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Innovation in Germany

Results of the German Innovation Survey 2004

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Mannheim, October 2005

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Confidence in the "Year of Innovation"

In the year 2003, the share of firms exhibiting successful product- or process innovations ("innovating firms") increased for the first time in three years. In manufacturing, 59% of all firms were able to successfully introduce new products into the market and/or new processes to their own operations. This represents a one-percent increase in innovation rate since 2002. In firm-related services the innovation rate rose from 49 to 52%; however, this is still far below the level reached between the end of the 1990s and 2001. Among distributive service providers (retail and wholesale, transport, real estate and renting) the share of successful innovators remained stable at 35%.

2003 seems to have ushered in a reversal of trend in the German economy's innovation orientation. Since 2000, firm participation in innovation had successively regressed. Market shortages of qualified employees were initially responsible in 2000, while 2001 was characterised by the worldwide economic recession and the continued stagnation of the German economy, which led to adverse conditions for innovative activities. Nevertheless, at the beginning of the "Year of Innovation", which was launched in January of 2004 with the "Partners for Innovation" by the German federal government, firms started to appraise markets with confidence once more and focus increasingly on innovations. This certainly owes to the worldwide economic recovery and German firms' booming exports.

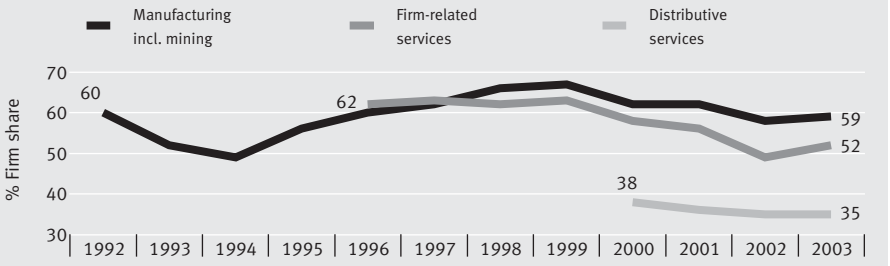
The share of firms investing in innovation projects in 2004 ("innovative firms") is presumed to have increased significantly. In 2003, this share was 59% in manufacturing. For 2004, 65% of firms indicated a mobilisation of financial resources for innovative purposes; just as many intend to allocate expenditures for innovation in 2005. More business-related service firms are also looking ahead more optimistically and turning to innovations. The share of innovative firms is expected to have increased from 57% in 2003 to 61% in 2004 and to rise further to 62.5% in 2005. An increased number of distributive service firms had actually planned in 2004 to carry out innovative activities, but a decline is once again anticipated for 2005.

The share of innovative firms is more volatile than the share of innovating firms, as the former relates to innovation activities in a certain calendar year. In contrast, the innovator share refers to all firms having introduced at least one innovation in the previous three-year period (see Box on p. 3). In the last five years the share of innovative firms has fluctuated considerably: After numerous innovation projects were put on hold in 2000 in an attempt to use the favourable cyclical situation to increase turnover - but also as a reaction to the lack of skilled labour - a sharp increase in the number of firms with innovation projects followed in 2001. However, in 2002 many firms disengaged from innovative activities, likely due to the cyclical lull that both worsened financing conditions and obfuscated turnover projections. In 2003, the share receded further in manufacturing and distributive services, while firm-related service companies concentrated increasingly on innovations. The high fluctuation in producer services indicates that entry and exit costs of innovation activities are rather low and innovation projects have often short terms.

More process innovators, fewer product innovators

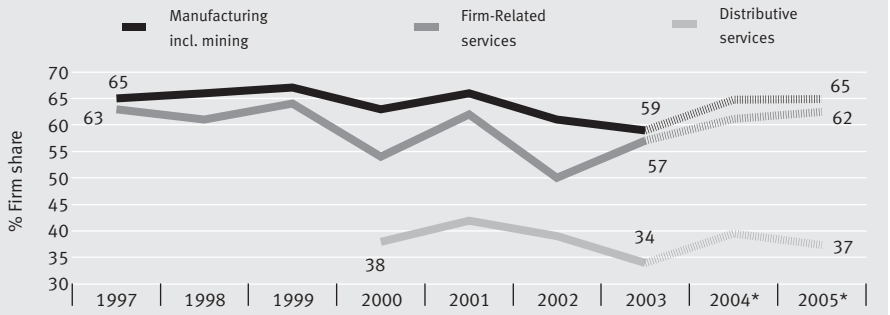
The fluctuation in the share of innovators between 2000 and 2003 can primarily be traced back to process innovation activity: The decline in the innovative share in manufacturing and firm-related services between 2000 and 2002 occurred due the presence of a small number of process innovators, just as the current rise in both sectors can be attributed to revitalised process innovation activity. The percentage of process innovators stood at 35% (manufacturing) and 34% (firm-related services) in 2003, comfortably

Innovator share, 1992-2003



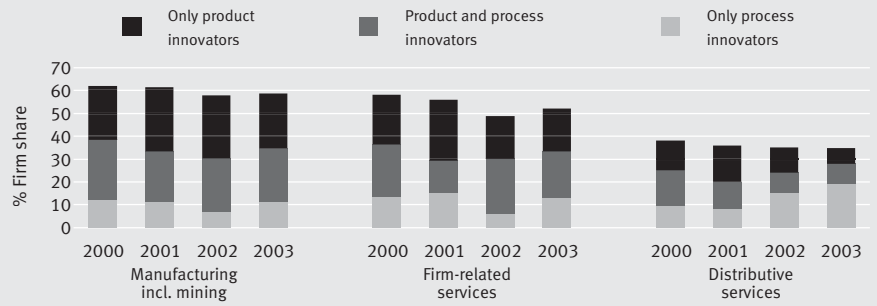
Source: ZEW (2004): Mannheim Innovation Panel.
Notes: Innovator share: innovators as a percentage of all firms. Figures for 2002 and 2003 are tentative. Figures for the service sectors are only available from 1996 on. Distributive service figures from 2000 on re not comparable with those from previous years and are only shown for 2000 and later. All figures are projected for the total firm population (firms with 5 or more employees) in Germany.

Innovative firms, 1997-2005



Source: ZEW (2004): Mannheim Innovation Panel.
* Data for 2004 and 2005 are based on firm plans and expectations at mid-2004.
Notes: Innovative firms: firms with positive innovation expenditures in a certain year as a percentage of all firms. Figures for 2002 and 2003 are tentative. Distributive service figures 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 firm population (firms with 5 or more employees) in Germany.

Product and process innovators, 2000-2003



Source: ZEW (2004): Mannheim Innovation Panel.
Notes: Figures for 2002 and 2003 are tentative. All figures are projected for the total firm population (firms with 5 or more employees) in Germany.

above the levels recorded for 2002 (with both areas just under 31%) but still below those from the year 2000 (38 and 36.5%, respectively). Also in 2003, 28% of all distributive-service firms introduced process innovations - even more than in 2000.

The decline leading up to 2002 is not surprising, as the implementation of process innovations very often demands more substantial investments. Investment conditions in periods of economic sluggishness are generally less favourable due to deteriorated external financing circumstances (in particular for small and medium-sized enterprises [SMEs]) underutilised capacities and more marginal cash flows.

The fact that process innovation activity increased in 2003 despite the still-adverse macroeconomic environment shows that firms could no longer postpone their rationalisation innovations without endangering their competitive positions. Indeed, the competitiveness of the German economy depends essentially on cost-efficient, high-yield production. Process innovations can also contribute to improvements in profit situations via cost reductions. In light of further-advancing financing restrictions on investments in SMEs (cf. results of KfW's SME panel from 2004), however, such innovations will more often be implemented with little or no investment. Instead, firms are expected to focus on organisational adaptations (more on this below).

The share of product innovators, on the other hand, shrank in all three sectors. In 2003 it stood at 47% in manufacturing (three to four percentage points below the level recorded in the previous three years), 39% in firm-related services (down four points from 2002 and six points from 2000) and just 15.5% in distributive services, while 29% of all distributive service firms had introduced new service elements in 2000. The third year of internal economic stagnation had thus left significant impressions on product innovation activities, particularly on less export-oriented sectors. This reflects the distinct importance of dynamic demand as a stimulant of the introduction of new products and services into the market.

Innovation expenditures increase

In spite of decreasing numbers of product innovators, the general sentiment is positive, which is emphasised by the development of innovation expenditures. The German economy's overall innovation expenditure totalled €96 billion in 2003 - a 2% increase from the previous year. It should be mentioned that the growth rates recorded for 2001 and 2002 were considerably higher at 4 and 6.5%, respectively. For 2004, firms' designs indicate a further nominal increase of just over 1%. Innovation expenditures should rise again slightly in 2005 (0.7%), reaching €98 billion.

Manufacturing is crucial to this positive development: It accounts for 74% of the included sectors' innovation expenditures. This sector group's funding of innovation projects increased further in 2003 to more than €71 billion, the highest value attained since the inception of the ZEW's innovation survey. This figure had totalled a mere €60 billion in the year 2000. Manufacturing firms anticipate even higher total innovation expenditures in the coming years, although the increase should level off. While innovation expenditures in 2001 rose nominally by 7% from the previous year, nominal growth rates in 2002 and 2003 sank to 6 and 5%, respectively.

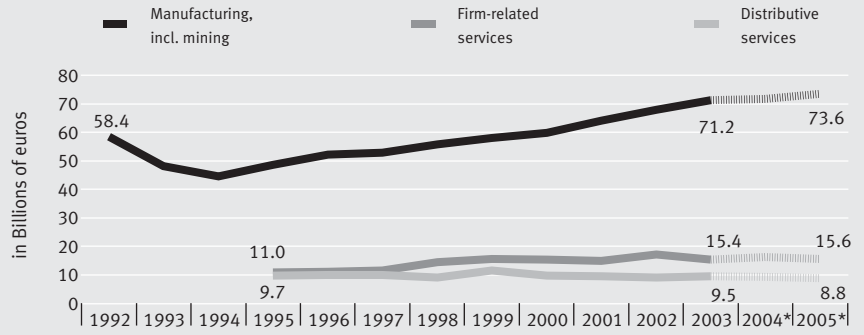
An increase of nearly one percent is now expected for 2004. According to firms' expectations, the year 2005 will see a somewhat stronger surge (calculated annually) of 2.5%. One should note, however, that firm projections take place under high uncertainty about the future dynamics of the German economy and macroeconomic conditions such as exchange rates and commodity prices. Changes in these variables with respect to current expectations are very likely to result in adjustments in firms' innovation budgets.

In firm-related services, innovation expenditures regressed significantly in 2003 from the previous year. While more financial resources than ever before (€17 billion) were earmarked for innovations in 2002, this figure fell by 11% to around €15.5 billion in 2003. This corresponds to the same volumes recorded for 1999 and 2000. Both the sharp increase in 2002 and 2003's decline can essentially be ascribed to the banking and insurance industry. For 2004, firm-related service companies anticipate total innovation expenditures of over €16 billion, an increase of more than 5%; the outlook for 2005, however, is more pessimistic (-4%). The unstable economic environment seems to be leading to short-term innovation planning. Short-term adjustments are rather easy to realise in firm-related services compared to manufacturing since innovation in services

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.

Innovation expenditures, 1992-2005



Source: ZEW (2004): Mannheim Innovation Panel.
* Data for 2004 and 2005 are based on firm plans and expectations at mid-2004.
Notes: Figures for 2002 and 2003 are tentative. Figures for the service sectors are only available for 1995 and later. Distributive service figures from 2000 on are only partially comparable with those from previous years. Firm-related services in 2001 do not include expenditures for UMTS licenses. All figures are projected for the total firm population (firms with 5 or more employees) in Germany.

only rarely requires time consuming R&D and preparatory investment in advance. Innovation projects in services are most often realised in short timeframes (less than one year). This fact may also explain the high fluctuation in the share of innovative firms in this sector.

Innovation expenditures in distributive services appear to be only slightly dynamic, standing at €9.5 billion in 2003, the same as in 2001 and a modest increase (+4%) from 2002. Firms had actually planned a significantly larger gain around mid-2002, which was apparently pared down throughout the remainder of the year. This sector was dominated by a sceptical future outlook in the middle of 2004: Innovation expenditures are expected to have dropped by 2% in 2004 and to decrease further by 5% in 2005 from the respective previous years. This negative projection is likely connected to sustained, weak domestic demand in Germany, as distributive service firms operate for the most part domestically.

Innovation intensity on the rise

The strong increase noted in innovation expenditures in manufacturing since 2001 along with simultaneous revenue growth led to a considerable jump in innovation intensity; that is, the ratio between the total volume of innovation expenditures and the total revenue of all firms (innovators and non-innovators). At 5.0%, this value has reached a level not seen in manufacturing since 1993. Innovation intensity also increased further in firm-related services – not including the banking and insurance industries – to 3.3% in 2003. In distributive services and the banking and insurance sectors, innovation intensity has oscillated between 0.7 and 0.9% in the past few years with no discernible tendency to rise or fall.

All things considered, a decline in innovation intensity is expected for the years 2004 and 2005: Thanks to the attraction of the current economic growth, higher (anticipated) nominal increases in revenue can be observed alongside the low nominal growth rates in innovation expenditures. Depending on sector, organisations currently expect revenue increases of at least 1-3%. Past experience also indicates that after a phase of weak growth, firms again utilise a stronger demand dynamic to consolidate and expand their market position; they apply their resources primarily to production and marketing to realise yields on innovation projects promoted during the weak phase. This was observed in 1997 and 2000 and many factors indicate that this will again be the case should the economic upturn continue throughout 2005. One should also remember that strong economic growth can cause skilled labour shortages to again become virulent and lead to limitations in expanding innovation expenditures beyond current plans.

Investments in innovation remain low

The share of investments in real capital and immaterial values (patents, licenses, etc.) in the total volume of innovation expenditures was lower in 2003 than in the previous ten years. In both manufacturing and firm-related services, approximately one-third of all innovation resources were allocated to investments. In 1999 the figures recorded for these sectors were 44 and 50%, respectively.

Innovation expenditures

Innovation expenditures refer 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 expenditures 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.

In light of the underutilised capacities and banks' reservedness in granting loans in 2003, this development comes as no surprise; it is in line with the German economy's generally quite conservative level of investment activity. As a consequence, according to Germany's Federal Statistical Office, gross fixed investments in the company sector fell by 2.2%: Innovation activity continues to migrate away from investment to personnel- and material expenditures. This also means that the increase in process innovation activities presented above does not imply such great advances in new process technology investments (machines, facilities), but rather that a greater number of less cost-intensive possibilities of process optimisation - through organisational measures in conjunction with the implementation of software and other forms of information technology, for instance - or of advanced training or con-

Sector groups

Manufacturing: includes mining and quarrying, and recycling (NACE 10-37).
Firm-related services: banking and insurance, computer services and telecommunications, technical services (architectural and engineering activities, technical testing and analysis, R&D), consulting (legal, accounting and auditing activities, advertising) and other producer services (e.g. cleaning, security, provision of personnel, waste management) (NACE 64.2, 65-67, 72-74, 90).
Distributive services: wholesale and retail (incl. repairing), transport and storage (incl. post and courier activities), real estate and renting (NACE 50-52, 60-63, 64.1, 70-71).

tinued improvements based on installed technologies can be used.

Despite all this, a considerable increase in nominal innovation investments can be seen for the first time since 2000 (+7% from the previous year), constituting a slight rise in the share of these investments in total innovation expenditures from 32 to 33%. On the other hand, firm-related services experienced an 18% slump in innovation investments. Only the distributive services sector broadened its investments in innovation projects significantly (+17%), compensating for the previous year's decline and boosting the sector's share of innovation investment in total innovation expenditures back to the level recorded for 2001. Most responsible for this current climb are higher investments in retail and in the transport industry.

Fewer market novelties, higher cost savings

The generally positive development in innovation participation (rate of innovation) and innovation expenditures is currently being eclipsed by receding rates of innovation success with new products. The shrinking percentage of product innovators is mainly attributable to the low number of firms that are still able to introduce original innovations to the market - products that have never before been available (market novelties). This share fell from 28 to 23% in manufacturing, from just over 19 to 12.5% in firm-related services and from 8.5 to 6.5% in distributive services between 2002 and 2003.

Contrarily, the percentage of firms that have had innovation success solely through product imitations has increased in both manufacturing and firm-related services. 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.

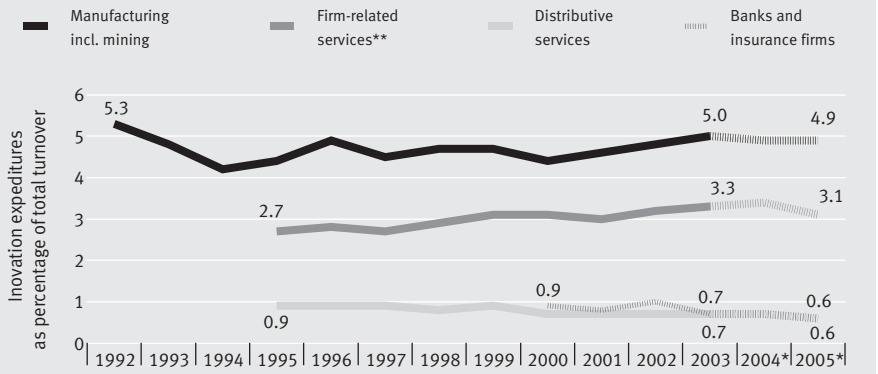
This is also supported by the decreased share of firms that have simultaneously introduced market novelties and entered a new market segment (firms with market and product-range novelties). Such firms comprised 15.5% of all manufacturing industry firms in 2003 (16.5% in 2002) and just 10.5% of all firm-related service firms in the same year (13.5% in 2002). With respect to product imitators, the percentage of firms that entered a market with at least a selection of their new products remained unchanged in manufacturing at 10%; in firm-related services this figure even rose from 11 to 13%. In distributive services the shares of both original innovators and product imitators with new product offerings declined sharply, which generally indicates less speculative product innovation activity (with an low overall percentage of successful product innovators) as well.

In contrast, more process innovators were successful in reducing costs as well as improving the quality of their innovations in 2003. The share of firms that were able to lower their unit costs through process innovations rose in all three sectors. In 2003 this figure stood at 24.5% (21% in 2002) in manufacturing, at 16% (12%) in firm-related services and at 13.5% (6%) in distributive services. Firms reacted thereby to the lifeless business cycle and worsened cost situation with an increased amount of rationalisation innovations.

Process innovations also increasingly served to improve the quality of the product supply; the percentage of firms that were able to raise the quality of their products through new or improved techniques rose in all three sectors. This surge was particularly pronounced in manufacturing between 2002 and 2003 (from 22 to 27%); in firm-related services the percentage rose from 22.5 to nearly 26% and from 14.5% to 17% in distributive services. An increasing number of process innovators were able to realise both effects; hardly shocking, as quality improvements made via optimised methods can lead directly to reduced costs - e.g. when post-processing or client complaints can be lessened or eliminated.

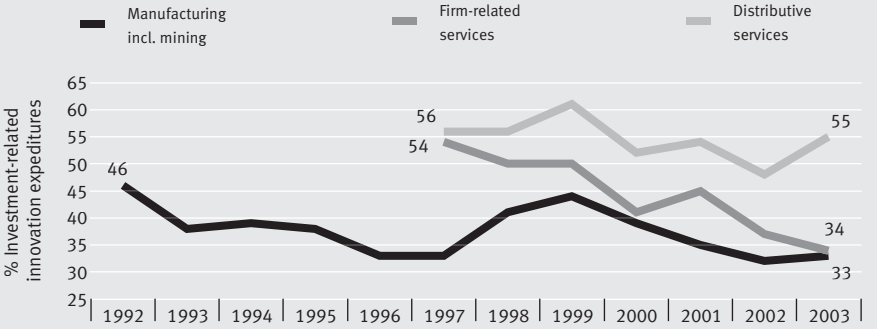
From a long-term perspective, however, it is clear that the share of process innovators that had success in reducing costs in 2003 was still comparatively small. In the later 1990s over 30% of manufacturing firms and over 20% of firm-related service firms successfully introduced cost-reducing process innovations - in other words, over five percentage points more than today. That said, in distributive services the prevalence of rationalisation innovations in

Innovation intensity, 1992-2005



Source: ZEW (2004): Mannheim Innovation Panel.
* Figures for 2004 and 2005 are estimated based on firm plans for innovation expeditures and estimations of revenue development in the three sectors. ** not including banks/insurance firms.
Notes: Total innovation expenditures as a percentage of total revenues from all firms. Figures for distributive services from 2000 on are only partially comparable with those from previous years. Service sector figures are not surveyed before 1995. Figures for banks and insurance companies are available from 2000 on only. All figures are projected for the total firm population (firms with 5 or more employees) in Germany.

Investment share in total innovation expenditures, 1992-2003



Source: ZEW (2004): Mannheim Innovation Panel.
Notes: Figures for 2002 and 2003 are tentative. Figures for distributive 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.

Product innovators with market novelties and with new product lines, 2002-2003

Source: ZEW (2004): Mannheim Innovation Panel.
Notes: Figures are tentative. All figures are projected for the total firm population (firms with 5 or more employees) in Germany.

2003 re-attained the peak value recorded in the year 1999.

The proportion of new-to-the-market innovators in 2003, on the other hand, represents the lowest value the service sectors have exhibited since the introduction of this indicator. The figure recorded for manufacturing (23%) very nearly corresponds to the lowest number recorded for the value (from 1994). This development should give rise to some worry, as the German economy's competitiveness is based essentially on the high degree of its products' novelty and its qualitative prominence compared to other suppliers. Cost reductions - which are currently more central to firms' innovative efforts - are necessary to maintaining a presence in the market through the efficient production of goods and services at competitive prices. However, such cuts cannot insure Germany's (still strong) position on international markets on their own in the long run.

Regressive innovation success

The immediate economic success of innovative activities can be measured as share of revenue based on product innovations and share of unit costs reduced through process innovations. One should bear in mind that some time can pass between the introduction of an innovation and the appearance of marked innovative success. In this respect, any rise or fall in the number of successful innovators does not necessarily lead immediately to a corresponding change in economic success concerning innovation activities.

Nevertheless, in product innovations just such a correlation can be observed: The shrinking share of product innovators is being accompanied by declining revenue shares from new products in all three sectors. After hovering above 30% in 2000, this percentage fell to 25% in manufacturing in 2003. In firm-related services just 16% of total revenue was obtained with new products, compared to 23.5% in 2001. Revenue shares from product innovations are traditionally low in distributive services, but a slight drop from 8 to 7% can also be ascertained here.

New-to-the-market innovators are at least still able to retain their innovative success in manufacturing and in distributive services. Market novelty revenues in manufacturing remained constant at 7.5% from the previous year, just under the peak values reached in 1999 and 2000 (over 8%). Hence, the sharp decline (5%) in product innovation revenues seen between 2000 and 2003 occurred at the expense of product imitators.

In contrast, in firm-related services revenues based on new-to-the-market innovations sank significantly, resting at 5% — well below the 2001 level (over 7%). The fact that innovations introduced in 2000 were no longer counted as new products after the beginning of 2003, thereby excluding revenues procured from these innovations after that point from the calculation of this indicator, definitely played a role in this slump. In 1999 and 2000 a large number of firm-related service firms happened to introduce market novelties, particularly in conjunction with internet applications and new information and communication technologies (software, telecommunications, e-commerce, internet consulting). These new offerings contributed to the high original innovation-based revenues recorded for 2001.

Despite a greater number of process innovators that were able to reduce costs, the share of reduced unit costs in the total expenditures of all firms (innovators and non-innovators) decreased further in both manufacturing and in firm-related services. In

Cost reductions and quality improvements through process innovations, 2002-2003

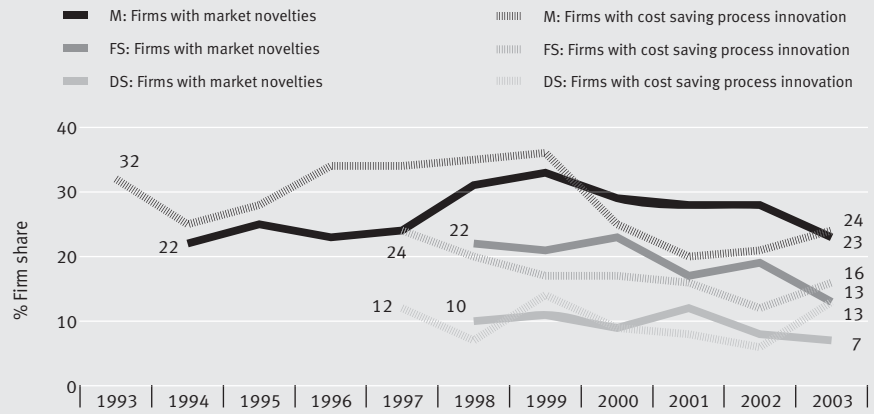
Source: ZEW (2004): Mannheim Innovation Panel.
Notes: Figures are tentative. All figures are projected for the total firm population (firms with 5 or more employees) in Germany.

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.

Market novelties and cost saving process innovations, 1993-2003



Source: ZEW (2004): Mannheim Innovation Panel.
Notes: Figures for 2002 and 2003 are tentative. Figures for distributive services (DS) from 2000 on are only partially comparable with those from previous years. Market novelties first surveyed in manufacturing (M) in 1994; in the service sectors, 1998. Cost saving process innovations first surveyed in the service sectors in 1997. FS: firm-related services. All figures are projected for the total firm population (firms with 5 or more employees) in Germany.

manufacturing this indicator currently stands at 4.5%, well below the level attained at the end of the 1990s (6-8% annual unit cost reductions through process innovations); in firm-related services the decline is less pronounced, but still lower overall (4%, down from 5% in 2001 and 2002). On the other hand, distributive service firms were able to increase their rate of success in process innovation-driven rationalisations from 2 to 3%.

The increased number of firms exhibiting successful rationalisation innovations not being reflected in higher economy-wide cost reductions can be explained by citing delayed effects. Full economisation potential is often only realised in the second or third year following the introduction of a new process technology or improvement of a provision of services, whereas high adjustment and learning costs can emerge in the first year, counterbalancing any technologically envisioned unit cost reductions.

Additionally, in the year 2003 process innovation activity seems to have concentrated on continuous improvement of already installed technology, which portend less pronounced immediate effects compared to larger investments in new technologies. After all, low capacity utilisation in 2003 must be considered, which may also have led to a less than optimal exhaustion of cost reduction possibilities regarding new technologies.

Increasing interest in R&D

Research and development (R&D) is one of the central components of innovation activities. Around 60% of all innovation expenditures in manufacturing are allocated to R&D; this share is lower in the service sector at one-third (distributive) to nearly half (firm-related), but R&D is also an essential component of innovation projects in these fields. In the past ten years the importance of R&D in innovation activities has experienced an increasing trend.

The share of firms engaging continuously in internal R&D serves as a measure of the orientation of innovation activities on the production of new knowledge and is thus an indicator of the demand that innovative plans place on the development of new technologies and methods. R&D participation increased again in 2003 after a slight decline in manufacturing and a period of stagnation in the service sector between 2000 and 2002. In 2003 a quarter of all manufacturing firms and nearly a fifth of all firm-related service firms were involved in R&D on a continuous basis. In distributive services, continuous R&D activity is hardly common, reported by just over 1% of firms.

The increasing share of firms engaged in R&D in conjunction with an essentially stagnating percentage of innovating firms indicates that innovative activity is being based more and more on firms' own R&D. As a consequence, the share of continuously researching innovators in all innovators in manufacturing rose from 33% (1999) to 42% (2003); in firm-related services, an increase from 20 to 34% was recorded.

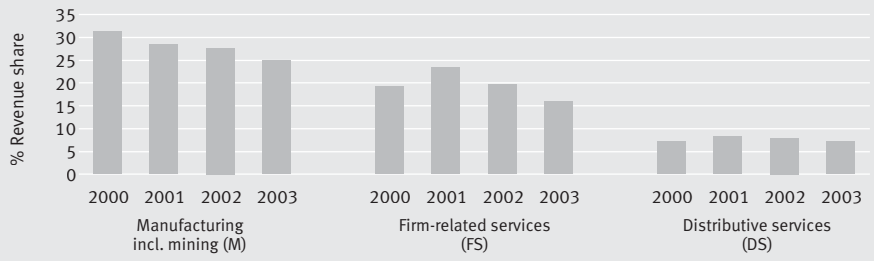
Innovation activities at sector level

Innovative activity can differ greatly between the various sectors of an economy. For instance, in manufacturing the share of innovators fluctuates between 35% (mining, food/beverages) and over 80% (chemicals); in firm-related services this figure can lie anywhere between 31% (other producer services) and 70% (software/telecommunications). Similarly significant contrasts can be observed in other indicators.

According to the indicator implemented, other sectors prove to be the "most innovative" ones:

- With respect to innovation- and R&D participation, the chemical and pharmaceutical industry comes out ahead with 81% of all

Revenue shares from product innovations, 2000-2003



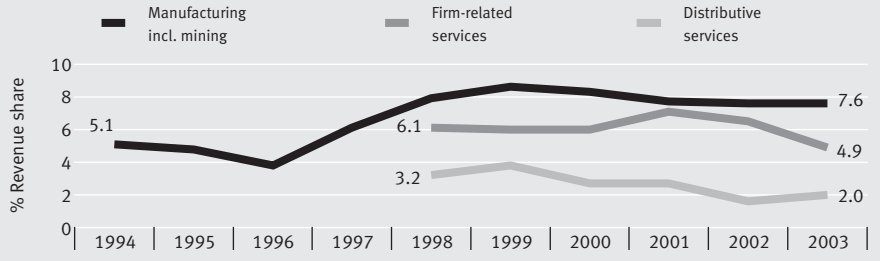
Source: ZEW (2004): Mannheim Innovation Panel.
Notes: Figures for 2002 and 2003 are tentative. Firm-related services do not include banks and insurance companies. All figures are projected for the total firm population (firms with 5 or more employees) in Germany.

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.

Revenue shares from market novelties, 1994-2003



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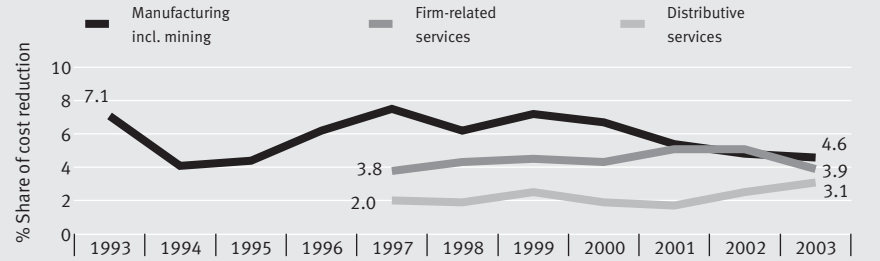
Cost saving through process innovations, 1993-2003



Source: ZEW (2004): Mannheim Innovation Panel.
Notes: Values for 2002 and 2003 are tentative. Values for distributive services from 2000 on only partially comparable with those from previ-ous years. Service sector values not surveyed before 1997. Firm-related services not including banks/insurance companies. All figures are projected for the total firm population in Germany.

firms having introduced successful innovations and 56% engaging in continuous R&D. The second-highest share of innovators is found in manufacturing of instruments (medical, precision and optical instruments) at 78%; this sector also has the third-highest percentage of firms with continuous R&D (50%). In terms of R&D participation, the electronics industry lies between chemicals/pharmaceuticals and instruments (51%). Mechanical engineering evinces the third-highest innovator share (75%).

■ Concerning the absolute level of innovation expenditure, transport equipment (motor vehicles, aircraft, railway, ships) was the clear leader in 2003 with expenditures of €24 billion. The following sectors combined - chemicals/pharmaceuticals (just over €11 billion) and electronics (€10.5 billion) - do not reach the expenditure level set by producers of automobiles, aircraft, watercraft and trains. A quarter of the entire German economy's innovation expenditures can be attributed to manufacture of transport equipment.

■ Innovation intensity is highest in instruments at 9%, while the transport equipment sector spends around 8% of its revenue on innovative projects. Technical and R&D service firms come in at 7.5%, followed by the electronics industry (7.2.%). In retail, banking/insurance and real estate/renting, however, innovation intensity stands at less than one percent.

■ Regarding revenue acquired from new products, the transport equipment industry holds a clear lead with around €145 billion. This sector alone accounts for almost 30% of the German economy's total product innovation revenue. In relation to the transport equipment industry's total revenue, product novelties constitute 49%, also the leader in the sector ranking. Additionally, high absolute innovation revenues are attained by the banking/insurance and wholesale industries. This is mostly a size effect in both of these sectors resulting from their high levels of revenue (a combined 35% of total revenue in the German business sector as covered here). Their shares of revenue from new products, however, are at the lower end of the spectrum at 15 and 10%, respectively. Following transport equipment manufacturing with respect to this indicator are the electronics (35%) and software and telecommunications industries (30%). Here one should remember that revenue shares from new products are highly influenced by a sector's average product lifespan. That is why, for example, the chemicals/pharmaceuticals industry trails in this area: Its products are often on the market for 10-20 years, while product cycles in sectors focused on information and communication technologies are typically just 2-3 years in length.

■ The share of revenue from market novelties is also highest in the transport equipment industry (16%). The software/telecommunication (almost 10%) and instrument sectors (9%) also attain high shares of revenue with new-to-the-market products. In revenue shares with product novelties, an indicator of the contribution made by product innovation activity in entering new market segments, banks and insurance firms lead after software/telecommunications and transport equipment.

■ Concerning immediate economic success in process innovation activity, the transport equipment sector again posts one of the highest values: Process innovations were able to cut just over 6% of unit costs. Transport equipment comes in second behind the electronics industry (7%) and ahead of software/telecommunications (5.5%) in the sector comparison. Revenue increases attributable to process innovation-induced quality improvements amount to 5.5% in transport equipment, a value that only the software/telecommunications sector is able to match. Coming in third with respect to this indicator is the banking/insurance industry. The individual ZEW Sector Innovation Reports (http://www.zew.de/innovation) provide more information on the development of the-

Indicators of innovation success

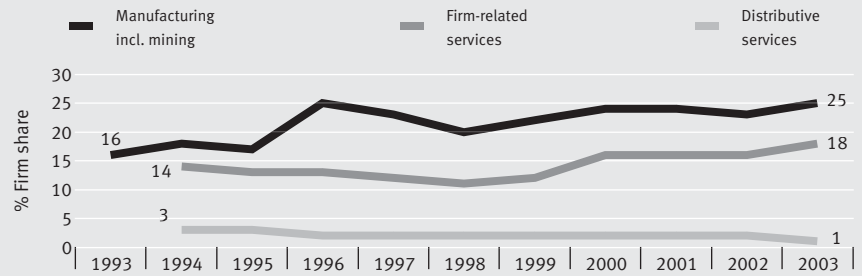
Revenue shares from product innovations refers to revenue from the year in question that has been acquired with new or markedly improved products/services introduced in the previous three-year period.

Revenue shares from market novelties refers to revenue from the year in question acquired thanks to market 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.

In firm-related services, these indicators are calculated excluding banks and insurance companies as turnover figures are not available for all years in this sector.

Firms evincing continuous R&D activity, 1993-2003



Source: ZEW (2004): Mannheim Innovation Panel.
Notes: Figures for 2002 and 2003 are tentative. Figures for 1997 and 1995 not surveyed in the service sectors. Service sector figures are only available from 1994 on. All figures are projected for the total firm population (firms with 5 or more employees) in Germany.

R&D Activities

Research and development (R&D) comprises creative work undertaken 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.

se innovation indicators at the sector level in recent years.

Weak innovation performance by SMEs

The innovative activities of small and medium-sized enterprises (SMEs) also left something to be desired in 2003. After a significant decline in share of innovators in SMEs from 1998/1999 to 2002, this regressive trend was indeed stopped in 2003, but no strong increase in successful innovative activities was observed either. In manufacturing firms with less than 50 employees the innovator share rose slightly from 50% in 2002 to 52% in 2003; in firms with 50-99 and 100-499 employees this share remained constant at 69 and 73%, respectively. A small drop in the share of innovators in large firms can be observed; with over 90% of such firms successfully innovating, however, this figure is still very high.

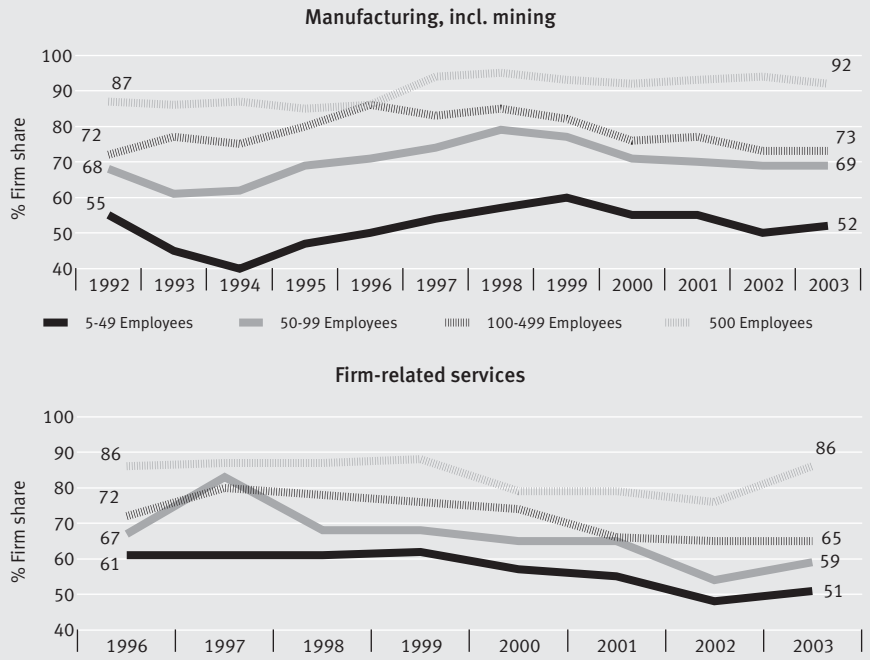
In firm-related services a very similar development is seen among SMEs: In the pool of SMEs with less than 50 employees the innovator share rose slightly from 48 to 51%; among mid-sized firms (100-499 employees) the share held steady at 65% between 2002 and 2003. Firms with 50-99 employees evince - after a sharp decline in 2002 - increased interest once more (from 54 to 59%). Among large firms the share of innovators saw a strong increase from 76 to 86%.

Performance figures on innovation activity, by sector in 2003

	Share of innovation	Share of firms with continuous R&D	Innovation expenditures	Innovation intensity	Revenue from new products	Share of revenues from new products	Share of revenues from market novelties	Share of revenues from product-range novelties	Share of unit cost reduced through process innovation	Revenue growth due to product quality improvements based on process innovation
	%	%	billions €	%	billions €	%	%	%	%	%
Mining and Quarrying	35	5	0.4	1.9	2	9	2.2	2.1	3.6	1.3
Food/Tobacco	36	7	2.6	1.7	18	12	2.8	4.8	2.2	2.7
Textiles/Clothing/Leather	53	14	0.8	2.9	5	19	4.7	3.6	1.7	1.9
Wood/Paper/Printing/Publishing	47	11	2.6	2.9	13	14	3.2	2.7	3.7	2.7
Chemicals/Pharma/Petroleum	**81**	**56**	**11.2**	4.7	29	12	6.1	5.3	3.6	3.1
Rubbers/Plastics	65	25	2.4	4.1	13	22	4.5	5.2	5.5	3.0
Glass/Clay/Stoneware	44	28	1.0	3.0	5	14	3.5	2.9	2.4	2.4
Metal Production and Processing	62	18	4.0	2.7	22	15	3.9	2.9	4.2	4.1
Mechanical Engineering	**75**	42	8.0	5.0	36	23	7.7	4.0	4.5	4.0
Electronics/Electrical Machinery	73	**51**	**10.5**	7.2	51	**35**	7.3	5.9	**7.1**	2.8
Instruments	**78**	**50**	3.0	**9.0**	10	29	**8.6**	5.4	4.7	3.1
Vehicles	70	36	**24.2**	**8.1**	**146**	**49**	**16.0**	**9.0**	**6.2**	**5.5**
Furniture/Sports/Games/Recycling	48	14	0.5	1.7	7	24	5.8	1.6	2.0	1.3
Wholesale Trade	34	5	2.3	0.4	**53**	10	2.5	4.5	2.9	3.9
Retail Trade	35	0	2.8	0.5	25	5	1.6	3.7	3.1	4.3
Transportation/Postal Services	31	3	3.4	2.3	10	7	1.1	3.1	2.6	3.1
Banks/Insurances	50	10	5.7	0.7	**107**	14	4.0	**7.4**	4.1	**4.6**
Software/Telecommunications	70	31	4.4	6.1	22	**30**	**9.7**	**9.6**	**5.5**	**5.6**
Technical/R&D-related Services	67	31	2.8	**7.5**	5	14	3.1	6.7	3.0	3.5
Consulting/Marketing	48	13	1.7	1.5	16	15	4.7	5.5	4.9	2.7
Other Firm-related Services	31	3	0.9	1.1	4	5	1.4	4.0	1.4	4.1
Real Estate/Renting	39	1	1.0	0.9	7	7	2.3	3.1	4.3	4.5

Source: ZEW (2004): 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 (firms with 5 or more employees) in Germany.

Innovator share by firm-size, 1992-2003



Source: ZEW (2004): Mannheim Innovation Panel.
Notes: Figures for 2002 and 2003 are tentative and only available from 1996 on for the service sector. All figures are projected for the total firm population (firms with 5 or more employees) in Germany.

While large firms constantly expand their innovation expenditures, the dynamic of such spending is more cautious in SMEs. Innovation expenditures attributable to manufacturing SMEs have nominally remained more or less constant since 2000 (2000-2003: +2%) and have hardly breached the level attained in 1996. In firm-related services, on the other hand, a significant rise was observed in SMEs' innovation spending in 2002 and 2003 (+12 and +9%, respectively), a continuation of the steady growth seen in resources allocated to innovation projects since 1996.

With almost €8.5 billion, firm-related service SMEs spent almost 40% more on innovations in 2003 than in 1996. Numerous young firms founded in the late 1990s were responsible for this dynamic development, attempting to position themselves in the knowledge-intensive service market using their innovations. Contrarily, in distributive services the innovation spending of SMEs dropped to €4 billion (-2.5%), thus reaching a low level not seen since 1995.

A look into the future of SMEs in the middle of 2004 may have been cause for a degree of pessimism: In comparison to the already quite low level from 2003 (excluding firm-related services), SMEs in all three sectors can expect receding innovation budgets through 2005. Still, large manufacturing and firm-related service firms intend to further increase their innovation budgets in the same period. While SMEs in manufacturing anticipate declines in 2004 and 2005, SMEs in firm-related services project another increase for 2004 (+2.5%), which is to be followed by a sharp drop (-7.5%) in 2005. In distributive services, SMEs report a decline for 2004 (-6%) but expect a slight rise (+1.5) in 2005, making their overall development between 2003 and 2005 less unfavourable as that seen in large firms.

Since the number of SMEs that plan to perform innovation activities in 2004 and 2005 is increasing, the projected reduction in innovation expenditures means a reduction in average innovation expenditure per innovative SME. Especially those SMEs that intend to newly enter into innovation activities in 2004 und 2005 are likely to do this with a small amount of financial resources.

In addition to spending on innovations, innovation success in SMEs is also slackening: In manufacturing, revenue shares from SMEs' market novelties sank further to under 4%, not even reaching half of the level set by large firms (10%). The same ratio is seen in revenue shares from all types of new products, coming in at 14% for SMEs but at 31% for large enterprises. A similar situation can be observed in the service sector: Revenue shares with market novelties fell significantly in 2003, resting at just over 3% (firm-related services) and 1% (distributive services), only around half of the levels reached by large firms.

Concerning shares of cost reductions through process innovations, current developments are more positive, likely due to the increasing prevalence of rationalisation innovations in SMEs. SMEs in manufacturing were able to reduce their unit costs by around 2% through process innovations in 2003, a value also reached in 2001 and 2002 but less than 40% of the figure recorded for large firms. For firm-related service firms the value of this indicator remains constant at ap-

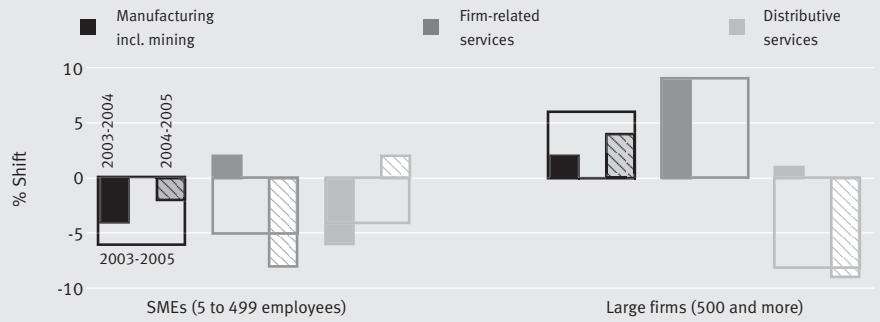
SMEs

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.

SMEs' innovation expenditures, 1992-2005

Source: ZEW (2004): Mannheim Innovation Panel.
Notes: Figures for 2002 and 2003 are tentative. Service sector figures are only available from 1994 on. Figures for distributive services from 2000 on are only partially comparable with those from previous years. Data for 2004 and 2005 are based on firm plans and expectations. All figures are projected for the total firm population (firms with 5 to 499 employees) in Germany.

Projected shift in innovation expenditures of SMEs and large firms, 2003-2005



Source: ZEW (2004): Mannheim Innovation Panel.
Notes: Figures are tentative. Data for 2005 are based on projected firm figures and expectations. All figures are projected for the total firm population (firms with 5 or more employees) in Germany

proximately 2%, while large firms in the same sector were able to realise cost reductions of 5%. In distributive services one can see a slight increase in rationalisation success to just over 1%, but this value amounts to just a quarter of that attained by large companies in this sector.

Overall, due to these issues SMEs continue to be a cause of concern in the German innovation system: Persistently low spending on innovation is seen along with low rates of innovative success with respect to both percentages of successful innovators as well as - and here most conspicuously - direct economic yields on innovation activities.

Eastern Germany: High innovation expenditures alongside declining returns from innovations

The innovative performance of the Eastern German economy is particularly important, as economic renewal- and economic growth in Eastern Germany depends largely on the innovative competency of Eastern German firms. The declared goal of economic and innovation policy is thus to strengthen the innovation activities of Eastern German firms through specific measures.

After registering a partially steep decline in the previous four years, the innovation participation of Eastern German firms increased markedly in 2003. Manufacturing's innovator share stood at 60% in 2003, thereby overtaking the same value in Western Germany for the first time since 1998. The downward trend in firm-related services was also turned around: In 2003 almost 50% of Eastern German firm-related service firms were counted among the most successful innovators, narrowing the distance to Western Germany (53%) once more. However, in distributive services the collapse experienced in 2002 could not be recouped; in 2003 less than a fourth of Eastern German firms were innovators (Western Germany: 37%).

The share of firms that are performing R&D on a continuous base increased in 2003 both in manufacturing and firm-related services, turning a three year trend of decreasing R&D activities in manufacturing and stagnating R&D activities in firm-related services. 25% of East German manufacturing firms perform R&D which is equal to the level observed for West German firms. In firm-related services, this indicator significantly increased from 12.5 to 16%, almost reaching the West German figure (18%).

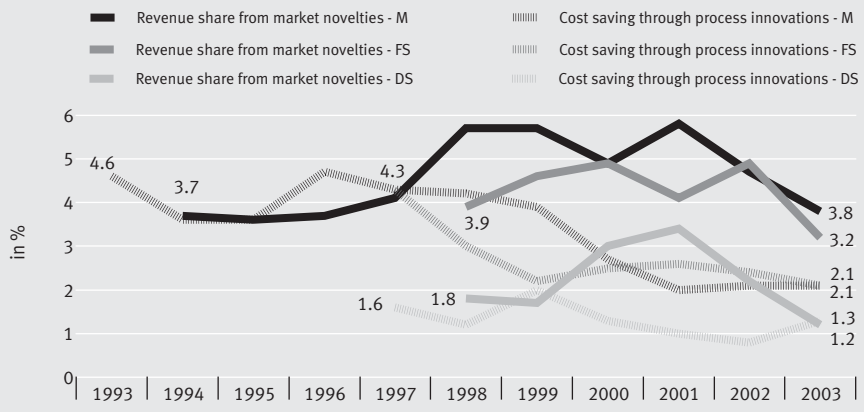
Innovation expenditures recorded up to 2003 also exhibit an overall upward trend in the Eastern German economy. In manufacturing, such spending increased strongly by 14% in 2003 after having already grown by 16% between 2001 and 2002. However, at almost €5.5 billion, just over 7% of all innovation expenditures in German manufacturing are distributed to the eastern part of the country. The strong growth seen since 1999 can primarily be traced back to large individual projects in microelectronics in the Dresden region and in vehicle manufacturing as well as to certain companies in West Berlin.

In 2003 a slight decrease in innovation expenditures in firm-related services is observable, following the broad expansion carried out in the previous two years. The driving forces behind this expansion were the sectors software/telecommunications and technical/R&D-related services. Around €1.7 billion were directed towards Eastern German firms, about 11% of all innovation spending in firm-related services. In distributive services the significant increase seen in 2001 and the stagnation recorded in 2002 were followed by a decline to the level recorded in 2000 (just under €1.2 billion).

In terms of their willingness to invest in innovation projects, however, Eastern German firms have approached 2004 and 2005 with a considerable amount of scepticism for the future. In all three sectors a drop in innovation spending is projected, particularly in the field of service. Eastern German manufacturing firms reported in mid-2004 that innovation expenditures in 2005 were to be recorded at levels around 2.5% lower than those calculated for 2003, while Western German firms projected a 4% growth. Firm-related service firms even anticipate a drop of around 12% between 2003 and 2005 (Western Germany: +3%); distributive service firms expect a decline of more than 20%. That said, total innovation expenditures in Eastern Germany are heavily influenced by large individual innovative projects, allowing the revisions of just a few target figures by a small number of large firms to bring about significantly different developments.

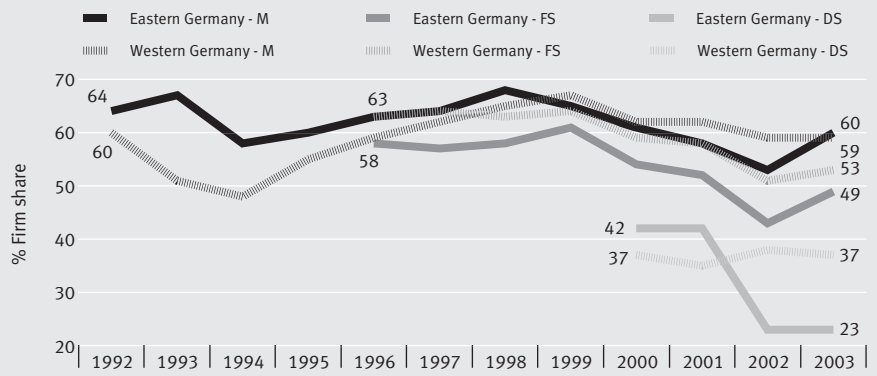
As a consequence of the strong increase seen in innovation expenditures in the last

Revenues from market novelties and share of reduced unit costs in SMEs, 1993-2003



Source: ZEW (2004): Mannheim Innovation Panel.
Notes: Figures for 2002 and 2003 are tentative. Figures do not include banks and insurance firms. Figures for distributive services from 2000 on are only partially comparable with those from previous years. All figures are projected for the total firm population (firms with 5 to 499 employees) in Germany.

Innovator share (East/West comparison), 1992-2003



Source: ZEW (2004): Mannheim Innovation Panel.
Notes: Figures for 2002 and 2003 are tentative. M: manufacturing. Firm-related services (FS) are only surveyed from 1996 on. Figures for distributive services (DS) from 2000 on are only partially comparable with those from previous years and only shown for 2000 and later. All figures are projected for the total firm population (firms with 5 or more employees) in Eastern- and Western-Germany.

three years, the Eastern German economy's innovation intensity has also risen with some force. In 2003 this figure came in above that of all three sectors in Western Germany; in other words, the economy of Eastern Germany was overall more innovation-intensive than that of the West. Here, the more concentrated orientation of innovation activity on investment continued to play an important role. The share of investment spending in total innovation expenditures lies between 43 and 47%; in Western Germany, this figure comes in below a third.

In firm-related services (excluding banks and insurance companies), innovation intensity amounted to just over 5.5% in 2003, almost twice as high as in the West. Two factors are behind this: Firstly, revenues of non-innovating firms developed more poorly (culminating in firm closure), causing innovation intensity to rise. Secondly, firms operating primarily in computing, consulting and - above all in 2002 - in technical services (particularly R&D firms) redeployed their resources in favour of innovation projects. This may also have been a reaction to the lower levels of production- and distribution activities caused by demand-related circumstances: Instead of dismantling personnel, attempts are made to use an economic slump for research and innovation projects. This sort of development was seen in 2001 and again in 2003. In manufacturing the discrepancy between East and West is less pronounced (5.5% in the East compared to 5% in the West).

Despite the high innovation intensity and the increasing expenditures for innovation projects, Eastern German firms' innovation success rates are still clearly below those in Western Germany. After a sharp decline in 2002, however, stabilisation and a slight partial increase from formerly low levels can be reported for important indicators of success in 2003. Revenue shares from market novelties in Eastern German manufacturing currently add up to 4.5%, three percentage points lower than the corresponding value in the West. In 2001 Eastern German manufacturing firms attained a 7.5% innovation success rate, thereby matching their Western German counterparts. Similar relations and developments can be observed with respect to revenue shares from new products (market novelties and imitations): While both regions recorded shares of just under 30% in 2001, this percentage sank significantly in the East to 16.5% and held steady in the West in 2002. In 2003, manufacturing firms in Eastern Germany were again able to record somewhat higher innovation revenues (increasing to 20%), while the West experienced a drop to 25%.

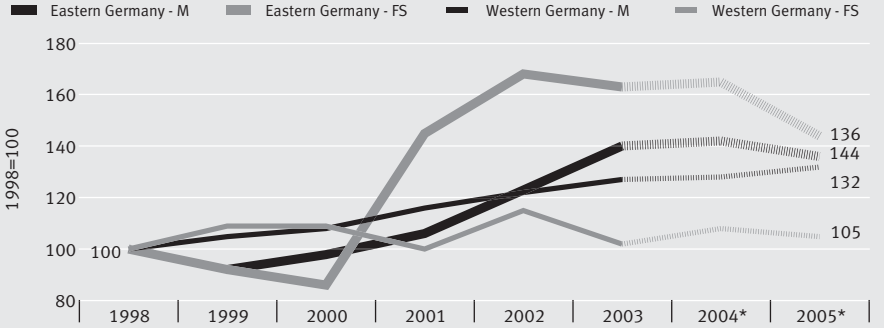
Process innovation success has also been somewhat less than ideal. Cost reductions through process innovations in Eastern German manufacturing amounted to around 3% in 2003, while Western German manufacturing firms came in at just over 4.5%. Still, in the East this share has risen again slightly since 2001. A similar increase from a previously low level can be seen in firm-related services. Rationalisation success rates in the East currently amount to 2.5%, but the gap between the two regions (Western Germany: 4%) continues to be substantial. In distributive services, cost reductions made possible by process innovations doubled in 2003 to 3%, thereby attaining the same level as Western Germany.

In Eastern German firm-related services, market-side innovation success also remained at the low level seen in 2002 in the following year, clearly missing the marks set between 1999 and 2001. With revenue shares from market novelties amounting to 2.5%, the distance to Western German firm-related service firms (5%) is considerable, but lessened in comparison to 2002.

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.

Innovation expenditures (East/West comparison), 1998-2005



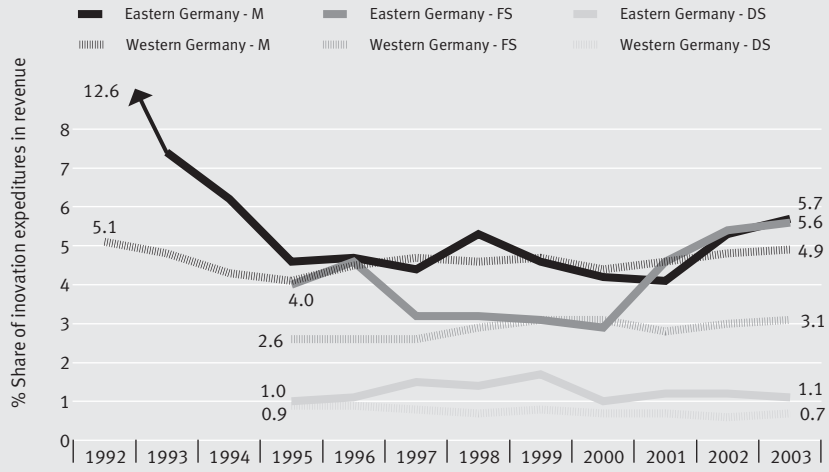
Source: ZEW (2004): Mannheim Innovation Panel.
* Data for 2004 and 2005 are based on firm plans and expectations.
Notes: Figures for 2002 and 2003 are tentative. All figures are projected for the total firm population (firms with 5 or more employees) in Eastern- and Western-Germany.

When comparing various measures of innovation success between Eastern and Western Germany, one observes that nearly all indicators point to the Eastern German economy's (often considerable) inferiority. At the same time, innovation intensity — that is, revenues that are reinvested in innovation projects — is significantly higher, indicating the Eastern German economy's lower innovation yields. Currently, only the revenue shares attained by manufacturing and firm-related service firms with new products that enlarge the firm's product range are higher in Eastern Germany.

Low innovation success in 2003 may partly be a cyclical effect: In 2001, Eastern revenue shares with product innovations were similar to those of Western German firms. Eastern German firms are still more focused on the German domestic market and are thus more strongly affected by its cyclical weakness than export-oriented Western German firms. Regarding process innovations, however, innovation success rates are low and decreasing further. A change of direction seems to be needed urgently: In the long run, the Eastern German economy will only be able to survive competitions of quality by implementing highly efficient systems of production.

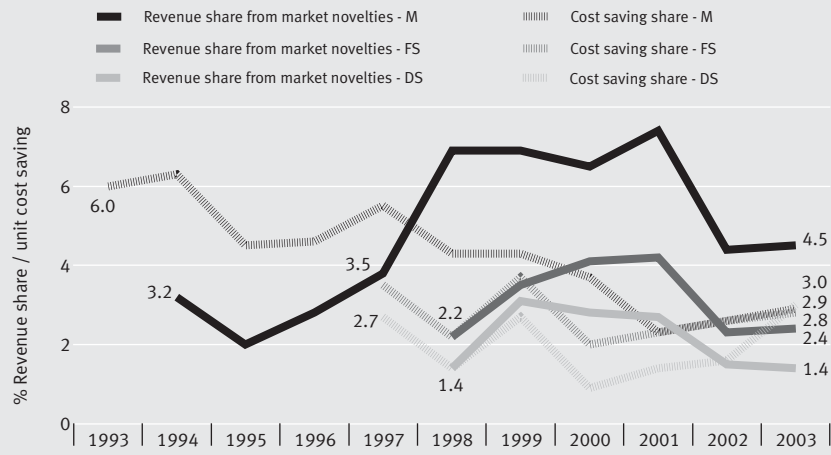
Further results of the German Innovation Survey, including a large number of analytic research papers and a series of policy related reports on subjects such as innovation in SMEs, technology transfer, sources of innovation, sector studies, can be found on ZEW's innovation website: www.zew.de/innovation. Anonymised micro data of the ZEW innovation survey are available to researchers, for details refer to the website, too.

Innovation intensity (East/West comparison), 1992-2003



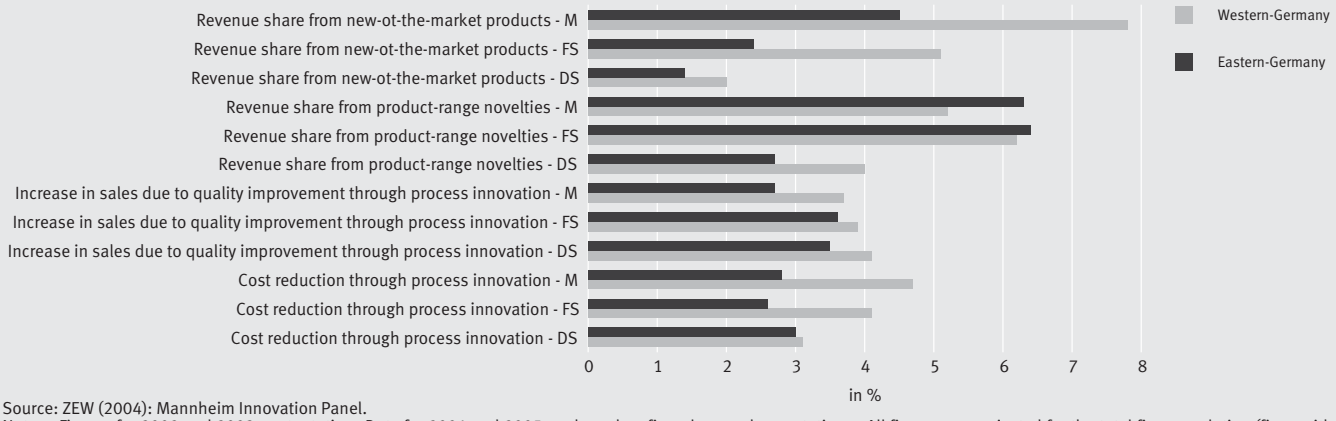
Source: ZEW (2004): Mannheim Innovation Panel.
Notes: Figures for 2002 and 2003 are tentative. Firm-related services do not include banks and insurance companies, figures are not surveyed be-fore 1995. M: manufacturing, FS: firm-related services, DS: distributive services. All figures are projected for the total firm population (firms with 5 or more employees) in Eastern- and Western-Germany.

Innovation success of Eastern German firms, 1993-2003



Source: ZEW (2004): Mannheim Innovation Panel.
Notes: Figures for 2002 and 2003 are tentative. Figures for revenue shares from market novelties are surveyed only from 1994 (manufactur-ing - M) and 1998 (firm-related services - FS, and distributive services - DS) on. Figures for cost savings in the service sectors are only surveyed from 1997 on. Firm-related services do not include banks and insurance companies. All figures are projected for the total firm population (firms with 5 or more employees) in Eastern- and Western-Germany.

Innovation success indicators (East/West comparison), 2003



Source: ZEW (2004): Mannheim Innovation Panel.
Notes: Figures for 2002 and 2003 are tentative. Data for 2004 and 2005 are based on firm plans and expectations. All figures are projected for the total firm population (firms with 5 or more employees) in Eastern- and Western-Germany.

Innovation Indicators for Manufacturing and Mining, 1993-2003

	1993		1994		1995		1996		1997		1998		1999		2000		2001		2002		2003	
	absolute	in %	absolute	in %	absolute	in %	absolute	in %	absolute	in %	absolute	in %	absolute	in %	absolute	in %	absolute	in %	absolute	in %	absolute	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
thereof:																						
Innovators	37	52	34	49	36	56	37	60	39	62	41	66	42	67	39	62	38	62	36	58	36	59
thereof:																						
Product Innovators	n. s.		n. s.		n. s.		n. s.		n. s.		n. s.		n. s.		31	50	31	50	32	51	29	47
Process Innovators	n. s.		n. s.		n. s.		n. s.		n. s.		n. s.		n. s.		24	38	21	34	19	30	22	35
Firms with new-to-the market products	–	–	15	22	16	25	14	23	15	24	20	31	21	33	18	29	18	28	17	28	14	23
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	24
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
Employees (1,000)	7796	100	7287	100	7100	100	6795	100	6751	100	6738	100	6725	100	6768	100	6773	100	6656	100	6613	100
thereof:																						
Innovators	6293	81	5776	79	5825	82	5664	83	5871	87	5950	88	5871	87	5628	83	5671	84	5472	82	5473	83
Firms with continuous internal R&D activities	4452	57	4216	58	4151	58	4340	64	–	–	4049	60	4093	61	4123	61	4288	63	4133	62	4077	62
Innovation expenditures (in billions of euros)	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	67.9	100	71.2	100
thereof:																						
Current expenditures	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	46.1	68	47.8	67
Investment	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	21.8	32	23.4	33
Share in turnover in %		4.8		4.2		4.4		4.9		4.5		4.7		4.7		4.4		4.6		4.8		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		27.7		24.9
Revenue share from market novelties		–		5.1		4.8		3.8		6.1		7.9		8.6		8.3		7.7		7.6		7.6
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		4.8		4.6

Source: ZEW (2004): Mannheim Innovation Panel.
Notes: Values for 2002 and 2003 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-sised Enterprises, 1993-2003

	1993		1994		1995		1996		1997		1998		1999		2000		2001		2002		2003	
	absolute	in %	absolute	in %	absolute	in %	absolute	in %	absolute	in %	absolute	in %	absolute	in %	absolute	in %	absolute	in %	absolute	in %	absolute	in %
Enterprises (1,000)	68	100	68	100	63	100	61	100	61	100	61	100	61	100	61	100	60	100	60	100	60	100
thereof:																						
Innovators	35	51	33	48	34	55	36	59	38	62	40	65	40	66	37	61	36	61	34	57	35	58
thereof:																						
Product Innovators	n. s.		n. s.		n. s.		n. s.		n. s.		n. s.		n. s.		30	49	29	49	30	50	28	46
Process Innovators	n. s.		n. s.		n. s.		n. s.		n. s.		n. s.		n. s.		23	37	19	32	18	29	20	34
Firms with new-to-the market products	–	–	14	21	15	24	13	22	14	22	18	30	20	32	17	28	16	27	16	27	13	22
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	23
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	23
Employees (1,000)	3637	100	3565	100	3423	100	3330	100	3375	100	3395	100	3408	100	3428	100	3398	100	3407	100	3406	100
thereof:																						
Innovators	2462	68	2367	66	2481	72	2541	76	2619	78	2708	80	2645	78	2430	71	2426	71	2351	69	2381	70
Firms with continuous internal R&D activities	1084	30	1235	35	1099	32	1338	40	–	–	1235	36	1231	36	1264	37	1251	37	1223	36	1269	37
Innovation expenditures (in billions of euros)	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	15.9	100	16.5	100
thereof:																						
Current expenditures	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	8.8	55	9.3	56
Investment	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	7.2	45	7.2	44
Share in turnover in %		4.3		3.3		3.7		3.3		3.2		4.1		3.9		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		13.9
Revenue share from market novelties		–		3.7		3.6		3.7		4.1		5.7		5.7		4.9		5.8		4.7		3.8
Share of cost reduction through process innovation		4.6		3.6		3.6		4.7		4.3		4.2		3.9		2.7		2.0		2.1		2.1

Source: ZEW (2004): Mannheim Innovation Panel.
Notes: Values for 2002 and 2003 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 to 499 and more employees in manufacturing and mining (NACE 10-37).

Innovation Indicators for Manufacturing and Mining – Eastern Germany, 1993-2003

	1993		1994		1995		1996		1997		1998		1999		2000		2001		2002		2003	
	absolute	in %	absolute	in %	absolute	in %	absolute	in %	absolute	in %	absolute	in %	absolute	in %	absolute	in %	absolute	in %	absolute	in %	absolute	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
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	5.3	53	5.9	60
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
Process Innovators	n. s.		n. s.		n. s.		n. s.		n. s.		n. s.		n. s.		3.5	36	2.8	29	2.8	29	3.8	39
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	22	2.0	20
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
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	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
thereof:																						
Innovators	498	72	463	73	399	71	415	77	435	79	448	80	455	80	446	76	473	74	413	69	439	72
Firms with continuous internal R&D activities	281	40	285	45	237	42	256	47	–	–	265	47	267	47	255	43	310	48	237	40	260	43
Innovation expenditures (in billions of euros)	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	4.8	100	5.4	100
thereof:																						
Current expenditures	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	52	3.1	57
Investment	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	2.3	48	2.3	43
Share in turnover in %		7.4		6.2		4.6		4.7		4.4		5.3		4.6		4.2		4.1		5.3		5.7
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		16.5		20.2
Revenue share from market novelties		–		3.2		2.0		2.8		3.8		6.9		6.9		6.5		7.4		4.4		4.5
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		2.6		2.8

Source: ZEW (2004): Mannheim Innovation Panel.
Notes: Values for 2002 and 2003 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) in Eastern-Germany.

Innovation Indicators for the Service Sectors, 1996-2003

	Firm-related Services*																Distributive Services **							
	1996		1997		1998		1999		2000		2001		2002		2003		2000		2001		2002		2003	
	absolute	in %	absolute	in %	absolute	in %	absolute	in %	absolute	in %	absolute	in %	absolute	in %	absolute	in %	absolute	in %	absolute	in %	absolute	in %	absolute	in %
Enterprises (1,000)	123	100	122	100	123	100	122	100	121	100	114	100	109	100	107	100	246	100	242	100	236	100	227	100
thereof:																								
Innovators	77	62	77	63	76	62	78	63	71	58	64	56	53	49	56	52	94	38	88	36	83	35	79	35
thereof:																								
Product Innovators	n. s.		n. s.		n. s.		n. s.		54	45	47	41	47	43	42	39	71	29	67	27	47	20	35	15
Process Innovators	n. s.		n. s.		n. s.		n. s.		44	36	33	29	33	30	36	34	62	25	49	20	57	24	64	28
Firms with new-to-the market products	–	–	–	–	27	22	26	21	27	23	20	17	21	19	13	13	21	9	29	12	20	8	15	7
Firms with process innovation driven cost reduction	–	–	30	24	25	20	21	17	20	17	18	16	13	12	17	16	22	9	19	8	14	6	30	13
Firms with continuous internal R&D activities	16	13	–	–	13	11	15	12	19	16	17	15	17	16	19	18	5	2	5	2	5	2	3	1
Innovation expenditures (in billions of euros)	11.2		11.5	100	14.5	100	15.6	100	15.5	100	14.9	100	17.2	100	15.4	100	9.7	100	9.5	100	9.1	100	9.5	100
thereof:																								
Current expenditures	–	–	5.3	46	7.2	50	7.9	50	9.2	59	8.3	56	10.9	63	10.2	66	2.5	26	4.4	46	4.7	52	4.3	45
Investment	–	–	6.2	54	7.3	50	7.7	50	6.3	41	6.6	44	6.3	37	5.2	34	7.2	74	5.1	54	4.4	48	5.2	55
Share in turnover in %		2.8		2.7		2.9		3.1		3.1		3.0		3.2		3.3		0.7		0.7		0.7		0.7
Innovation success (in %)																								
Revenue share from product innovations		n. s.		n. s.		n. s.		n. s.		19.3		23.4		19.6		16.0		7.3		8.2		8.0		7.2
Revenue share from market novelties		–		–		6.1		6.0		6.0		7.1		6.5		4.9		2.7		2.7		1.6		2.0
Share of cost reduction through process innovation		–		3.8		4.3		4.5		4.3		5.1		5.1		3.9		1.9		1.7		2.5		3.1

Source: ZEW (2004): Mannheim Innovation Panel.
Notes: Values for 2002 and 2003 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.
*Total firm population: Firms with 5 and more employees in sectors banking/insurance, computer services and telecommunication, technical services, consulting, other firm-related services (e.g. cleaning, security, provision of personal, waste management (NACE 64.2, 65-67, 72-74, 90).
**Total firm population: Firms with 5 and more employees in sectors whole sale and retail trade, transport incl. post services, real estate and renting (NACE 50-52, 60-63, 64.1, 70-71). 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, 1996-2003

	Firm-related Services*																Distributive Services **							
	1996		1997		1998		1999		2000		2001		2002		2003		2000		2001		2002		2003	
	absolute	in %	absolute	in %	absolute	in %	absolute	in %	absolute	in %	absolute	in %	absolute	in %	absolute	in %	absolute	in %	absolute	in %	absolute	in %	absolute	in %
Enterprises (1,000)	122	100	121	100	121	100	121	100	120	100	112	100	107	100	106	100	245	100	241	100	235	100	226	100
thereof:																								
Innovators	76	62	76	63	75	62	76	63	69	58	63	56	52	49	55	52	93	38	87	36	82	35	78	35
thereof:																								
Product Innovators	n. s.		n. s.		n. s.		n. s.		53	44	46	41	46	43	41	39	70	29	66	27	46	20	35	15
Process Innovators	n. s.		n. s.		n. s.		n. s.		43	36	33	29	32	30	35	33	62	25	48	20	56	24	63	28
Firms with new-to-the market products	–	–	–	–	27	22	25	21	27	22	19	17	21	19	13	12	21	8	29	12	20	8	15	7
Firms with process innovation driven cost reduction	–	–	29	24	24	20	20	17	20	17	17	15	13	12	17	16	22	9	18	8	14	6	30	13
Firms with continuous internal R&D activities	15	12	–	–	12	10	15	12	19	16	17	15	17	16	18	17	5	2	5	2	4	2	3	1
Innovation expenditures (in billions of euros)	6.5		6.3	100	6.7	100	7.0	100	7.3	100	6.8	100	7.7	100	8.4	100	4.8	100	5.0	100	4.1	100	4.0	100
thereof:																								
Current expenditures	–	–	3.0	48	3.5	53	3.3	47	4.2	58	4.2	61	4.9	64	5.6	67	2.1	45	2.0	41	2.0	49	1.7	42
Investment	–	–	3.3	52	3.1	47	3.7	53	3.0	42	2.7	39	2.8	36	2.7	33	2.7	55	2.9	59	2.1	51	2.3	58
Share in turnover in %		4.2		3.7		3.6		4.1		4.4		4.0		4.3		4.8		0.7		0.7		0.6		0.5
Innovation success (in %)																								
Revenue share from product innovations		n. s.		n. s.		n. s.		n. s.		15.7		15.1		14.6		15.9		6.7		9.1		6.9		5.0
Revenue share from market novelties		–		–		3.9		4.6		4.9		4.1		4.9		3.2		3.0		3.4		2.2		1.2
Share of cost reduction through process innovation		–		4.3		3.0		2.2		2.5		2.6		2.4		2.1		1.3		1.0		0.8		1.3

Source: ZEW (2004): Mannheim Innovation Panel.
Notes: Values for 2002 and 2003 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.
*Total firm population: Firms with 5 to 499employees in sectors banking/insurance, computer services and telecommunication, technical services, consulting, other firm-related services (e.g. cleaning, security, provision of personal, waste management (NACE 64.2, 65-67, 72-74, 90).
**Total firm population: Firms with 5 to 499 employees in sectors whole sale and retail trade, transport incl. post services, real estate and renting (NACE 50-52, 60-63, 64.1, 70-71). 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, 1996-2003

	Firm-related Services*																Distributive Services **							
	1996		1997		1998		1999		2000		2001		2002		2003		2000		2001		2002		2003	
	absolute	in %	absolute	in %	absolute	in %	absolute	in %	absolute	in %	absolute	in %	absolute	in %	absolute	in %	absolute	in %	absolute	in %	absolute	in %	absolute	in %
Enterprises (1,000)	19.4	100	18.9	100	19.2	100	19.5	100	19.2	100	17.9	100	17.0	100	16.7	100	42.4	100	41.5	100	40.1	100	38.6	100
thereof:																								
Innovators	11.3	58	10.8	57	11.2	58	12.0	61	10.3	54	9.2	51	7.1	42	8.2	49	17.6	42	17.8	43	9.1	23	8.9	23
thereof:																								
Product Innovators	n. s.		n. s.		n. s.		n. s.		7.0	37	6.2	35	5.4	32	6.7	40	14.9	35	15.0	36	6.7	17	5.3	14
Process Innovators	n. s.		n. s.		n. s.		n. s.		6.3	33	6.3	35	4.6	27	4.9	29	14.3	34	8.2	20	6.0	15	6.7	17
Firms with new-to-the market products	–	–	–	–	2.4	12	3.5	18	4.2	22	3.0	17	2.2	13	2.6	16	3.6	8	4.2	10	3.3	8	2.2	6
Firms with process innovation driven cost reduction	–	–	5.3	28	4.2	22	3.5	18	2.8	15	3.6	20	1.6	9	1.5	9	2.5	6	2.0	5	1.3	3	3.2	8
Firms with continuous internal R&D activities	2.4	12	–	–	2.3	12	2.3	12	2.5	13	2.2	12	2.1	13	2.7	16	0.6	1	0.7	2	0.3	1	0.6	1
Innovation expenditures (in billions of euros)	1.3		1.0	100	1.0	100	0.9	100	0.9	100	1.5	100	1.8	100	1.7	100	1.1	100	1.3	100	1.4	100	1.2	100
thereof:																								
Current expenditures	–	–	0.6	60	0.5	47	0.5	52	0.5	56	0.9	61	1.2	69	1.1	64	0.5	42	0.5	39	0.5	40	0.4	37
Investment	–	–	0.4	40	0.5	53	0.5	48	0.4	44	0.6	39	0.5	31	0.6	36	0.7	58	0.8	61	0.8	60	0.7	63
Share in turnover in %		4.6		3.2		3.2		3.1		2.9		4.6		5.5		5.6		1.0		1.2		1.2		1.1
Innovation success (in %)																								
Revenue share from product innovations		n. s.		n. s.		n. s.		n. s.		14.6		13.5		17.4		17.7		5.9		10.1		6.0		5.8
Revenue share from market novelties		–		–		2.2		3.5		4.1		4.2		2.3		2.4		2.8		2.7		1.5		1.4
Share of cost reduction through process innovation		–		3.5		2.2		3.7		2.0		2.4		2.2		2.6		0.9		1.4		1.6		3.0

Source: ZEW (2004): Mannheim Innovation Panel.
Notes: Values for 2002 and 2003 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.
*Total firm population: Firms with 5 and more employees in sectors banking/insurance, computer services and telecommunication, technical services, consulting, other firm-related services (e.g. cleaning, security, provision of personal, waste management (NACE 64.2, 65-67, 72-74, 90) in Eastern Germany.
**Total firm population: Firms with 5 and more employees in sectors whole sale and retail trade, transport incl. post services, real estate and renting (NACE 50-52, 60-63, 64.1, 70-71) in Eastern Germany. 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) is conducting annual surveys on innovation behaviour of German enterprises in cooperation with the Institute for Applied Social Science (infas) since 1993. These surveys focus on all firms located in Germany, having at least five employees and being active in the production sector as well as in distributive and firm-related services. The ZEW innovation survey is also the German part to the Community Innovation Survey conducted every four years under the co-ordination of Eurostat.

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 indicators of innovation performance). The 2004 survey was of the latter variety.

The 2004 sample comprises 19,500 firms 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 2004. Until June 2004, a total of about 3,900 firms responded to this questionnaire. In order to correct for a possible bias in the firms' response behaviour, another 4,000 companies were selected at random from the non-responding firms and interviewed by telephone regarding the survey's core variables (June-July 2004). About 4,100 firms could not be surveyed since they closed down or were not part of the target population at the time of survey. The total response rate (written questionnaire plus telephone interviews) was 51%.

The results are projected for the basic population in Germany. The data on firm, employment and revenue figures for the basic population of manufacturing are based on publications of the German Federal Statistical Office from 1992-2002. For 2003 the data are based on extrapolations made by the ZEW and are thus preliminary. Due to large gaps in the official statistics, the basic population for the service sectors in the period 1995-2001 was constructed using information from the Federal Statistical Office, the German Central Bank and various federal agencies and industry associations. The data for 2002 and 2003 are based in part on ZEW extrapolations of this basic population and are also tentative. The size classification structure in the service sectors are mainly based on the ZEW's estimates.

The European harmonisation of this survey instrument in the course of the 2001 Community Innovation Survey (CIS 3) has 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 distributive 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 distributive services is limited to a lower degree of comparability: In comparison to the values from the surveys conducted from 2001 on, those from previous surveys tend to be overestimated.

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ZEW
Zentrum für Europäische Wirtschaftsforschung GmbH

IMPRESSUM

Herausgeber: Zentrum für Europäische Wirtschaftsforschung GmbH (ZEW) Mannheim,
L 7, 1 · 68161 Mannheim · Postanschrift: Postfach 10 34 43 · 68034 Mannheim · Internet: www.zew.de
Präsident: Prof. Dr. Dr. h.c. mult. Wolfgang Franz
Redaktion: Forschungsbereich Industrieökonomik und Internationale Unternehmensführung