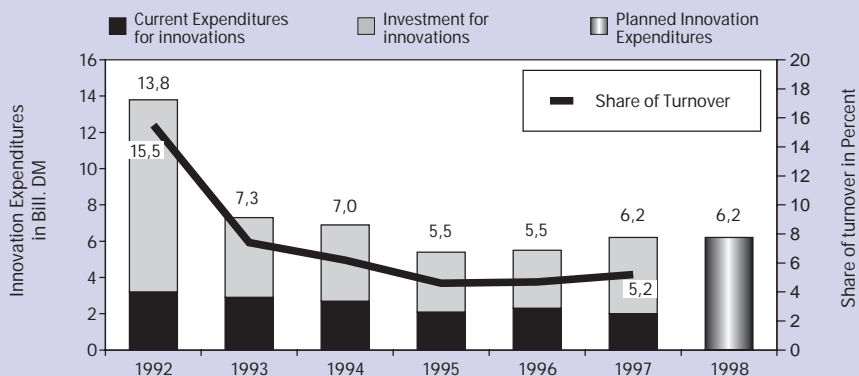
The innovation expenditures have in 1997 risen by a good 10% to about 6.2 bill. DM. As in the old Länder, this corresponds to a turnover share of innovati-

on expenditures of about 5.2%. This, however, should not divert from the fact that innovation expenditures in the new Länder comprise little more than a twentieth of the total innovation expenditures.

In contrast to the old Länder the rise in innovation expenditures can be attributed to an increase in investments. The invested innovation expenditures have risen by about 30% to 4.2 bill. DM in 1997, whereas current innovation expenditures have fallen by more than 10% to about 2.0 bill. DM. This goes hand in hand with the observed rise in process innovations, since the modernisation of production processes is accompanied by high investments in machines and plants.

The turnover share of product innovations developed better in 1997 than the

Innovation Expenditures in the New Länder



Source: ZEW (1999): Mannheim Innovation Panel – Manufacturing and Mining.

Comments: Values for 1997 preliminary. Values for 1998 are plans/expectations of firms. All information projected on the population in the New Länder in Germany.

Innovations Indicators for Manufacturing and Mining – New Länder

	1992		1993		1994		1995		1996		1997	
	absolute	in %	absolute	in %	absolute	in %	absolute	in %	absolute	in %	absolute	in %
Firms	6,819	100	7,711	100	8,506	100	7,897	100	8,235	100	8,721	100
amongst those:												
– Innovators	4,331	64	5,161	67	4,926	58	4,763	60	5,626	68	5,552	64
amongst those:												
– Product Innovators	3,889	57	4,728	61	4,698	55	4,406	56	5,478	67	5,279	61
– Process Innovators	3,498	51	4,356	56	4,104	48	3,991	51	4,243	52	4,817	55
Employees (in 1.000)	843	100	696	100	630	100	562	100	544	100	559	100
amongst those:												
– Innovators	684	81	498	72	463	73	399	71	416	76	422	75
amongst those												
– Product Innovators	604	72	437	63	404	64	316	56	342	63	367	66
– Process Innovators	514	61	411	59	377	60	286	51	271	50	355	64
Innovation Expenditures (in Bill. DM)	13.8	100	7.3	100	7.0	100	5.5	100	5.5	100	6.2	100
Share of Turnover in %	15.5		7.4		6.2		4.6		4.7		5.2	
under them:												
– Current Innovation Expenditures	3.2	23	2.9	40	2.7	39	2.1	39	2.3	42	2.0	32
– Investment for Innovations	10.6	77	4.4	60	4.2	61	3.3	61	3.2	58	4.2	68
Share of Firms with (Information in %)												
– Market Novelties	–		–		21.6		24.0		20.8		22.2	
– Cost Reduction	–		39.4		32.3		33.6		36.9		38.3	
Share of Turnover (Information in %)												
– Market Novelties	–		–		3.2		2.0		2.8		2.9	
– Product Innovations	38.0		37.1		35.4		30.9		2.4		38.5	
Share of reduced Costs (Information in %)												
	–		6.0		6.3		4.5		4.6		5.3	

Source: ZEW (1999): Mannheim Innovation Panel – Manufacturing and Mining.

Comments: Values for 1997 preliminary. Turnover share of product innovations for 1996 and 1997 only to a limited extent comparable to previous years. Market novelties prior to 1994 not surveyed, cost reductions not surveyed prior to 1993. All information projected on the population in the New Länder in Germany.

innovator shares. They have increased by more than 6% points to almost 39%, thereby for the first time since 1992 again reaching the all-German level. Indeed, in the new Länder remain less innovative firms, but they achieve a higher turnover share with product innovations.

In contrast to the share of product innovators, the share of firms with market novelties has risen slightly to a little more than 22% compared with the previous year. It lies a good 2% points below that of the old Länder.

The turnover shares with market novelties have only slightly increased. They now amount to just about 3%, less than half of the share of the old Länder. Altogether the innovation process is still characterised by imitations. Products really new to the market still do not play an important role.

New Länder

Firms from the new Länder include firms from former West Berlin. Due to the relatively low number of cases, statements made about larger firms (starting from 500 employees) and individual sectors are of great uncertainty. Besides that, the number of firms, employees and turnover are subject to relatively extensive fluctuations, which make it more difficult to recognise general tendencies.

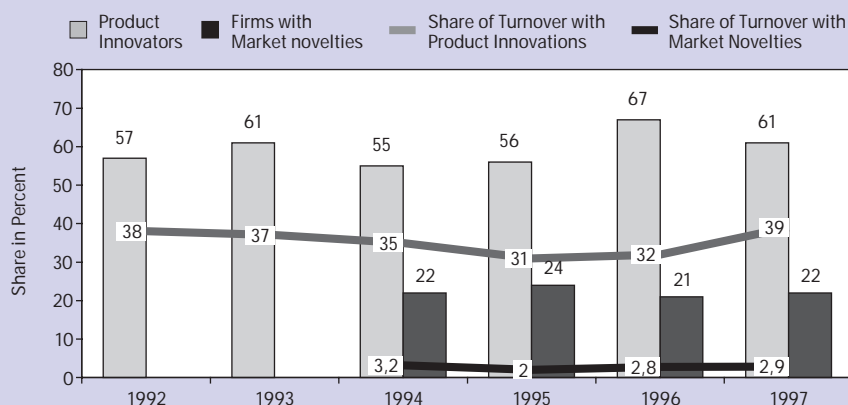
The share of firms with cost reducing process innovations, at a little more than 38%, for the first time stands below the share of the old Länder in 1997. Also, at 5.3%, the achieved cost reduction share lies almost 1.5% points lower than that of the old Länder. Against this background a relative rise in productivity compared to that of the old Länder cannot be diagnosed.

Conclusions for Innovation Policy

The innovation activities of manufacturing and mining in Germany can altogether come up with a good report. All major indicators point upwards:

- ▶ The share of innovative firms has, at 66% in 1997, reached a level it has not touched for many years. It is markedly rising by 6% points compared to 1996 alone.
- ▶ Despite the obviously dwindling number of firms in manufacturing and

Product Innovations in the New Länder 1992 to 1997



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mining, the number of innovative firms has also risen in absolute numbers.

- ▶ Employment in innovative firms has stabilised to a large extent. In the entire manufacturing and mining sector, though, it is still decreasing.
- ▶ The innovation expenditures have risen in 1997 by 5.8% and now amount to 108 bill. DM. This corresponds to a turnover share of 5.2%.
- ▶ The turnover share with product innovations has increased by 3% points to around 39%.
- ▶ The share of firms with market novelties has risen again slightly to a level of 24%. The turnover share with market novelties has risen by 2% points to just about 6%.
- ▶ The share of firms with cost-reducing process innovations is rising continuously. With a good 40% it reached more than 1.5 times the value of 1994. The cost reduction shares have been

rising continuously since 1993 and now amount to more than 6%.

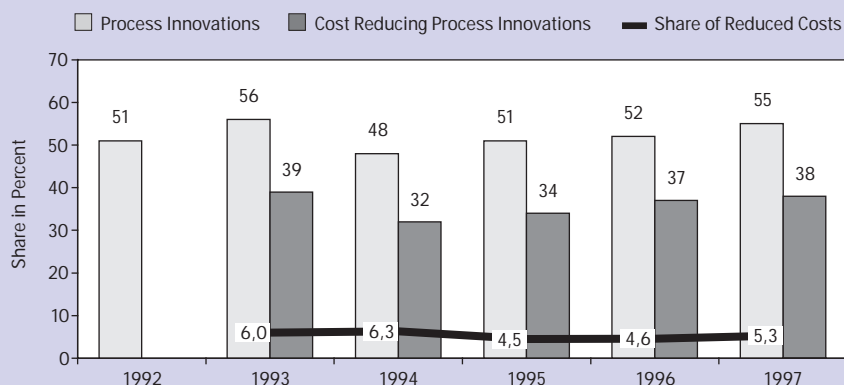
Despite these outcomes which are positive in all, there are three problem areas which quite distinctly emerge in German manufacturing and mining:

- ▶ Firms from less R&D-oriented industrial sectors,
- ▶ Medium-sized firms with 200 to 500 employees,
- ▶ Firms from the new Länder.

Innovations are standing out more and more as the decisive motor for securing employment in the manufacturing industry and mining. The employment is stable amongst innovative firms; among non-innovative firms it is falling heavily. The firm mortality is considerable among non-innovative firms.

Hence, the development of innovation activities and in this case stagnating innovation expenditures of firms from branches with low R&D-intensity, gives

Process Innovations in the New Länder 1992 to 1997



Source: ZEW (1999): Mannheim Innovation Panel – Manufacturing and Mining.

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cause for serious concerns. A total of 3 out of 5 employees work in these sectors, which quite obviously have difficulties in keeping up. One can assume that a further employment downsizing is occurring here. It is precisely in these sectors with low R&D-intensity, however, where an above-average number of people are employed who belong to the problem group of the labour market: lower qualified manpower. For this reason, innovation policy alone should not lose sight with these sectors.

Giving cause for concern are also the problems of the traditional medium-sized firms with 200-500 employees, which for decades have belonged to the pillars of the German economy. One can even detect a decline in the innovation expenditures within them.

Both groups that overlap naturally have one thing in common: there are problems in reaching them with instru-

ments of established innovation support, that is direct innovation support orientated towards individual technologies. An alternative would be represented by a premium-oriented, indirect innovation support, with which one may achieve much better stimulating effects.

An innovation advancement reaching far beyond the R&D-oriented support would be desirable, since particularly the problem groups of the less R&D-intensive economic sectors can profit only to a small degree from an R&D-advancement. With a broadly invested advancement of innovation activities the take-away-effects, which result from the declaration of non-R&D innovation activities as R&D activities, could be avoided. However, it is difficult to put a broader innovation support into practice.

The situation presents itself a little differently in the new Länder where innovation support are already marked by

an indirect promotion of R&D. But the same reason for an innovation support going beyond the promotion of R&D is also valid for the new Länder.

What becomes questionable for the new Länder is, in particular, the effect the simultaneous declining of product innovations and strongly rising process innovations might have, since securing or projecting of employment, respectively, is to be expected more from product innovations.

The modernisation of the production apparatus is far from being completed in the new Länder. The cost pressure, especially through rising labour costs and incidental labour expenses, will force firms into further rationalisations. Negative effects in the labour market can only be avoided if the renewal of production plants is accompanied by a corresponding renewal of the product range.

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On behalf of the federal ministry of education and research (Bundesministerium für Bildung und Forschung, bmb+f), since 1993 the ZEW in collaboration with infas has been conducting annual surveys on innovation behaviour of the German manufacturing industry and mining.

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