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Research Report

Innovation in Germany: Results of the German Innovation Survey 2005

ZEW Innovation Survey - Mannheim Innovation Panel, Key Figures Reports

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Suggested Citation: Aschhoff, Birgit et al. (2006) : Innovation in Germany: Results of the German Innovation Survey 2005, ZEW Innovation Survey - Mannheim Innovation Panel, Key Figures Reports, Zentrum für Europäische Wirtschaftsforschung (ZEW), Mannheim

This Version is available at:
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Innovation in Germany

Results of the German Innovation Survey 2005

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Mannheim, March 2006

Innovation in Germany

Results of the German Innovation Survey 2005

No Clear Overall Trend in Innovation

The survey results paint a disparate picture of the innovative activities undertaken by German firms in 2004:

- Expenditure on innovation rose strongly, by 2%. Alongside large firms, small and medium-sized enterprises (SMEs) also resumed increased spending on innovation projects. Firms plan to further increase their innovation budgets by 1 and 2% in 2005 and 2006, respectively.
- In contrast, the proportion of all firms that implemented successful innovations (innovation rate) did not increase in 2004. Nevertheless, the proportion of firms engaged in innovation activities (innovative firms) increased, as a larger number of firms took up innovation activities for the first time. These have not yet led to the introduction of new products onto the market or the implementation of new processes. The proportion of firms involved in innovation is expected to remain stable in 2005 and 2006.
- The share of revenue from new products also remained constant on average across all sectors. There was little overall change in unit cost reductions achieved through process innovations.
- In manufacturing, most of the innovation indicators for 2004 point to an upwards trend, with increases in innovation expenditure, in innovation participation and in successful innovation.

A number of different developments are behind these figures. Firms with a continuous involvement with innovation processes and whose competitiveness depends heavily on bringing out new products and innovative processes used the improved worldwide economic outlook in 2004 as an opportunity to expand their innovation efforts. This is particularly true of manufacturing firms.

SMEs that had not been engaged in innovation seem to have found sufficient incentives in current conditions to start up innovation activities. Manufacturing SMEs increasingly got back into the business of innovating in 2004. In service sectors, on the other hand, the number of SMEs that abandoned innovation activities exceeded the number who took them up. Companies indicated in their responses that the main factor behind their giving up innovation activities was a lack of demand for innovations, while funding problems, regulations and lengthy administrative processes were also sources of discouragement.

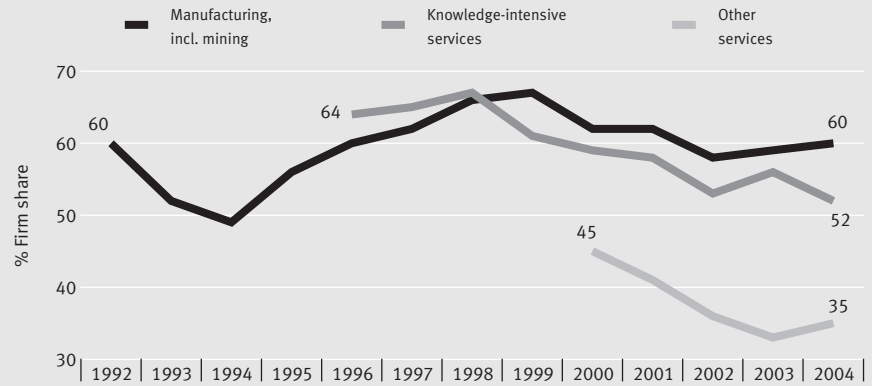
Innovation Rate Essentially Unchanged

For the economic sectors covered (see box on the right) the innovation rate for 2004 remained unchanged from the previous year, at around 48%. Nonetheless, the slight upwards trend in the proportion of successfully innovative firms continued. 60% of manufacturing firms successfully brought new products to the market or introduced new processes. The resultant innovation rate is two percentage points higher than that of 2002.

In knowledge-intensive services, however, the figure dropped from 56% to 52%. Technical service (engineering activities, technical consultancy, technical testing and analysis) and consultancy firms played a decisive part in this development; at the same time, the innovation rate actually rose in the software sector, as well as banking and insurance. In the category of other services (wholesale trade, transport and postal services, firm-related services and waste disposal) the share of successful innovators rose for the first time in three years, from 33% to 35%.

The 2004 innovation rate in all three sector groupings remains considerably below the level reached at the end of the 1990s. The slight increases for the manufacturing industry and for other services are by no means sufficient to near the peak values attained in 1999 (66% for the manufacturing industry) and in 2000 (45% for other services). For knowledge-intensive services, the 2004 innovation rate of 52% is

Innovator share, 1992-2004



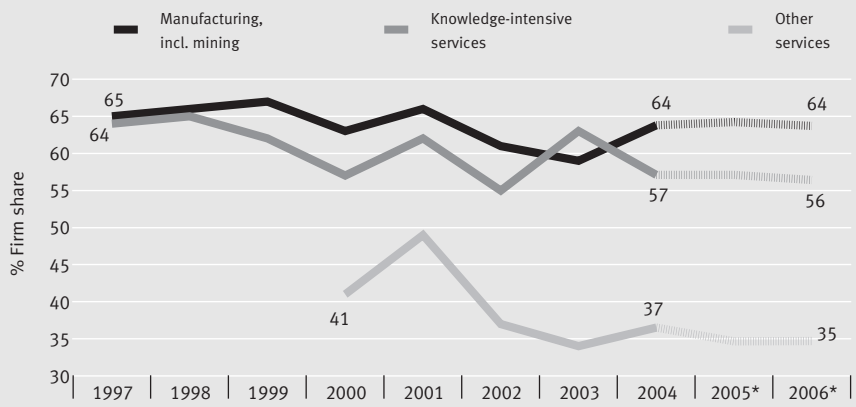
Source: ZEW (2005): Mannheim Innovation Panel.
Notes: Innovator share: Innovators as a percentage of all firm. Figures for 2003 und 2004 are tentative and for the service sectors are only available from 1996. Figures for other services from 2000 on are not comparable with those from previous years and are only shown for 2000. All figures are projected for the total firm population in Germany.

New Sector Division in Services

Service firms are grouped differently in this report compared to the previous year. Service sectors are now grouped into **knowledge-intensive services** (banking and insurance, data processing and telecommunications, technical services – for example engineering offices – R&D-related services, laboratories, consultancy, advertising) and **other services** (wholesale trade, transportation, postal services, cleaning, security, provision of staff, waste disposal). This new sector division resulted in a change in the report's coverage – from the 2005 survey onwards, two service sectors, namely retail trade and property rental, are no longer included.

The definition of the **manufacturing** sector grouping (including mining and recycling) remains unchanged.

Innovative firms, 1997-2006



Source: ZEW (2005): Mannheim Innovation Panel.
Notes: Innovative firms: firms with positive innovation expenditures in certain year as a percentage of all firms. Figures for 2003 und 2004 are tentative. Data for 2005 and 2006 are based on projected firm figures and expectations at mid-2004. Figures for other services from 2000 on are not comparable with those from previous years and are only shown for 2000 and later. All figures are projected for the total population in Germany.

the lowest since the innovation survey began coverage of this sector grouping.

2005/06: Participation In Innovation Steady

In 2004, 64% of firms in the manufacturing sector were innovative (i.e. they carried through innovation projects). This share is higher than that of successful innovators (the innovation rate), as some of the innovative firms had not yet successfully progressed to the stage of introducing a new product onto the market or implementing a new process, or indeed had abandoned innovation plans. The share of innovative manufacturing showed a clear increase compared to 2003. This suggests that many firms took advantage of the improved economic climate to launch innovation projects. According to the information firms gave about their plans for 2005 and 2006, the proportion of innovative manufacturing firms should remain stable in these two years, at 64%. It should, however, be noted that information about firms' plans was submitted in the spring and early summer of 2005. At this time, business cycle predictions for 2006 were not yet available. Experience shows that when expectations become more positive, the willingness to invest in innovation projects also increases.

The proportion of innovative firms in the knowledge-intensive industry sector grouping decreased markedly in 2004, to 57% (as compared to 63% in 2003). In 2005 and 2006, no renewed increase is expected. The picture for the category 'other services' is similar: with 37% of companies evidencing innovative activities, the 2004 figure is admittedly slightly above that of 2003, but nonetheless far below the values attained in 2000 and 2001. This share is expected to fall further to 35% in 2005 and remain there in 2006.

Fewer Process Innovators in Services

The slight rise in the innovation rate can be put down to minor increases in the shares of both product and process innovators, which were of roughly equal importance. In 2004, the group of product innovators accounted for 48% of manufacturers, while 36% brought in process innovations. Both of these figures represent an increase on the previous year of slightly less than one percentage point. Around 24% of manufacturing firms successfully introduced both new products and new processes.

In the service sectors, the proportion of process innovators decreased markedly between 2003 and 2004. The 2004 process innovation rate in knowledge-intensive services was down to 30% (cf. 38% in 2003) and the rate for other services fell from over 24% to under 22%. One possible explanation for this phenomenon is that many firms had already reorganised their processes to improve their efficiency in the period 2000 to 2003, using computer software and hardware, leaving less room for further process rationalisations.

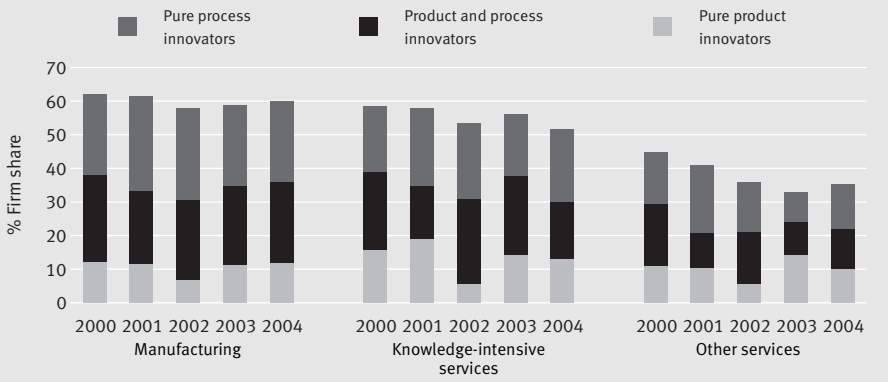
Innovators/Innovations

Innovators are firms that successfully introduced at least one innovation in the previous three-year period (i.e. in the case of 2003, a firm introduced at least one innovation between 2001 and 2003). Whether or not another firm has already implemented the same innovation is not considered; the assessment of the innovation from the perspective of the firm in question is integral.

Product innovations are new or significantly improved products and/or services with respect to technological characteristics or intended uses brought onto the market by a firm. **Process innovations** are new or significantly improved production, delivery or distribution methods, including methods to provide services, introduced by a firm. This includes significant changes in techniques, equipment and/or software.

Innovative firms are firms that engage in any kind of innovation activities in the observed year, i.e. that allocated funds to innovation projects, regardless of whether the projects were completed successfully. The definitions correspond to those of Eurostat and the OECD, which are established in the Oslo Manual.

Product and process innovators, 2000-2004



Source: ZEW (2005): Mannheim Innovation Panel.
Notes: Figures for 2003 and 2004 are tentative. All figures are projected for the total firm population in Germany.

In other services, there was a clear increase in firms that successfully introduced new products, from 19% to 25%. This more than compensated for the drop in the process innovation rate. In knowledge-intensive services, however, even the share of product innovators decreased (from 42% in 2003 to 39% in 2004). The share of firms that introduced both new products and new processes was particularly hard hit, falling to 17% in 2004 (compared to 24% in 2003).

Only Manufacturers Increase Innovation Expenditure

Expenditure on innovation within the German economy as a whole (as a total of the branches distinguished in this report) stood at €100bn in 2004, a nominal increase of 2% on the previous year. This continues the trend that has been observed for many years, though at a lower pace than 2003 (+3.5%). Firms plan a further increase for 2005, although it will be smaller, at 1%. In 2006, too, the trend should continue, with firms estimating a minor positive increase of 2%. It should be noted, though, that firm's predictions in previous years have been conservative, lying under the values eventually achieved.

The decisive factor behind the positive development lies in the manufacturing industry, which was responsible for 75% of total innovation expenditure, across all of the sectors covered. These firms' expenditures on innovation projects rose again in 2004, hitting a new peak value of just under €75bn (+3.6 %). This compares to only €60bn in the year 2000. Three sectors are responsible for the majority of this €3bn increase from 2003 to 2004: transport equipment industry (+€1.7bn), electronics industry (+€0.5bn) and mechanical engineering (+€0.65bn).

For the coming years, too, manufacturers are working on the assumption that innovation expenditure will continue to grow, albeit at a considerably lower rate. In spring/summer 2005, manufacturing firms' predicted an increase of more than 2% for 2005, to almost €77bn. Their prognosis for 2006 points to innovation expenditure of €79bn (+3%).

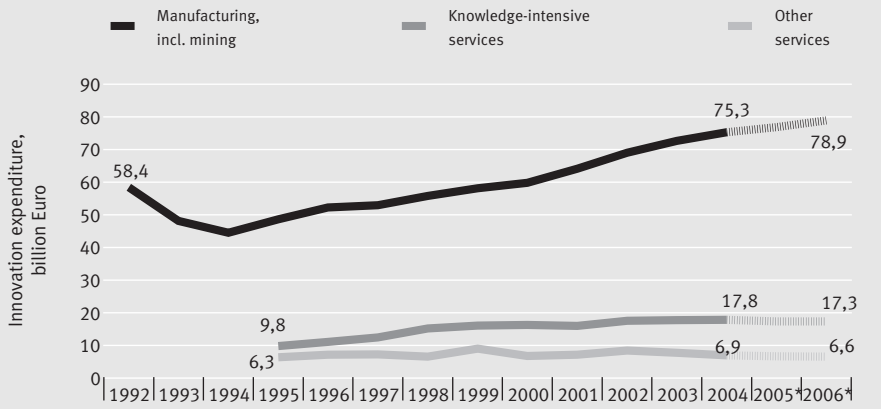
In contrast, the level of innovation expenditure in knowledge-intensive services barely changed. It stood at €17.8bn in 2004, the previous years figure having been €17.7bn. For 2005, the knowledge-intensive service firms predict spending will be down to €17.3bn (-3%). The same level of expenditure is also expected in 2006. Within this overall development, different sectors are actually experiencing quite different trends. On the one hand, software and telecommunications firms clearly expanded their innovation expenditure in 2004, by €0.5bn (+7%), and a slight increase was also to be seen for the banking/insurance industry (+1%). On the other hand, the technical related services sector cut their expenditure on innovation by 6% and consulting/marketing firms slashed theirs by almost 11%.

In other services innovation expenditure decreased for the second year running. Its 2004 value of €6.9bn roughly equals those for 2000 and 2001, following a peak at €8.4bn in 2002. Firms in this sector grouping reckon with a further decrease for 2005 and 2006, to around €6.5bn. The transport sector has an overriding influence on the level of innovation expenditure in this group, particularly through investments in new infrastructure and vehicles. Reluctance to invest, which has been increasing since 2000, has also led to reduced spending on innovation.

Innovation Expenditure

Innovation expenditure refers to spending on ongoing, completed and discontinued innovation projects in a one-year period, encompassing both **current** (personnel and material, etc.) and **investment** expenses. R&D expenditure and innovation- related spending on machinery, equipment and material, external knowledge (e.g. software, patents, licenses), advanced employee training, market introduction, product design, conception of service and other preparations for production and distribution of innovations are counted among these expenses.

Innovation expenditures, 1992-2006



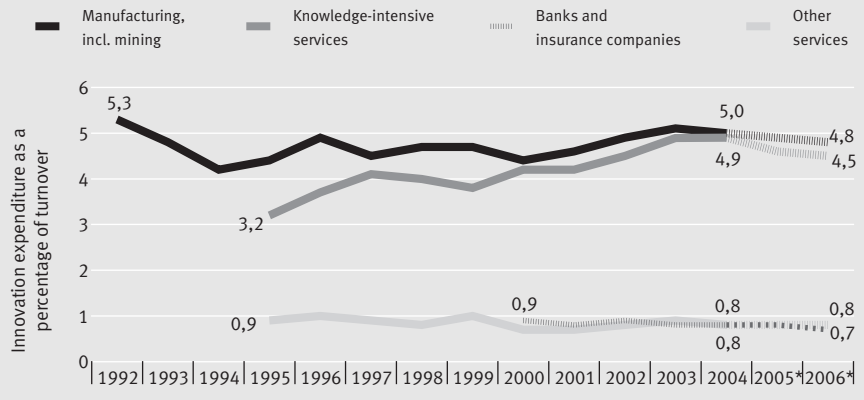
Source: ZEW (2005): Mannheim Innovation Panel.
Notes: Figures for 2003 and 2004 are tentative. Figures for the service sectors are only available for 1995 and later. Data for 2005 and 2006 are based on projected firm figures and expectations at mid-2005. Figures for other services from 2000 on are only partially comparable with those from previous years. All figures are projected for the total firm population in Germany.

No Further Increase in Innovation Intensity

The strong increase in innovation expenditure in manufacturing since 2001 along with restrained revenue growth in the years from 2001 to 2003 led to a considerable jump in innovation intensity; that is, the ratio between the total volume of innovation expenditure and the total revenue of all firms (innovators and non-innovators). Innovation intensity thus reached a value of 5.1% in 2003. In spite of large increases in innovation expenditure on the part of manufacturing firms, this value could not be maintained in 2004, because revenues increased at a higher pace. A further fall in innovation intensity can be expected for the manufacturing industry in 2005 and 2006, as firms plan only modest increases in innovation expenditure (+2-3% per year) but expect macroeconomic conditions to develop favourably, enabling nominal turnover to be expanded by 5-6% per year.

In knowledge-intensive services, too, innovation intensity grew more or less continuously (when banking/insurance is excluded from the calculation) from 1995, peaking at 5% in 2003. As innovation expenditure levelled off in 2004 while turnover was resurgent, the value of this indicator fell slightly to 4.9%. Given companies' reduced

Innovation intensity, 1992-2006



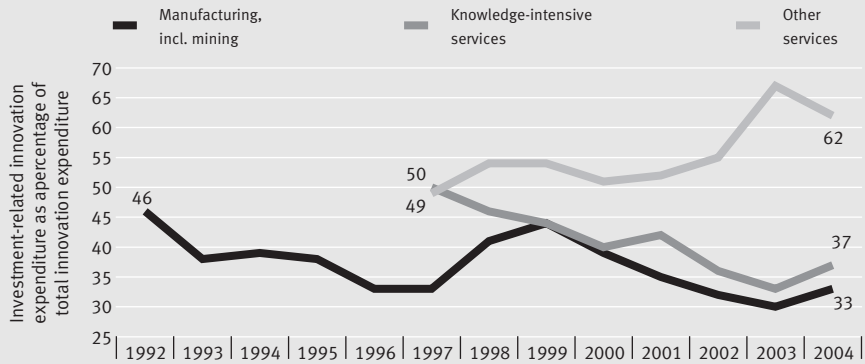
Source: ZEW (2005): Mannheim Innovation Panel.
** excluding banks/insurance firms.
Notes: Total innovation expenditures as percentage of total revenues from all firms. Figures for 2003 and 2004 are tentative. * Data for 2005 and 2006 are estimated based on projected firm figures and estimations of revenue development in three sectors. Service sector figures are not surveyed before 1995. Figures for banks and insurance are not comparable before 2000. All figures are projected for the total firm population in Germany.

innovation expenditures and increasing turnovers, innovation intensity can be expected to drop further in 2005 and 2006, although not below its values for 2000 and 2001. In other services and banking/insurance, innovation intensity oscillated between 0.7% and 0.9%, without showing any clear trend in either an upward or downward direction. In 2005 and 2006 it is expected to fall slightly for both of these sectors.

More Investment in Innovation

The sole cause of the rise in innovation expenditure in the German economy in 2004 is increased investment in innovation projects. Between 2003 and 2004, investment expenses went up by €2.4bn to €35.5bn, while current expenses (in particular personnel, materials and services from third parties) declined by 1% to €64.5bn. A particularly sharp increase (+12%) occurred in investments on innovation projects in manufacturing, which returned to their 1999 level at €24.5bn. As a proportion of all innovation expenditure, this represents the first rise since 1999, from 30% to 33%. Nevertheless, seen over a number of years this is still below average. In knowledge-intensive services, the share rose from 33% to 37%, with expenses for innovation investments up by 13% from 2003 to 2004. Yet even in this area, the level of investment in innovation projects lies well below that of the late 1990s and the start of the new century, both in absolute terms and as a proportion of total innovation expenditure. In other services, seen as a share of all innovation expenditure, it fell from the very high 2003 value down to 62%, which is nevertheless considerably higher than the level for the period from 1997 to 2003. This change is due to higher investment in new products by firms in the transport sector, but also to lower spending on bringing new services to the market.

Investment share in total innovation expenditures, 1992-2004



Source: ZEW (2005): Mannheim Innovation Panel.
Notes: Figures for 2003 and 2004 are tentative. Figures for other services from 2000 on are only partially comparable with those from previous years. Service sector figures are not surveyed before 1997. All figures are projected for the total firm population (firms with 5 or more employees) in Germany.

This development reflects the overall increase in investments in Germany in 2004. There was a nominal rise of 2.2% in gross fixed investment in plants and equipment, while the figure for the manufacturing industry stood at 2.7%. The fact that investment in innovation rose proportionally more than gross total investment shows a trend towards channelling investment into innovation projects.

The calculated proportion of total gross investment that went to innovation rose from 37% in 2003 to 41% in 2004 in the manufacturing industry. As a caveat to this calculation, it should be noted that the German Federal Statistical Office's definition of investment differs from that used in the innovation survey, so that only a limited comparison is possible. In particular, investment in innovation according to the survey definition also includes investment in intangible assets such as patent and trademark rights. Nonetheless, we can interpret the increase as a sign that numerous firms are again prepared to build production capacities for new products. It is also linked to the increased efforts to cut costs and improve efficiency, for example by introducing new processes. Such process innovations very often involve investment in fixed capital

Novelty in Short Supply Among Product Innovations

The share of firms who successfully brought new products onto the market in 2004 remained unchanged from the previous year at 48%. In knowledge-intensive services, the share of product innovators sank in parallel with the overall share of innovators (from 42% to 39%). In other services, however, there was a noticeable rise in the value of this indicator (from 19% to 25%).

22% of manufacturing firms (2003: 23%) managed to bring out original innovations, i.e. products that had never before been offered on the market ("market novelties"). Thus, in 2004, 45% of all product innovators in manufacturing (also) successfully introduced market novelties. This share has clearly dropped in the last two years, having stood at 55% in 2002 and 49% in 2003. In knowledge-intensive services, around 15% of firms introduced market novelties, as indeed was the case in 2003. This represents a 40% success rate in terms of product innovators managing to get original innovati-

Market novelties, product imitations, product-range novelties

Market novelties („new-to-the-market products“) are new or significantly improved products and/or services that have been introduced by the firm onto the market prior to any competitor. **Product imitations** are new or significantly improved products and/or services introduced by a firm onto its market which were already offered by competitors at the time of introduction. The relevant market is defined from the firm's own perspective.

Product-range novelties are new or significantly improved products and/or services that have no predecessors in the innovating firms. Such innovations thus enlarge the product range of a firm and allow to address customer demand not covered by a firm's products and services so far. Information on product-range novelties is registered in the innovation survey since 2002.

ons onto the market. The 2002 rate, in comparison, was 42%. Market novelties are comparatively rare in other services; accordingly, of these firms, just over 6% were original product innovators in 2004. They represented a quarter of all product innovators in the sector.

The declining proportion of product innovators that successfully introduce market novelties makes for an increase in the proportion of firms that simply bring out product imitations. This may indicate that innovating firms are currently attempting to take fewer market risks and are foregoing more risky, albeit growth and profit-intensive, "radical" innovations.

A second type of novelty involves the position that a product occupies within a company's range. New products that do not replace a previously-existing product are categorised as "product range novelties". As a rule, such products broaden a firm's customer base and help it to access new sources of demand. Product range novelties can be either original product innovations or product imitations. The proportion of firms with product range novelties stayed constant in the manufacturing sector in 2004, at 25%. This means that every other product innovator expanded its range with new products. In knowledge-intensive services, on the other hand, the proportion of firms with product-range novelties fell from 27% (2003) to 22% (2004). Whereas in 2003 two-thirds of product innovators in this sector introduced new services which did not replace existing services, this proportion had sunk to 55% by 2004. In other services, this group of innovators encompassed a quarter of all firms. Seen as a proportion of all product innovators, the resultant figure of 44% represented no change from the previous year.

Fewer Process Innovators Reduce Costs and Improve Quality

The share of process innovators in manufacturing increased slightly in 2004, to 36% (2003: 35 %). In knowledge-intensive services, on the other hand, the share decreased sharply from 38% to 30% and in other services, too, fewer firms successfully introduced new internal processes (22% as compared to 24% in 2003).

The proportion of process innovators who were able both to reduce unit costs and improve the quality of the goods and services produced with the help of new processes sank in all three sector groupings. One cause was that this generally more complex process innovation activity was shelved in favour of new processes aimed exclusively at improving quality. In addition to this, an increased proportion of firms managed neither to sink costs nor to increase quality with their innovations. In a large number of these cases the innovations in question were new processes necessary for the manufacture of new products.

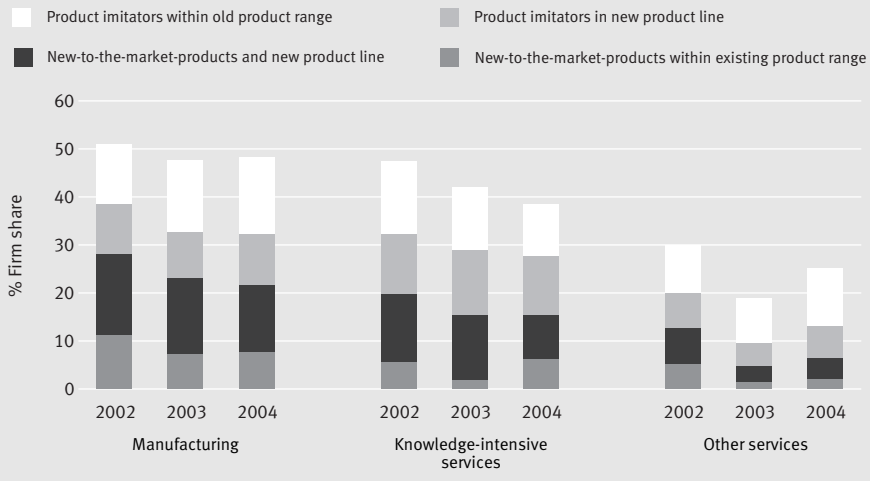
The share of firms who introduced cost-saving process innovations fell from 25% (2003) to 20% (2004) in manufacturing, from 19% to 11% in knowledge-intensive services and from 12% to 8% in other services. In association with this, the proportion of the process innovators that carried out rationalisation innovations ("rationalisation innovators") dropped considerably in all three sector groupings (manufacturing: from 71% in 2003 to 55% in 2004, knowledge-intensive services: from 50% to 36%, other services from 47% to 35%). At the same time, the proportion of firms that introduced quality-enhancing process innovations also decreased. Measured as a proportion of all firms in each sector, it stood at 24% in manufacturing (2003: 27%), 21% in knowledge-intensive services (2003: 29%) and 14% in other services (2003: 16%). This meant that around two-thirds of process innovators improved the quality of their products

Cost savings and improvements in quality

Cost saving process innovations („rationalisation innovations“) are new or significantly improved production, delivery or distribution methods that lead to a reduction in the average unit costs of production or service delivery. They are a mean to increase a firm's price competition.

Quality improving process innovations are new or significantly improved production, delivery or distribution methods that increase the quality of a product or service. They are often linked to product innovations. Improved quality typically enhances a firm's sales opportunities. Information on quality improving process innovations is registered in the innovation survey since 2002.

Cost reduction and quality improvement through process innovation, 2002-2004



Source: ZEW (2005): Mannheim Innovation Panel.
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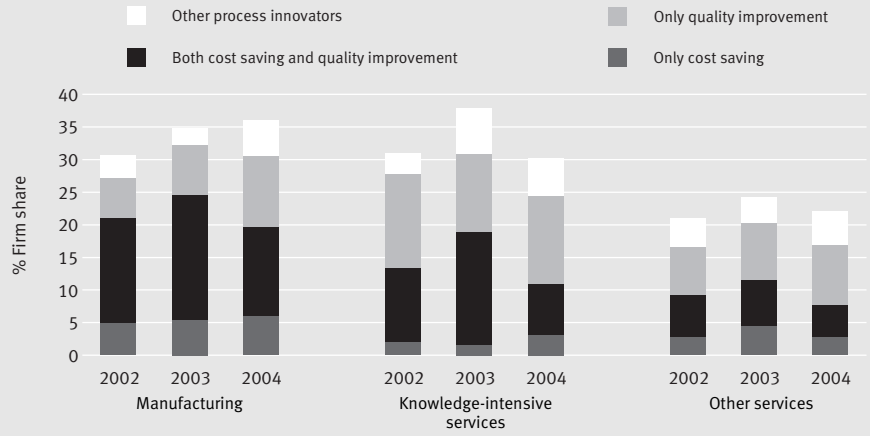
Revenue shares from product innovation, 2000-2004



Source: ZEW (2005): Mannheim Innovation Panel.
Notes: Figures for 2003 and 2004 are tentative. All figures are projected for the total firm population in Germany.

thanks to new processes, compared to three-quarters in 2003.

This result suggests that process innovators are focussing more strongly on definite targets. The fact that the proportion of process innovators who managed to meet both cost-cutting and quality targets fell, while the proportion of those who managed neither rose, can also be put down to delays in the effectiveness of process innovations. So firms that engaged in process innovation in 2004 for the first time after a long period of inactivity are possibly yet to realise the results they are aiming for. As far as cutting unit costs is concerned, it should be noted that the prices of energy, raw materials and preliminary products rose in many sectors, which could have cancelled out the effect of any cost savings made thanks to innovations.

From a long-term perspective, we can see that the share of process innovators who successfully cut costs reached its lowest ever value in all three sectors in 2004. In the latter half of the 90s, over 30% of industrial firms and over 20% of knowledge-intensive service providers successfully introduced cost-cutting innovations – the current figures stand some 10 percentage points below this. In other services, rationalisation innovations were only half as prolific in 2004 as in 1999.

A similar downward trend over several years has been experienced for the proportion of original product innovators. The 2004 figure of 22% corresponds to a level last seen in the mid-nineties, whereas around 30% of firms introduced market novelties in each of the years between 1998 and 2002. In knowledge-intensive services, only 15% of firms successfully brought out market novelties in 2004, although the figure had stayed between 21% and 25% from 1998 to 2000. In other services, too, the corresponding share of 6% is the second-lowest since 1998.

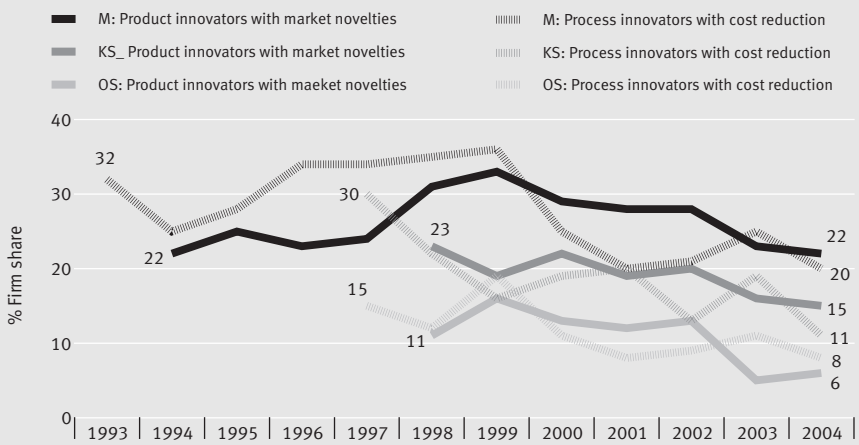
Share of Turnover from Market Novelties Up in Services

The direct economic success of innovation activities can be measured via the share of turnover that is due to product innovations and the proportional reduction in unit costs due to process innovations. It is important to be aware that a fair amount of time may pass between the introduction of an innovation and any noticeable success resulting from it. As such, an increase or decrease in the number of successful innovators need not lead directly to a corresponding change in economic success from innovation activities. Besides, the quantitative measurement of innovation success is strongly influenced by values recorded by large firms, while the numerical share of firms who successfully innovated is determined by SMEs.

For product innovations, at least, a parallel of this sort between the two variables can be seen. The slightly increased share of product innovators was accompanied by a slightly higher share of turnover from product novelties. The latter climbed by one percentage point, to 26.5% in 2004. In knowledge-intensive services, on the other hand, the share of turnover resulting from new products is showing a downward trend (having fallen from 25% to 20% excepting the financial sector – for banks and insurance companies the share fell from 11% to 9%). This mirrors the development of the proportion of product innovators. The opposite situation is to be found for other services, where a higher share of product innovators is reflected in a slightly higher share of turnover from product novelties.

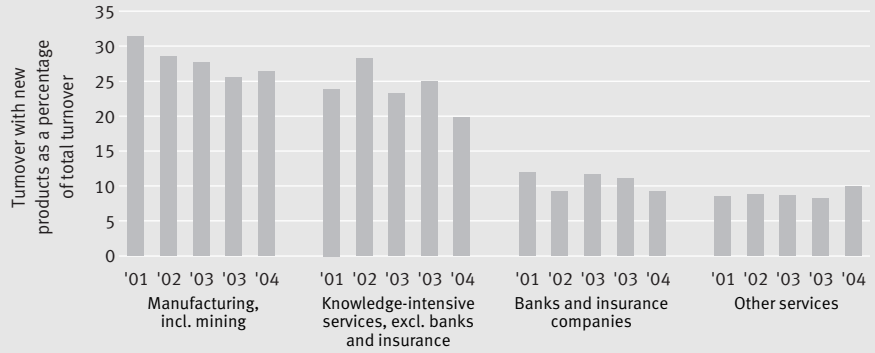
Although the share of original product innovators has sunk in all three sectors, service providers were at least able to increase their success from innovation. The share of turnover related to market novelties rose in both knowledge-intensive services and other services. The greatest increase was in knowledge-intensive services excluding banks and insurance companies (because of their high turnover, these would have dominated the overall picture for the sector). The share of turnover from market novelties in these industries rose from 6.6% in 2003 to 7.5% in 2004, thus regaining its level

Market novelties and cost saving process innovations, 1993-2004



Source: ZEW (2005): Mannheim Innovation Panel.
Notes: Figures for 2003 and 2004 are tentative. Figures for other services (OS) from 2000 on are only partially comparable with those from previous years. Market novelties first surveyed in manufacturing (M) in 1994; in knowledge-intensive services (KS) and other services in 1998. Cost saving process innovations first surveyed in the service sectors in 1997. All figures are projected for the total firm population in Germany.

Revenue shares from product innovation, 2000-2004



Source: ZEW (2005): Mannheim Innovation Panel.
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from the years 1999 and 2000. This is nonetheless lower than the peak values of 2001 and 2002, when many original services that were introduced during the New Economy Boom still counted as new and had high turnovers.

In manufacturing, on the other hand, the share of turnover from market novelties fell for the fifth year running, although at 6.5% it is still higher than in the mid-nineties. From 1998 to 2000, however, manufacturing firms achieved more than 8% of their turnover with original market novelties.

Process Innovations in Manufacturing Increase Cost Savings

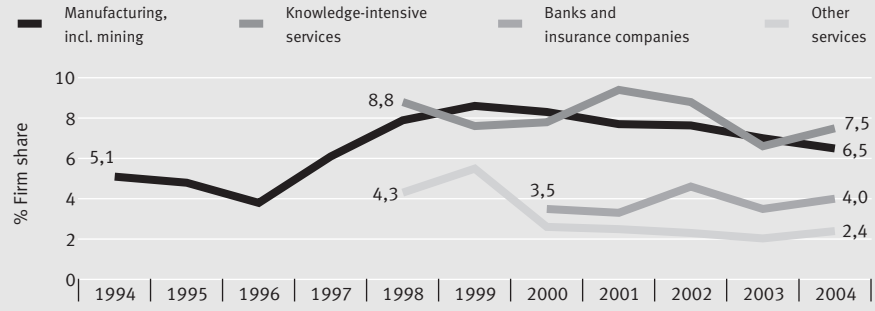
The development of unit cost savings due to process innovations in 2004 depended on the sector. The extent of successful rationalisation increased in manufacturing, even though a lower proportion of firms successfully introduced cost-cutting process innovations. The average unit cost saving through new processes across all firms in the sector in 2004 was 5.6%, compared to only 4.5% in 2003. This indicates that it was mainly large firms that successfully carried out rationalisation innovations. The corresponding figures also increased in banking and insurance, as well as in other services.

Conversely, knowledge-intensive services (excluding banks and insurance companies), cost savings achieved through process innovations fell for the third year running, now standing at 3.3%. This is the lowest proportional cut in unit costs for this sector since 1997 and amounts to less than half of the peak value (of just under 7%) achieved in the year 2000. One possible explanation for the reduced levels of successful rationalisation is that the potential for savings through the introduction of new communications and information technologies may have been exhausted. These new technologies had been a central driving force behind process innovations in the preceding years. When banks and insurance companies are excepted, the sector of knowledge-intensive industries is dominated by small companies. It is difficult for these companies to keep making efficiency gains with the help of such technologies.

There are two further measurements for the success of innovation activities for which values are only available for the past three years, as no data on these points was collected previously. The proportion of turnover from product-range novelties dropped in all sector groupings in 2004. The biggest drops were recorded in the group of knowledge-intensive services excluding banking and insurance. In 2003, firms from this sector made a good 7% of their turnover with services that had been newly introduced in the previous three years (and were not replacements for services the companies already offered). This fell to 4% in 2004. The same indicator for manufacturing decreased for the second successive year, a development parallel to that of the proportion of turnover from market novelties.

The quantitative effect of quality-improving innovations, as measured by the resultant increase in turnover, has remained constant for the last three years in manufacturing, knowledge-intensive services (excluding banking and insurance) and other services. The 2004 figure stands at 4% in manufacturing, 4.7% in knowledge-intensive services and 3% in other industries. The only clear drop came from banking and insurance, where the increase in turnover fell from 6% (in 2002) to only 3.5%. While the

Revenue shares from market novelties, 1994-2004



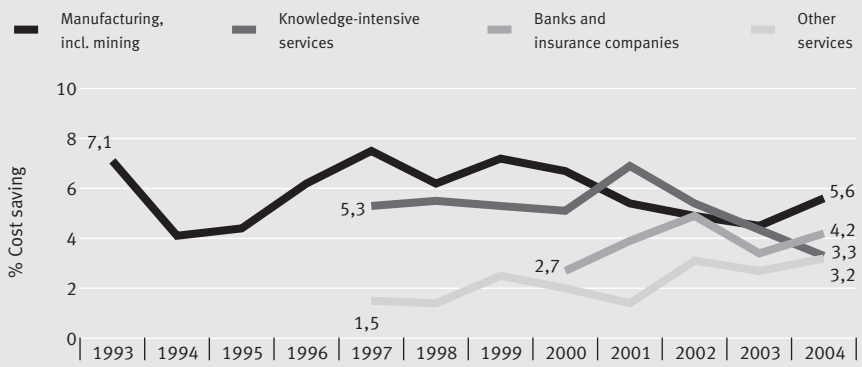
Source: ZEW (2005): Mannheim Innovation Panel.
Notes: Figures for 2003 and 2004 are tentative. Figures for other services (OS) from 2000 on are only partially comparable with those from previous years. Service sector figures are not surveyed before 1998. * Knowledge-intensive services do not include banks and insurance companies. All figures are projected for the total firm population in Germany.

Indicators of innovation success

Revenue shares from product innovations refers to revenue from the year in question that has been acquired with new or markedly improved products/services introduced in the previous three-year period. **Revenue shares from market novelties** and **product-range novelties** refer to revenue from the year in question acquired thanks to market novelties and product-range novelties released in the previous three-year period. The difference between revenue shares from product innovations and those from market novelties equals the revenue shares from product imitations.

The share of unit costs reduced through process innovations refers to costs from the previous year that were reduced through process innovations from the previous three-year period. **Increase in revenue due to quality improvements** measures the increase in revenue compared to the previous year that can be put down to quality improvements that were realised thanks to process innovations introduced in the previous three years.

Cost saving through process innovations, 1993-2004



Source: ZEW (2005): Mannheim Innovation Panel.
Notes: Figures for 2003 and 2004 are tentative. Figures for other services from 2000 on are only partially comparable with those from previous years. Service sector values are not surveyed before 1997. * Knowledge-intensive services do not include banks and insurance companies. All figures are projected for the total firm population in Germany.

manufacturing sector's increase in turnover from quality improvements was below the total increase in turnover in 2004, the opposite was true for the service sectors. Here, the rate of turnover growth from quality improvements was higher than that of overall turnover growth.

R&D Slipping Slightly

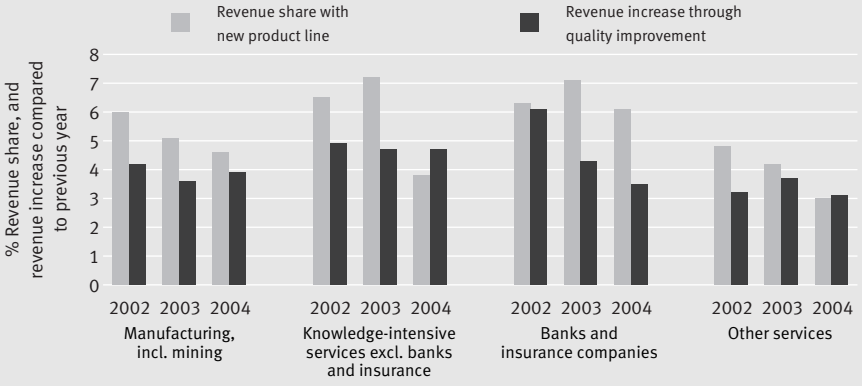
Research and development (R&D) is a central component of innovation activity. Around 55% of all innovation spending in manufacturing is currently allocated to R&D, while the proportion in the service sector is around 30% to 40%. Over the last ten years, the trend has been for the significance of R&D for innovation activities to increase.

The share of firms that continuously carry out their own R&D is a measure of how innovation activities are structured to promote new knowledge and thereby an indicator for the demand that innovative plans place on the development of new technologies and methods. R&D participation fell slightly in 2004, contrary to the general increasing trend for the number of firms that continually carry out research, which could be observed from 1998 onwards.

In 2004, the proportion of firms conducting R&D on a continuous basis was 24% in manufacturing (2003: 25%), 18% in knowledge-intensive services (2003 just under 20%) and 3% in other industries (2003: 4%).

The fall in R&D participation, occurring while involvement in innovation (measured by the innovation rate) remains steady, means that, for the first time in many years, the proportion of all firms who carry out research has decreased. In manufacturing, this proportion had increased from 30% (in 1998) to 43% (2003) but in 2004 stands at 41%. In knowledge-intensive services, the share rose from 19% to 34% between 1998 and 2003 and stabilised at the latter level in 2004. R&D plays less of a role in other services: the proportion of all innovators who carry out research was only 10% in 2004.

Revenue shares of new product lines and revenue increase through quality improvement, 2002-2004



Source: ZEW (2005): Mannheim Innovation Panel.
Notes: Figures for 2003 and 2004 are tentative. All figures are projected for the total firm population in Germany.

R&D activities

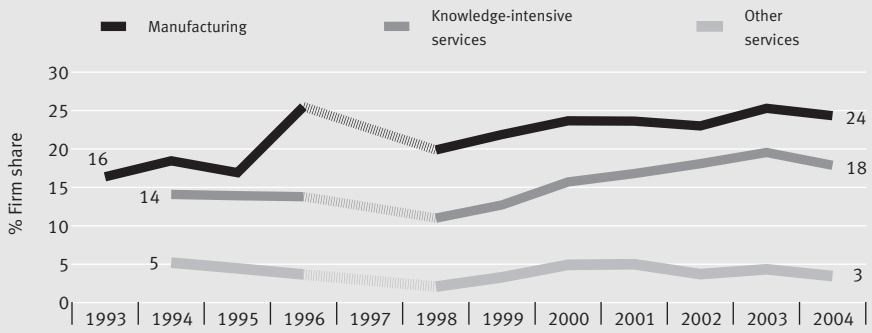
Research and development (R&D) comprises creative workundertaken on a systematic basis in order to increase the stock of knowledge, and the use of this stock of knowledge to devise new applications, such as new or markedly improved products and services or processes and methods (including software development). This definition corresponds to that which is presented in the Oslo Manual and thereby also complies with the OECD's Frascati Manual on surveying research and experimental development.

Innovation Activities at Sector Level

Innovative activity can differ greatly from one sector to another. Dependent on which indicator is chosen, different sectors emerge as the "most innovation intensive":

- In terms of the share of successfully innovating firms, IT and telecommunication services ranked first, showing an innovator share in 2004 of 78%. In second place came mechanical engineering (75%), followed by the chemical and electrical industry (both with 72%) and manufacture of instruments (medical, precision and optical instruments 70%). The highest R&D participation came from the chemical industry (with 53% of all firms conducting continual R&D), followed by manufacture of instruments (48%), the electronic industry (44%), mechanical engineering (42%) and IT and telecommunications (42%). High values for SMEs for participation in innovation and R&D mean that the two indicators have a wide base among this group of firms.
- In terms of absolute spending on innovation, the vehicle industry is far ahead, with expenditure of just under € 28bn in 2004. The combined total for the second and third-placed sectors, chemicals (11.8bn) and electronics (11.2bn) is still less than the spending on the part of the manufacturers of motor vehicles, aircraft, railway and ships. Thus more than a quarter of all innovation expenditure in Germany is accounted for by the vehicle industry.
- Innovation intensity is at its highest in the vehicle industry at 8.5%, while manufacturers of instruments spent around 8.3% of turnover on innovation projects in 2004. Technical and R&D-related services reach a share of 7.8% and the electronic industry 7.2%. In wholesale trade and banking/in-

Firms conducting continuous R&D activity, 1993-2004



Source: ZEW (2005): Mannheim Innovation Panel.
Notes: Figures for 2003 and 2004 are tentative. Figures for 1997, and 1995 figures in the service sectors, are not surveyed and are interpolate in the Diagram. Service sector figures are only available from 1994 on. All figures are projected for the total firm population in Germany.

surance, on the other hand, innovation intensity is less than one percent.

■ When it comes to turnover achieved with new products, the manufacture of vehicles, with €155bn, remains clearly ahead in 2004. The sector accounts for 26% of total turnover achieved with product novelties in Germany. Sales of product novelties make up 48% of the vehicle industry's total turnover, also the highest figure for any sector. High absolute values for turnover from innovation are also achieved by banking and insurance, electronics, wholesale trade and mechanical engineering. Yet while both the electronics industry and mechanical engineering make a significant proportion of their turnover with product novelties (44% and 32% respectively), the high absolute values recorded for banks and insurance companies nevertheless only account for 9% of total proceeds for this sector. Other sectors characterised by a high share of turnover from new products are manufacture of instruments (with 33%) and IT and telecommunications (26%). It is important to mention in this context that this indicator is influenced to a great extent by the sector's average product lifespan. It is for this reason that the chemical and pharmaceutical industry, for example, is some way behind in terms of this indicator. Its products are often on the market for 10-20 years, compared to product life cycles that are often no more than 2-5 years for IT and communications technologies.

■ In terms of the share of turnover from market novelties, the electronics industry again took pole position (with 15%), while the previous year's value for vehicle manufacturing - of 14% - was not repeated, the sector attaining only 10% in 2004. Other industries with high shares of turnover from product novelties included IT and telecommunications (just under 13%) and mechanical engineering (9%). The ranking in for the indicator share of turnover with product-range novelties shows a similar pattern, although the motor vehicle industry (with 7.7%) placed above electronics (7.1%) and the third-highest value came from banking and insurance (6.1%).

■ The electronics industry can also claim the highest values for the direct eco-

Indicators for innovation activity, by sectors in 2004

	Share of Innovators %	Share of firms with continuous R&D %	Innovation expenditure billion €	Innovation intensity %	Revenue from new products billion €	Share of revenues from new products %	Share of revenues from market novelties %	Share of revenues from product-range novelties %	Share of unit costs reduced through process innovation %	Revenue growth due to product quality improvement based on process innovation %
Mining and Quarrying	32	10	0,2	1,2	0	2	0,1	0,2	2,8	0,8
Food, Beverages, Tobacco	54	14	2,5	1,6	16	10	1,6	2,6	3,3	2,8
Textiles, Clothes, Leather	54	18	0,6	2,3	4	14	3,8	3,1	1,5	2,3
Wood, Paper, Printing, Publishing	54	8	2,4	2,6	10	10	3,6	2,4	2,3	2,2
Chemicals, Pharma, Petroleum	**72**	**54**	**11,8**	5,1	35	15	3,0	3,4	6,2	4,4
Rubber, Plastics	56	21	1,9	3,2	9	15	3,1	4,4	4,9	3,4
Glass, Ceramic, Stoneware	57	21	0,8	2,2	4	11	3,7	1,6	4,4	2,2
Metal Production and Processing	55	18	4,2	2,7	18	12	3,0	2,8	4,1	2,9
Mechanical Engineering	**75**	42	8,4	4,8	56	32	8,9	4,1	5,2	3,9
Electronics, Electrical Machinery	72	**44**	**11,2**	7,2	**69**	**44**	**15,2**	**7,1**	**9,2**	**5,1**
Instruments	70	**50**	3,0	**8,3**	12	**33**	6,9	4,4	**7,5**	3,6
Vehicles	65	37	**27,7**	**8,5**	**155**	**48**	**10,1**	**7,7**	**6,9**	**5,3**
Furniture, Sport Goods, Toys, Recycling	56	16	0,6	1,9	8	25	3,7	4,3	2,8	1,8
Wholesale Trade	35	4	2,5	0,4	66	11	2,6	3,5	3,5	2,7
Transportation, Postal Services	30	3	3,6	2,1	11	6	2,1	1,9	2,4	4,6
Banks, Insurance	63	18	6,4	0,8	**74**	9	4,0	**6,1**	4,2	3,5
Software, Telecommunication	**78**	42	6,9	5,6	33	26	**11,9**	4,6	4,3	**6,5**
Technical and R&D-related Services	55	26	2,7	**7,8**	5	15	3,3	3,4	2,9	3,4
Consulting, Advertising	43	9	1,8	2,3	9	12	2,3	2,8	2,0	2,4
Producer Services, Refuse Dispostal	45	3	0,8	1,5	3	5	0,4	1,6	2,2	3,0

Source: ZEW (2005): Mannheim Innovation Panel.
Notes: Figures are tentative. The three sectors with the highest figures are shown in bold print. All figures are projected for the total firm population in Germany.

nomic success of process innovation activities. More than 9% of unit costs could be reduced with the help of process innovations. The rates for manufacturing of instruments and vehicles were also above average, at 7.5% and 7% respectively. The increase in turnover from improved quality due to process innovations was at its highest in IT and telecommunications in 2004. Innovation activities also made large contributions to product diversification in vehicle manufacturing and the electronics industry (over 5% in both cases).

For further information on the long-term development of innovation indicators of each sector, individual ZEW Sector Innovation Reports are available in German (see http://www.zew.de/innovation).

Improved Innovation Performance for Manufacturing SMEs

Small and medium-sized enterprises (SMEs) in manufacturing turned back to innovation in their numbers in 2004. Both innovation participation and innovation expenditure rose. Additionally, the direct economic gains from innovation activities were up – i.e. both turnover from new products and cost savings from process innovations. In the service sectors, on the other hand, the innovation indicators for SMEs all tended downwards, with a regressive innovation rate in most sectors, falling innovation expenditure and fewer innovation success stories to be told.

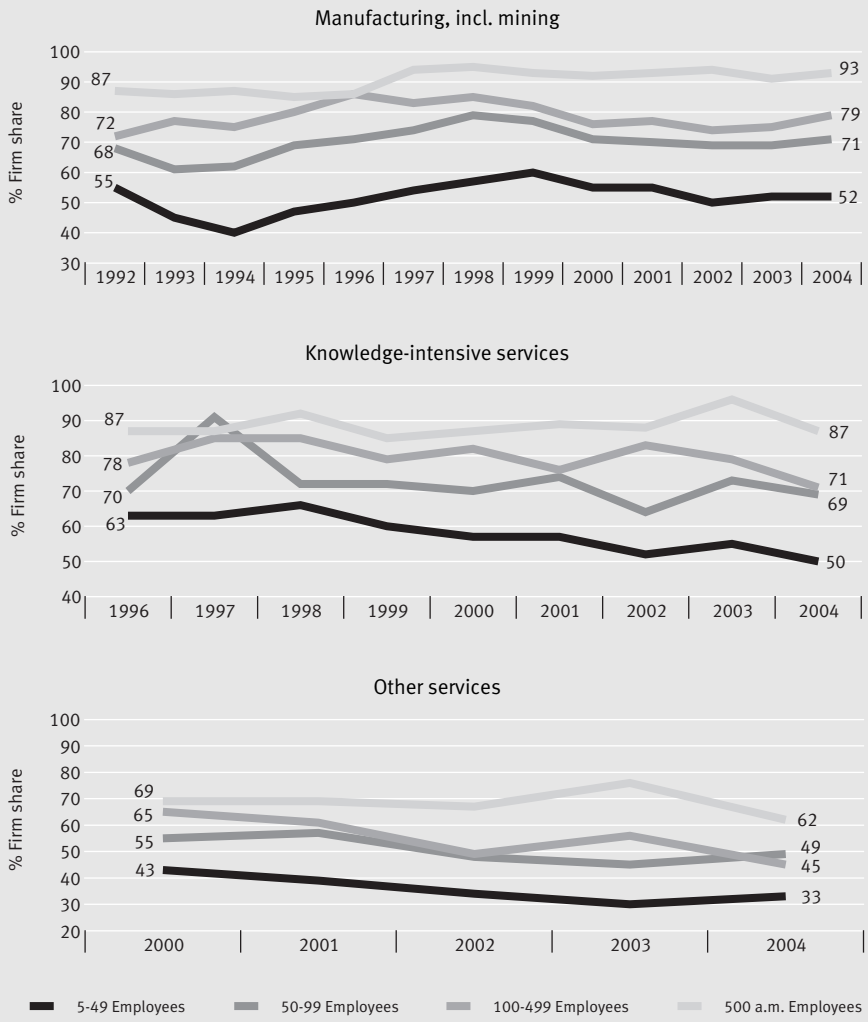
In manufacturing, the proportion of SMEs that successfully introduced new products or processes increased slightly for the first time in four years. Medium-sized firms (categorised as having 50-99 employees and 100-499 employees) were responsible for this development. The innovation rates for these two groups increased from 69% to 71% and 75% to 79%, respectively. Among small enterprises (5 to 49 employees), 52% were successful with innovations in 2004, unchanged from the previous year. Firms' projections for 2005 and 2006 suggest there will be little change in participation in innovation among SMEs in manufacturing. An increase of one percentage point is expected among small firms in 2005, for small-medium firms (50-99 employees) a one to two percentage point drop is predicted and the share of medium firms involved in innovation is should stay stable at around 80% in 2005 and 2006.

In knowledge-intensive services, on the other hand, innovation participation fell considerably. In the group of firms with up to 49 employees it fell dropped from 55% in 2003 to 50% in 2004. Knowledge-intensive service providers with 50 to 99 employees experienced a drop from 73% to 69% and only 71% of medium-sized companies from the same sector grouping successfully introduced innovations (compared to 79% in 2003). Technical service firms (architectural and engineering activities, technical testing and analysis) are, in the main, responsible for this significant downturn, along with consultancy and advertising companies. In 2005 and 2006, participation in innovation is expected to increase again among knowledge-intensive service providers with 50 employees or more. For firms with 50-99 employees, this should result in a proportion of 78% to 81% involved in innovation in 2005 and 2006 (the 2004 figure was 71%). For firms with 100 to 499 employees, the corresponding proportion is predicted to reach between 85% and 86% (up from 77% in 2004). In contrast, firms with fewer than 50 employees do not expect innovation participation to rise: in fact the figure for 2005 and 2006 will be lower again than that for 2004 (56%).

In other services, the innovation rate increased again in 2004 for firms with fewer than 100 employees but fell for medium-sized and large firms. However, a reversal of this trend is expected in 2005 and 2006. Firms with fewer than 100 employees will decrease their participation in innovation, while the share of larger "other service" firms (firms with 100 to 499 employees and large companies) involved in innovation will be back up.

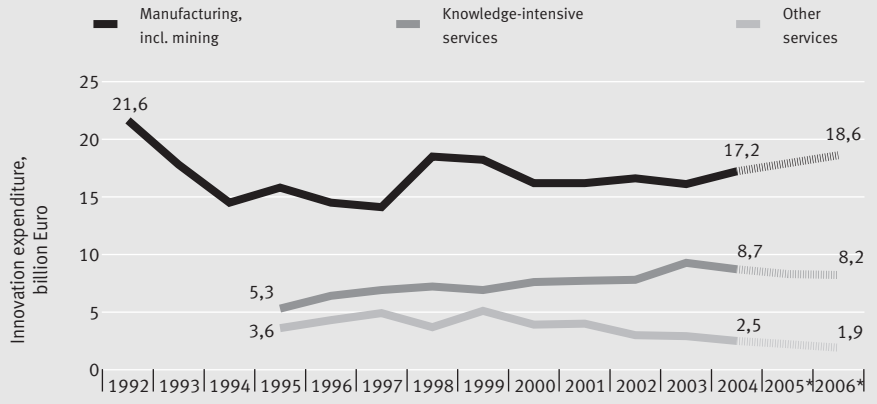
Innovation expenditure by industrial SMEs grew in 2004 for the first time in five ye-

Innovator share by firm-size, 1992-2004



Source: ZEW (2005): Mannheim Innovation Panel.
Notes: Figures for 2003 and 2004 are tentative and only available from 1996 on for service sectors. Figures for other services are only partially comparable with those from previous years and are not shown. All figures are projected for the total firm population in Germany.

Innovation expenditures in SMEs, 1992-2006



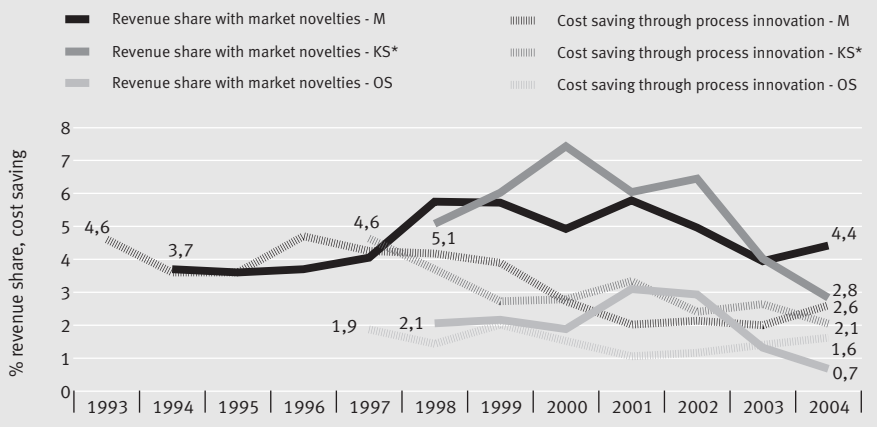
Source: ZEW (2005): Mannheim Innovation Panel.
Notes: Figures for 2003 and 2004 are tentative. Service sector figures are only available from 1995 on. Figures for other services from 2000 on are only partially comparable with those from previous years. Data for 2005 and 2006 are based on projected firm figures and expectations. All figures are projected for the total populationof SMEs in Germany.

ars, up by an impressive 7% to a total of €17bn. This accounts for 23% of the sector's total innovation expenditure. Innovation expenditure by SMEs at current prices, however, still stands below the level reached in 1998 and 1999. For 2005 and 2006, too, these firms plan to expand their innovation budgets at an annual rate of around 3-4%.

In knowledge-intensive services, the steady upwards trend in SMEs' innovation expenditure, which had continued since 1995, came to an end. The amount of funding available for innovation projects decreased to €8.7bn (-6%). When asked in the spring of 2005, the firms also predicted further cuts in innovation budgets for 2005 (-5%) and 2006 (-1%). In other services, SMEs cut innovation spending for the fifth successive year, down 13% from 2003 to €2.5bn. Expenditure is expected to fall further still in 2005 and 2006, by 11% and 15% respectively, to a final value of below €2.0bn.

The split between industrial and service firms is also clearly visible when it comes to success with innovations. SMEs from the manufacturing industry managed to increase their success from innovations in 2004, with respect to both the share of turnover they made with market novelties (4.4% compared to 4.1% in 2003) and unit costs savings achieved with the help of process innovations (2.6% up from 2.0% in 2003). In the service sectors, however, the 2004 values for virtually all of these indicators lay below those from the previous year. The proportion of turnover that SMEs in knowledge-intensive services made with market novelties was only 2.8%. The proportion for the period between 1999 and 2002 was always at least 7%. Cost savings were at 2.1%, down from 2.7% in 2003. In other services, too, the share of turnover from market novelties dropped sharply from 3% (2001-2002) to less than 1%. When it came to cost savings, there was a slight improvement on the previous year's result, from 1.4% to 1.6% in 2004.

Revenues from market novelties and share of reduced unit costs in SMEs, 1993-2004



Source: ZEW (2005): Mannheim Innovation Panel.
Notes: Figures for 2003 and 2004 are tentative. * Knowledge-intensive services (KS) do not include banks and insurance companies. Figures for other services (OS) from 2000 on are only partially comparable with those from previous years. All figures are projected for the total population of SMEs in Germany.

SMEs

Small and medium-sized enterprises (SMEs) cover all firms having not less than 5 and not more than 500 employees. SMEs determine those innovation indicators that refer to shares in the number of firms (such as the share of innovators) since SMEs account for 97 to 99.5% of all enterprises, depending on the sector. In contrast, indicators that refer to revenues and expenditures are by large determined by large companies.

Eastern Germany: Falling Innovation Activities and Success from Innovation Still Lagging

Innovation behaviour in the Eastern German economy is of particular interest, as the processes of economic renewal and growth in Eastern Germany are heavily dependent on the innovative potential of firms based there. It is therefore also a freely-declared economic and innovation policy aim to implement specific measures to foster innovation activity in Eastern German firms.

Innovation participation among Eastern German companies in 2004 fell in both manufacturing and knowledge-intensive services. In the previous year it had risen sharply. More "other service" firms were successful with innovations than in the previous year. The innovator share in Eastern Germany is between four and six percentage points below that in Western Germany in all three sector groupings.

There are several reasons why an east/west comparison of innovation expenditure is of limited pertinence. For one thing, total innovation expenditure figures can often be affected by single large-scale investments in the construction of new production facilities or product lines. Another issue arises when large firms relocate, particularly to and from Berlin. This can lead to considerable changes in recorded innovation expenditure, even though the firms involved may not have altered their innovation behaviour at all. Particularly in the period 1999 to 2002, a number of re-locations – e.g. in knowledge-intensive services – as well as some large single investment in manufacturing caused a huge increase in innovation expenditure in Eastern Germany.

Innovations in Eastern Germany

In order to generate representative figures on innovation activities by firms located in Eastern Germany, the sample of the ZEW innovation survey is stratified for all sectors and size classes by East and West. Eastern Germany consists of the following six Federal States: Berlin, Brandenburg, Mecklenburg-Western Pomerania, Saxony, Saxony-Anhalt und Thuringia. East German firms are defined as those firms that have their registered office in one of the Federal States mentioned above. Subsidiaries of West German firms in Eastern Germany that are not organised as separate legal entities are not part of the East German enterprise sector as defined here.

With respect to them most recent development since 2002, innovation expenditure are clearly declining in the East German economy. Between 2002 and 2004 they decreased in all three sectors at annual rates of 2% to 5%. This is in sharp contrast to Western Germany, where both manufacturing and knowledge-intensive services increased their budgets for innovation projects during this period.

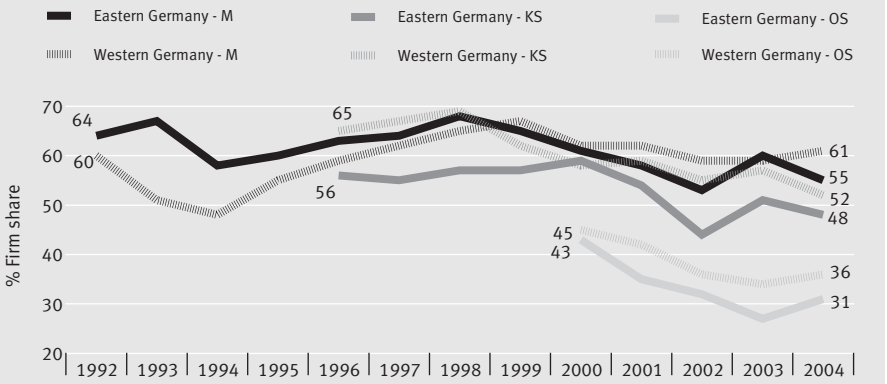
Falling overall innovation expenditure in Eastern Germany is also projected for 2005 and 2006. In manufacturing, a large drop should occur in 2005 compared to 2004, followed by a slight rise in 2006. The result is a negative annual rate of change of 3%, for a period in which Western German manufacturing firms plan to increase their innovation expenditure by almost 3% p.a. For knowledge-intensive service providers, on the other hand, planned budgets for 2005 are up slightly. However, they are set to fall again in 2006, resulting in an overall annual decrease of 3% over the two years. This compares to a decrease of just less than 1.5% p.a. in Western Germany.

In comparison, the decline for other services is large. Firms in this sector expect to decrease innovation expenditure by 10% annually in both 2005 and 2006. However, we should not forget that innovation expenditure within this sector grouping is, to a great extent, determined by innovation projects. Additionally, huge drops were recorded as early as 2002 and 2003, due to falling innovation activity on the part of Eastern German transport services firms.

Eastern German firms' success from innovation developed in quite a disparate way in 2004. In manufacturing, share of turnover from market novelties fell sharply again, while successful rationalisations through process innovations increased. In knowledge-intensive services, innovation success remained at a comparatively high level on the product side, but unit cost savings due to process innovations stayed low. There was also little change to be noticed in other service firms' success from innovation.

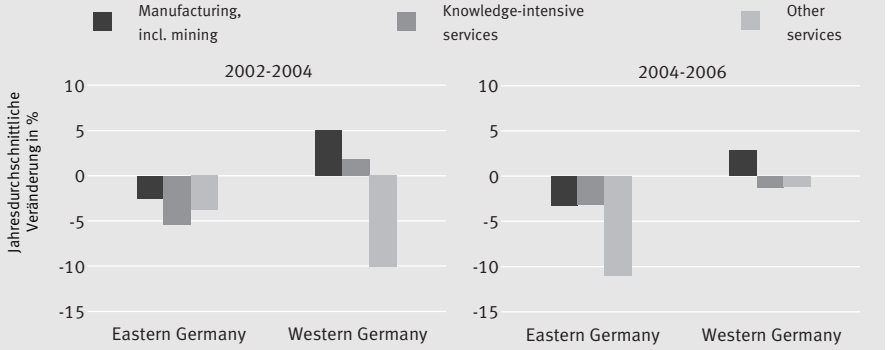
Compared to Western German firms, the considerably lower level of success with innovations continues to be conspicuous in 2004. This has been the picture for a number of years and there is no sign of the gap getting any smaller.

Innovator share (East/West comparison), 1992-2004



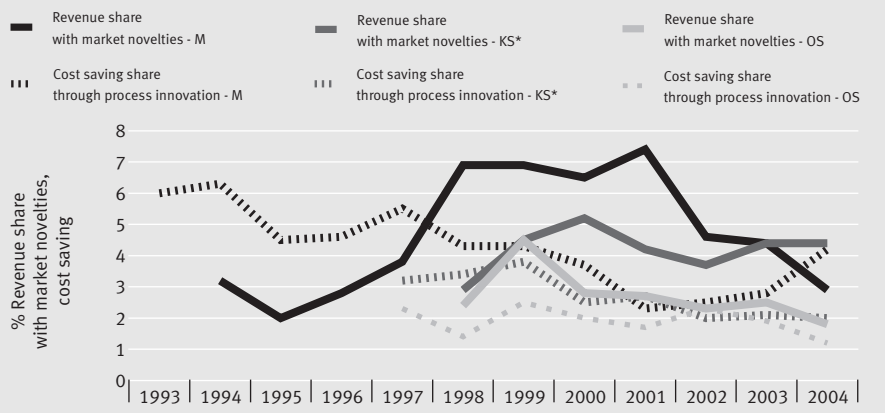
Source: ZEW (2005): Mannheim Innovation Panel.
Notes: Figures for 2003 and 2004 are tentative. Knowledge-intensive services (KS) are only surveyed from 1996 on. Figures for other services (OS) from 2000 on are not comparable with those from previous years and are shown only from 2000 on. All figures are projected for total firm population in Eastern and Western Germany.

Development of innovation expenditures, 2002- 2006 (East/West comparison)



Source: ZEW (2005): Mannheim Innovation Panel.
Notes: Figures are tentative. Data for 2006 are based on projected/expected firm figures. All figures are projected for the total firm population in Eastern and Western Germany.

Innovation success, 1993-2004 (East/West comparison)



Source: ZEW (2005): Mannheim Innovation Panel.
Notes: Figures for 2003 and 2004 are tentative. Figures for revenue shares from market novelties are only surveyed from 1994 (manufacturing), 1998 (service sectors) and figures for cost saving in service sectors - from 1997. *Knowledge-intensive services (KS) do not include banks and insurance companies. All figures are projected for the total firm population in Eastern and Western Germany.

Innovation Indicators for Manufacturing and Mining, 1993 - 2004

	1993		1994		1995		1996		1997		1998		1999		2000		2001		2002		2003		2004	
	abs.	in %	abs.	in %	abs.	in %	abs.	in %	abs.	in %	abs.	in %	abs.	in %	abs.	in %	abs.	in %	abs.	in %	abs.	in %	abs.	in %
Enterprises (1,000)	71	100	70	100	65	100	63	100	63	100	63	100	63	100	62	100	62	100	62	100	62	100	60	100
thereof:																								
Innovators	37	52	34	49	36	56	37	60	39	62	41	66	42	67	39	62	38	62	36	58	36	59	36	60
thereof:																								
Product innovators	n. s.		n. s.		n. s.		n. s.		n. s.		n. s.		n. s.		31	50	31	50	32	51	29	48	29	48
Process innovators	n. s.		n. s.		n. s.		n. s.		n. s.		n. s.		n. s.		24	38	21	34	19	31	21	35	22	36
Firms with new-to-the-market products	–	–	15	22	16	25	14	23	15	24	20	31	21	33	18	29	18	28	18	28	14	23	13	22
Firms with process innovation driven cost reduction	23	32	17	25	18	28	22	34	21	34	22	35	22	36	15	25	12	20	13	21	15	25	12	20
Firms with continuous internal R&D activities	12	16	13	18	11	17	16	25	–	–	13	20	14	22	15	24	15	24	14	23	15	25	15	24
Employees (1,000)	7,796	100	7,287	100	7,100	100	6,795	100	6,751	100	6,738	100	6,725	100	6,768	100	6,773	100	6,656	100	6,518	100	6,421	100
thereof:																								
Innovators	6,293	81	5,776	79	5,825	82	5,664	83	5,871	87	5,950	88	5,871	87	5,628	83	5,671	84	5,497	83	5,426	83	5,428	85
Firms with continuous internal R&D activities	4,452	57	4,216	58	4,151	58	4,340	64	–	–	4,049	60	4,093	61	4,123	61	4,288	63	4,137	62	4,057	62	3,969	62
Innovation expenditure (billion of Euro)	48.1	100	44.5	100	48.6	100	52.2	100	52.9	100	55.7	100	58.1	100	59.8	100	64.1	100	69.0	100	72.6	100	75.3	100
thereof:																								
Current expenditure	29.7	62	27.1	61	30.2	62	34.8	67	35.5	67	32.9	59	32.4	56	36.3	61	41.9	65	46.6	68	50.7	70	50.7	67
Investment for innovations	18.4	38	17.4	39	18.4	38	17.4	33	17.4	33	22.8	41	25.7	44	23.6	39	22.2	35	22.4	32	21.9	30	24.5	33
Share in turnover in %		4.8		4.2		4.4		4.9		4.5		4.7		4.7		4.4		4.6		4.9		5.1		5.0
Innovation success (in %)																								
Revenue share from product innovations		n. s.		n. s.		n. s.		n. s.		n. s.		n. s.		n. s.		31.4		28.5		27.8		25.7		26.4
Revenue share from market novelties		–		5.1		4.8		3.8		6.1		7.9		8.6		8.3		7.7		7.6		7.0		6.5
Share of cost reduction through process innovation		7.1		4.1		4.4		6.2		7.5		6.2		7.2		6.7		5.4		4.9		4.5		5.6

Source: ZEW (2005): Mannheim Innovation Panel.
Notes: Values for 2003 and 2004 are tentative. Deviations from total due to rounding. "-": Figures not surveyed in that year. " n.s.": not shown due to lack in comparability to values from 2000 on. All figures are projected for the total firm population in Germany.
Total firm population: Firms with 5 and more employees in manufacturing and mining (NACE 10-37).

Innovation Indicators for Manufacturing and Mining – Small and Medium-sized Enterprises, 1993 - 2004

	1993		1994		1995		1996		1997		1998		1999		2000		2001		2002		2003		2004	
	abs.	in %	abs.	in %	abs.	in %	abs.	in %	abs.t	in %	abs.	in %	abs.	in %	abs.	in %	abs.	in %	abs.	in %	abs.	in %	abs.	in %
Enterprises (1,000)	68	100	68	100	63	100	61	100	61	100	61	100	61	100	61	100	60	100	60	100	59	100	59	100
thereof:																								
Innovators	35	51	33	48	34	55	36	59	38	62	40	65	40	66	37	61	36	61	34	57	34	58	35	59
thereof:																								
Product innovators	n. s.		n. s.		n. s.		n. s.		n. s.		n. s.		n. s.		30	49	29	49	30	50	28	47	28	47
Process innovators	n. s.		n. s.		n. s.		n. s.		n. s.		n. s.		n. s.		23	37	19	32	18	29	20	34	20	35
Firms with new-to-the-market products	–	–	14	21	15	24	13	22	14	22	18	30	20	32	17	28	16	27	17	27	13	22	12	21
Firms with process innovation driven cost reduction	21	31	16	23	17	27	20	34	20	33	21	34	21	34	14	24	11	19	12	20	14	24	11	19
Firms with continuous internal R&D activities	10	15	12	17	10	15	15	24	–	–	11	18	12	20	13	22	13	22	13	21	14	24	13	23
Employees (1,000)	3,637	100	3,565	100	3,423	100	3,330	100	3,375	100	3,395	100	3,408	100	3,428	100	3,398	100	3,407	100	3,351	100	3,296	100
thereof:																								
Innovators	2,462	68	2,367	66	2,481	72	2,541	76	2,619	78	2,708	80	2,645	78	2,430	71	2,426	71	2,374	70	2,372	71	2,408	73
Firms with continuous internal R&D activities	1,084	30	1,235	35	1,099	32	1,338	40	–	–	1,235	36	1,231	36	1,264	37	1,251	37	1,228	36	1,270	38	1,218	37
Innovation expenditure (billion of Euro)	17.8	100	14.5	100	15.8	100	14.5	100	14.1	100	18.5	100	18.3	100	16.2	100	16.2	100	16.6	100	16.1	100	17.2	100
thereof:																								
Current expenditure	7.8	44	6.8	47	7.5	47	7.7	53	7.1	51	8.3	45	8.6	47	7.5	46	8.0	50	8.9	54	9.3	58	9.4	55
Investment for innovations	10.0	56	7.8	53	8.3	53	6.8	47	6.9	49	10.2	55	9.7	53	8.7	54	8.2	50	7.7	46	6.8	42	7.8	45
Share in turnover in %		4.3		3.3		3.7		3.3		3.2		4.1		3.9		3.2		3.2		3.2		3.1		3.1
Innovation success (in %)																								
Revenue share from product innovations		n. s.		n. s.		n. s.		n. s.		n. s.		n. s.		n. s.		15.3		16.0		16.3		14.6		15.2
Revenue share from market novelties		–		3.7		3.6		3.7		4.1		5.7		5.7		4.9		5.8		4.5		4.1		4.4
Share of cost reduction from process innovation		4.6		3.6		3.6		4.7		4.3		4.2		3.9		2.7		2.0		2.1		2.0		2.6

Source: ZEW (2005): Mannheim Innovation Panel.
Notes: Values for 2003 and 2004 are tentative. Deviations from total due to rounding. "-": Figures not surveyed in that year. " n.s.": not shown due to lack in comparability to values from 2000 on. All figures are projected for the total population of SMEs in Germany. Total population of SMEs: Firms with 5 to 499 employees in manufacturing and mining (NACE 10-37).

Innovation Indicators for Manufacturing and Mining – Eastern Germany, 1993 - 2004

	1993		1994		1995		1996		1997		1998		1999		2000		2001		2002		2003		2004	
	abs.	in %	abs.	in %	abs.	in %	abs.	in %	abs.	in %	abs.	in %	abs.	in %	abs.	in %	abs.	in %	abs.	in %	abs.	in %	abs.	in %
Enterprises (1,000)	7.7	100	8.5	100	7.9	100	7.9	100	8.4	100	8.9	100	9.4	100	9.7	100	9.7	100	9.9	100	9.9	100	10.0	100
thereof:																								
Innovators	5.2	67	4.9	58	4.8	60	5.0	63	5.3	64	6.1	68	6.1	65	6.0	61	5.7	58	5.2	53	5.9	60	5.5	55
thereof:																								
Product innovators	n. s.		n. s.		n. s.		n. s.		n. s.		n. s.		n. s.		4.9	51	4.8	50	4.5	46	4.6	47	4.5	44
Process innovators	n. s.		n. s.		n. s.		n. s.		n. s.		n. s.		n. s.		3.5	36	2.8	29	2.9	29	3.8	39	3.4	34
Firms with new-to-the-market products	–	–	1.8	22	1.9	24	1.6	21	1.8	21	2.5	28	2.7	29	2.6	27	2.5	25	2.2	23	2.0	21	1.6	16
Firms with process innovation driven cost reduction	3.0	39	2.7	32	2.7	34	2.9	37	2.7	32	3.0	33	3.0	32	2.2	22	1.5	16	1.9	19	2.1	21	1.7	17
Firms with continuous internal R&D activities	2.0	26	2.5	30	1.8	22	2.2	28	–	–	2.4	27	2.9	31	2.7	28	2.7	28	2.4	25	2.5	26	2.5	25
Employees (1,000)	696	100	630	100	562	100	542	100	550	100	562	100	573	100	588	100	641	100	595	100	606	100	589	100
thereof:																								
Innovators	498	72	463	73	399	71	415	77	435	79	448	80	455	80	446	76	473	74	414	70	440	73	427	72
Firms with continuous internal R&D activities	281	40	285	45	237	42	256	47	–	–	265	47	267	47	255	43	310	48	243	41	262	43	261	44
Innovation expenditure (billion of Euro)	3.7	100	3.6	100	2.8	100	2.8	100	2.9	100	3.9	100	3.6	100	3.8	100	4.1	100	5.4	100	5.7	100	5.2	100
thereof:																								
Current expenditure	1.5	40	1.4	39	1.1	39	1.2	42	1.1	37	1.8	46	1.6	44	1.8	47	2.2	53	2.5	46	3.2	55	2.9	56
Investment for innovations	2.2	60	2.2	61	1.7	61	1.6	58	1.8	63	2.1	54	2.0	56	2.0	53	1.9	47	3.0	54	2.6	45	2.3	44
Share in turnover in %		7.4		6.2		4.6		4.7		4.4		5.3		4.6		4.2		4.1		6.0		5.8		5.8
Innovation success (in %)																								
Revenue share from product innovations		n. s.		n. s.		n. s.		n. s.		n. s.		n. s.		n. s.		23.1		28.6		16.2		19.2		20.2
Revenue share from market novelties		–		3.2		2.0		2.8		3.8		6.9		6.9		6.5		7.4		4.6		4.4		2.9
Share of cost reduction through process innovation		6.0		6.3		4.5		4.6		5.5		4.3		4.3		3.7		2.3		2.5		2.8		4.2

Source: ZEW (2005): Mannheim Innovation Panel.
Notes: Values for 2003 and 2004 are tentative. Deviations from total due to rounding. "-": Figures not surveyed in that year. " n.s.": not shown due to lack in comparability to values from 2000 on. All figures are projected for the total firm population in Eastern Germany.
Total firm population: Firms with 5 and more employees in manufacturing and mining (NACE 10-37) in Eastern Germany (including West-Berlin).

Innovation Indicators for the Service Sectors, 1997 - 2004

	Knowledge-intensive services *																Other services **									
	1997		1998		1999		2000		2001		2002		2003		2004		2000		2001		2002		2003		2004	
	abs.	in %	abs.	in %	abs.	in %	abs.	in %	abs.	in %	abs.	in %	abs.	in %	abs.	in %	abs.	in %	abs.	in %	abs.	in %	abs.	in %	abs.	in %
Enterprises (1,000)	89	100	90	100	90	100	89	100	83	100	86	100	78	100	80	100	96	100	93	100	92	100	90	100	89	100
thereof:																										
Innovators	58	65	60	67	55	61	52	59	48	58	46	53	44	56	41	52	43	45	38	41	33	36	30	33	31	35
thereof:																										
Product innovators	n. s.		n. s.		n. s.		38	43	32	39	41	47	33	42	31	39	32	34	28	31	28	30	17	19	22	25
Process innovators	n. s.		n. s.		n. s.		35	39	29	35	26	31	30	38	24	30	28	30	19	21	19	21	22	24	20	22
Firms with new-to-the-market products	–	–	20	23	17	19	19	22	16	19	17	20	12	16	12	15	12	13	11	12	12	13	4	5	6	6
Firms with process innovation driven cost reduction	27	30	19	22	15	16	17	19	16	20	12	13	15	19	9	11	10	11	8	8	9	9	10	11	7	8
Firms with continuous internal R&D activities	–	–	10	11	11	13	14	16	14	17	15	18	15	20	14	18	4.7	5	4.7	5	3.4	4	3.9	4	3.0	3
Innovation expenditure (billion of Euro)	12.4	100	15.2	100	16.0	100	16.2	100	15.9	100	17.5	100	17.7	100	17.8	100	6.7	100	7.1	100	8.4	100	7.7	100	6.9	100
thereof:																										
Current expenditure	6.2	50	8.2	54	9.0	56	9.7	60	9.3	58	11.2	64	11.8	67	11.2	63	3.3	49	3.4	48	3.7	45	2.5	33	2.6	38
Investment for innovations	6.3	50	7.1	46	7.0	44	6.6	40	6.7	42	6.3	36	5.9	33	6.6	37	3.4	51	3.7	52	4.6	55	5.2	67	4.2	62
Share in turnover in %		–		–		–		1.7		1.6		1.7		1.7		1.7		0.9		0.9		1.1		1.0		0.8
Share in turnover in %, excl. banks and insurance		4.1		4.0		3.8		4.2		4.2		4.5		4.9		4.9										
Innovation success (in %)																										
Revenue share from product innovations		n. s.		n. s.		n. s.		23.9		28.2		23.3		25.0		19.8		8.5		8.8		8.7		8.2		9.9
Revenue share from market novelties		–		8.8		7.6		7.8		9.4		8.8		6.6		7.5		2.6		2.5		2.3		2.0		2.4
Share of cost reduction through process innovation		5.3		5.5		5.3		5.1		6.9		5.4		4.3		3.3		2.0		1.4		3.1		2.7		3.2

Source: ZEW (2005): Mannheim Innovation Panel.
Notes: Values for 2003 and 2004 are tentative. Deviations from total due to rounding. "-": Figures not surveyed in that year. " n.s.": not shown due to lack in comparability to values from 2000 on. Revenue shares and unit cost reduction shares calculated excluding banks and insurance firms. All figures are projected for the total firm population in Germany.
* Total firm population: Firms with 5 and more employees in sectors banking/insurance, computer services and telecommunication, technical services, and consulting and advertising (NACE 64.2, 65-67, 72-73, 74.1-74.4).
** Total firm population: Firms with 5 and more employees in sectors wholesale trade, transport incl. postal services, and producer services (e.g. cleaning, security, provision of personnel, waste management) (NACE 51, 60-63, 64.1, 74.5-74.8, 90). Due to changes in survey questions in 2000, figures previous to 2000 are not comparable to these from 2000 on and are thus not reported.

Innovation Indicators for the Service Sectors – Small and Medium-sized Enterprises, 1997 - 2004

	Knowledge-intensive services *																Other services **									
	1997		1998		1999		2000		2001		2002		2003		2004		2000		2001		2002		2003		2004	
	abs.	in %	abs.	in %	abs.	in %	abs.	in %	abs.	in %	abs.	in %	abs.	in %	abs.	in %	abs.	in %	abs.	in %	abs.	in %	abs.	in %	abs.	in %
Enterprises (1,000)	88	100	89	100	89	100	88	100	82	100	85	100	78	100	79	100	95	100	92	100	91	100	89	100	88	100
thereof:																										
Innovators	58	65	60	67	55	61	51	58	47	58	45	53	44	56	41	51	42	45	37	41	32	35	29	33	31	35
thereof:																										
Product innovators	n. s.		n. s.		n. s.		37	42	32	39	40	47	32	42	30	38	32	34	28	30	27	30	16	18	22	25
Process innovators	n. s.		n. s.		n. s.		34	38	28	34	26	31	29	38	24	30	28	29	19	21	19	21	21	24	19	22
Firms with new-to-the-market products	–	–	20	22	17	19	19	21	15	19	17	20	12	15	12	15	12	13	11	12	12	13	4	5	6	6
Firms with process innovation driven cost reduction	26	30	19	21	14	16	16	19	16	19	11	13	14	19	9	11	10	10	7	8	8	9	10	11	7	8
Firms with continuous internal R&D activities	–	–	10	11	11	13	14	16	14	17	15	18	15	19	14	17	4.5	5	4.5	5	3.2	4	3.6	4	2.8	3
Innovation expenditure (billion of Euro)	6.9	100	7.2	100	6.9	100	7.6	100	7.7	100	7.8	100	9.3	100	8.7	100	3.9	100	4.0	100	3.0	100	2.9	100	2.5	100
thereof:																										
Current expenditure	3.5	51	4.2	58	3.7	54	4.5	59	5.0	65	5.1	65	6.3	68	5.5	64	1.8	45	1.8	44	1.3	44	1.2	40	1.3	53
Investment for innovations	3.4	49	3.1	42	3.2	46	3.1	41	2.7	35	2.7	35	3.0	31	3.2	36	2.2	55	2.2	56	1.7	56	1.7	60	1.2	47
Share in turnover in %		–		–		–		2.3		2.3		2.0		2.4		2.2		0.9		0.9		0.7		0.7		0.6
Share in turnover in %, excl. banks and insurance		5.7		5.1		4.9		6.0		6.0		4.8		6.0		5.2										
Innovation success (in %)																										
Revenue share from product innovations		n. s.		n. s.		n. s.		19.1		18.9		17.0		22.5		14.6		5.8		7.5		6.8		5.4		4.7
Revenue share from market novelties		–		5.1		6.0		7.4		6.0		6.4		3.7		2.8		1.9		3.1		2.9		1.3		0.7
Share of cost reduction through process innovation		4.6.		3.7		2.7		2.8		3.3		2.4		2.7		2.1		1.5		1.1		1.2		1.4		1.6

Source: ZEW (2005): Mannheim Innovation Panel.
Notes: Values for 2003 and 2004 are tentative. Deviations from total due to rounding. "-": Figures not surveyed in that year. " n.s.": not shown due to lack in comparability to values from 2000 on. Revenue shares and unit cost reduction shares calculated excluding banks and insurance firms. All figures are projected for the total population of SMEs in Germany.
* Total population of SMEs: Firms with 5 to 499 employees in sectors banking/insurance, computer services and telecommunication, technical services, and consulting and advertising (NACE 64.2, 65-67, 72-73, 74.1-74.4).
** Total population of SMEs: Firms with 5 to 499 employees in sectors wholesale trade, transport incl. postal services, and producer services (e.g. cleaning, security, provision of personnel, waste management) (NACE 51, 60-63, 64.1, 74.5-74.8, 90). Due to changes in survey questions in 2000, figures previous to 2000 are not comparable to these from 2000 on and are thus not reported.

Innovation Indicators for the Service Sectors – Eastern Germany, 1997 bis 2004

	Knowledge-intensive services *																Other services **									
	1997		1998		1999		2000		2001		2002		2003		2004		2000		2001		2002		2003		2004	
	abs.	in %	abs.	in %	abs.	in %	abs.	in %	abs.	in %	abs.	in %	abs.	in %	abs.	in %	abs.	in %	abs.	in %	abs.	in %	abs.	in %	abs.	in %
Enterprises (1,000)	12.8	100	13.1	100	13.3	100	13.1	100	12.1	100	12.4	100	11.4	100	11.6	100	16.1	100	15.4	100	15.2	100	14.9	100	14.7	100
thereof:																										
Innovators	7.0	55	7.5	57	7.6	57	7.8	59	6.5	54	5.4	44	5.9	51	5.6	48	6.9	43	5.4	35	4.8	32	4.0	27	4.5	31
thereof:																										
Product innovators	n. s.		n. s.		n. s.		4.7	36	4.8	39	4.1	33	4.9	43	4.5	39	5.6	35	3.4	22	4.0	27	2.8	19	3.5	24
Process innovators	n. s.		n. s.		n. s.		4.6	35	4.5	37	3.4	27	3.5	31	3.5	30	4.4	27	4.2	27	2.7	18	2.7	18	2.5	17
Firms with new-to-the-market products	–	–	1.0	8	2.8	21	2.9	22	2.3	19	1.5	12	3.1	27	1.6	14	2.9	18	1.2	8	1.5	10	1.1	7	1.1	8
Firms with process innovation driven cost reduction	3.3	25	2.7	21	1.9	15	1.8	14	3.1	25	1.3	11	1.1	10	1.1	10	1.6	10	1.3	9	0.6	4	1.4	9	0.8	6
Firms with continuous internal R&D activities	–	–	1.2	9	1.4	10	1.6	12	1.3	10	1.6	13	2.1	18	2.4	21	0.6	4	0.9	6	0.3	2	0.3	2	0.5	4
Innovation expenditure (billion of Euro)	1.0	100	1.2	100	0.9	100	0.8	100	1.3	100	1.9	100	1.8	100	1.7	100	1.0	100	1.4	100	0.9	100	0.5	100	0.9	100
thereof:																										
Current expenditure	0.7	66	0.6	52	0.5	59	0.5	58	0.8	66	1.4	73	1.2	67	1.2	73	0.4	38	0.5	38	0.4	38	0.2	34	0.3	35
Investment for innovations	0.3	34	0.6	47	0.4	41	0.3	42	0.4	34	0.5	27	0.6	33	0.5	27	0.6	62	0.9	62	0.6	62	0.3	66	0.6	65
Share in turnover in %		–		–		–		2.2		3.1		4.6		3.8		3.6		2.0		2.7		1.7		0.9		1.5
Share in turnover in %, excl. banks and insurance		5.9		6.2		5.1		4.4		6.0		9.2		9.1		9.6										
Innovation success (in %)																										
Revenue share from product innovations		n. s.		n. s.		n. s.		19.6		16.2		19.0		19.7		15.2		7.5		9.1		6.0		9.2		7.4
Revenue share from market novelties		–		2.9		4.5		5.2		4.2		3.7		4.5		4.4		2.8		2.7		2.3		2.5		1.8
Share of cost reduction through process innovation		3.2		3.4		3.8		2.5		2.7		2.0		2.1		2.0		2.0		1.7		2.3		1.9		1.2

Source: ZEW (2005): Mannheim Innovation Panel.
Notes: Values for 2003 and 2004 are tentative. Deviations from total due to rounding. "-": Figures not surveyed in that year. " n.s.": not shown due to lack in comparability to values from 2000 on. Revenue shares and unit cost reduction shares calculated excluding banks and insurance firms. All figures are projected for the total firm population in Eastern Germany.
* Total firm population: Firms with 5 and more employees in sectors banking/insurance, computer services and telecommunication, technical services, and consulting and advertising (NACE 64.2, 65-67, 72-73, 74.1-74.4) in Eastern Germany (including West-Berlin).
** Total firm population: Firms with 5 and more employees in sectors wholesale trade, transport incl. postal services, and producer services (e.g. cleaning, security, provision of personnel , waste management) (NACE 51, 60-63, 64.1, 74.5-74.8, 90) in Eastern Germany (including West-Berlin). Due to changes in survey questions in 2000, figures previous to 2000 are not comparable to these from 2000 on and are thus not reported.

The Mannheim Innovation Panel

On behalf of the German Federal Ministry of Education and Research (BMBF), the Centre for European Economic Research (ZEW) has conducted annual surveys on innovation behaviour of German enterprises in cooperation with the Institute for Applied Social Science (infas) and the Fraunhofer-Institut für System- und Innovationsforschung (ISI) since 1993. These surveys focus on all firms located in Germany that have at least five employees and are active in the manufacturing sector, mining, knowledge-intensive services or other services.

The ZEW's annual innovation survey is designed as a panel survey (the "Mannheim Innovation Panel"); i.e. the same firm sample is queried every year. Every two years the sample is refreshed by a random sample of newly founded firms to replace those decommissioned in the interim. The innovation survey is conducted alternately in its "long" form (including additional questions regarding framework conditions of innovation, such as innovation barriers) and "short" form (with questions limited to the core indicatorsof innovation performance). The 2005 survey was of the former variety.

The definitions and measurement concepts on which the survey is based follow the OECD and Eurostat recommendations for the collection and interpretation of data on innovation, as set our in the "Oslo Manual". The first revision of the Oslo Manual (1997) was used as a standard for the 2005 survey. Every four years, the ZEW survey forms part of the Community Innovation Survey coordinated by Eurostat. As was the case in 1993, 1997 and 2001, the 2005 survey was again Europe-wide (CIS IV).

The 2005 sample comprises about 27,000 firms (excluding neutral losses, such as firms that had ceased trading in the meantime) and is stratified by sector, firm-size and region (Eastern/Western Germany). Serving as the scope of the sample is the CREDITREFORM database, processed by the ZEW for this specific purpose. The written questionnaire was sent out in March 2005 and was to be returned by July 2005. Around 5,200 firms responded to the questionnaire. In order to correct for a possible bias in the firms' response behaviour, another 4,200 companies were selected at random from the non-responding firms and interviewed by telephone regarding the survey's core variables (August-September 2005).

The results are projected for the basic population in Germany. The data on firm, employment and revenue figures for the basic population of manufacturing, mining and most service sectors are based on publications of the German Federal Statistical Office from 1993-2003. The data for 2004 and for wholesale trade in 2003 are based on extrapolations made by the ZEW and are thus preliminary. Since no data is available in the official statistics for the basic population for some service sectors (banking/insurance, waste disposal, media) these were compiled and extrapolated by the ZEW using information from the German Central Bank and various federal agencies and industry associations. The size classification structure in the service sectors and East/West categorisation are partially based on ZEW estimates. From the 2005 survey onwards, statistics for a number of knowledge-intensive service sectors are drawn from the German Federal Statistical Office to reach the basic population. This led to changes from the previous population, which was based on value added tax statistics. To allow for uninterrupted temporal comparison of the innovation indicators in this sector grouping, the 2005 survey recalculates all indicators for knowledge-intensive services for the new basic population, going back to 1996. This leads to some discrepancies with previously published results.

The European harmonisation of this survey instrument in the course of the 2001 Community Innovation Survey (CIS 3) led to changes in the way some questions were posed, which has in turn made comparisons with values from previous years more complicated or even impossible. Among the affected indicators were the number of product and process innovation, and revenues from product innovations; all of the other service indicators were also influenced. In this sector group, comparisons of some core values – share of innovators, for instance – cannot be made. Each of the remaining innovation indicators in other services is limited to a lower degree of comparability.

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IMPRESSUM

Herausgeber: Zentrum für Europäische Wirtschaftsforschung GmbH (ZEW) Mannheim,
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Präsident: Prof. Dr. Dr. h.c. mult. Wolfgang Franz
Redaktion: Forschungsbereich Industrieökonomik und Internationale Unternehmensführung