

**UNECE**United Nations Economic Commission for Europe

**Embargo:
3 October 2002,
00:01 hours GMT**

Press Release ECE/STAT/02/01
Geneva, 1 October 2002

**2001 was a record year for robot investment in Europe but one of
plummeting sales in Japan and the United States**

**Worldwide growth in the period 2002-2005 forecast at an average annual
rate of 7.5%**

**Household robots now on the verge of taking off
*UNECE issues its 2002 World Robotics survey***

Below are some of the many questions answered by the newly released survey ***World Robotics 2002*** produced by the United Nations Economic Commission for Europe (UNECE) in cooperation with the International Federation of Robotics (IFR). The following questions and answers provide an executive summary of this 380 pages in-depth analysis:

- **How did the recession and 11 September affect the robot business?** *"The European business did very well. The European Union scored record investments of 30,500 units or 2.5% over the previous record of year 2000",* says Jan Karlsson, responsible for the UNECE/IFR publication. In the United Kingdom and Spain investment surged by as much as 26% and 22%, respectively. On the other hand, robot investments in Japan fell by almost 40%. The market in the United States fell by 17%. When excluding Japan and the Republic of Korea, the world market fell by just 3%.
- **What about the trends in 2002 and the forecast for 2002-2005?** Confidence seems to be back in North America. Orders increased by 2% compared with the same period in 2001. In Asia the market expanded by 8%. In Europe, however, the market was gloomy. Orders fell by 15%. For the period 2002-2005, the world market is forecast to grow by an annual average of 7.5%.
- **How many robots are now working out there in industry?** Worldwide at least 760,000 units (possibly the real stock could be over one million units), of which 360,000 in Japan, 220,000 in the European Union and just under 100,000 in North America. In Europe, Germany is in the lead with just under 100,000 units, followed by Italy with 44,000, France with 23,000, Spain 16,000 and the United Kingdom with 13,000.
- **What is the forecast for 2005?** A conservative forecast points to some 965,000 worldwide, of which 352,000 in Japan, 321,000 in the European Union and 131,000 in North America.

.../

- **Is Japan's lead position in automation eroding?** Robot business was booming in Japan in the 1980s and early 1990s. The optimism was unlimited. It seemed as if everything that could be robotized was robotized. Since the middle of the 1990s, the momentum in the robot business has moved to Europe and North America but also to countries like Brazil. While the robot stock continuously increases in Europe and North America (8% and 10%, respectively, in 2001) it has been steadily falling in Japan since 1998. However, as from 2004 it is expected to start to increase again.
- **Why invest in robots?** In the last decade the performance of robots has increased enormously while at the same time prices have been plummeting. A robot sold in 2001 would have cost less than a fifth of what a robot with the same performance would have cost in 1990. In the last few years the price decrease of robots has, however, started to level off. Profitability studies have shown that it is not unusual for robots to have a pay-back period as short as 1-2 years.
- **And not hire people?** In Germany, for instance, the prices of robots relative to labour costs have fallen from 100 in 1990 to 35 in 2001 and to less than 20 when taking into account the radically improved performance of robots. In North America, the relative price dropped to 20 and to about 10 if quality improvements are taken into consideration. "*Falling or stable robot prices, increasing labour costs and continuously improved technology are major driving forces which speak for continued massive robot investment in industry*", concludes Jan Karlsson. Even in developing countries like Brazil, Mexico and China, robot investments are starting to take off at an impressive rate.
- **If robots are so profitable why is there not an even stronger rush to invest?** Robots are not products to be acquired "over the counter". In order to reap the benefits of robots, potential user companies must have sufficient in-house technological know-how as well as a thorough comprehension of their production processes.
- **How many robots per employee in the manufacturing industry?** About 270 per 10,000 employees in Japan, 130 in Germany, 100 in Italy, 90 in Sweden and between 50 and 70 in Finland, France, Spain, Benelux and the United States (the figure for Japan includes all types of robots while for all the other countries only multipurpose industrial robots are included. The figures are therefore not comparable).
- **In the car industry?** In Italy and Germany there is almost 1 robot per 10 production workers.
- **Are robots a threat to employment?** Yes, certain types of employment will continue to be replaced by robots, in particular those which have very bad working conditions: heavy lifting, repetitive tasks or hazardous workplaces involving smoke, heat, chemicals etc. Robots are never installed suddenly on a massive scale but rather in a step-wise manner, which leaves room for adjustment in employment. In the long run, 10-20 years from now, the robot population will, however, have grown very substantially while in the same time demographic conditions will have resulted in a sharp decrease in the working population. Robots will then to a larger extent help the active working population in supporting the "dependency burden", that is, an increasing share of the population that is not in the labour market, primarily because of the ageing of the population.
- **Are we seeing any service robots in our homes?** Lawn mowing robots have had their commercial breakthrough while vacuum cleaning robots have just recently been introduced on the market. Next in line are window cleaning robots.
- **How are service robots for professional use doing?** Medical robots, underwater robots, surveillance robots, demolition robots and many other types of robots for carrying out a multitude of tasks are doing very well. A stock of some 12,000 units was estimated at end 2001. In the period 2002-2005, another 25,000 units are projected to be added to the stock.

Details of the market development for industrial robots in France, Germany, Italy, Spain, United Kingdom and United States are presented in a separate press release for each of those countries.

The facts

The world market fell by 21% in 2001...

Worldwide sales of **multipurpose industrial robots**, admitting the fact that the figures for Japan and the Republic of Korea include all types of industrial robots, peaked in 1990 when they reached over 80,000 units (see table 1 and figure 1). Following the recession in 1991-1993, worldwide sales of industrial robots fell to about 53,000 units in 1993. The world robot market then started a period of strong recovery, which peaked in 1997 when it reached a level of 82,000 units. In 1998, however, sales plunged by 15% to just under 69,000 units. The market recovered sharply in 1999 with sales of nearly 80,000 units, an increase of almost 15% over 1998. In 2000, growth accelerated to 24%, attaining a record of almost 99,000 units. **In 2001, however, the world market fell by 21%, reaching 78,100 units.**

... mainly as a result of plummeting sales in Japan and a depressed market in the United States

After two years of falling or stagnant sales, there was a sharp recovery in **Japan** in 2000. Sales of all types of industrial robots surged by 32% over 1999, reaching almost 47,000 units. This recovery was, however, only temporary because **in 2001 the market fell by nearly 40% below the 2000 level to 28,400 units**, the lowest level since the middle of the 1980s.

From 1995 to 2000 the robot market in the **United States** was booming every second year and, in the years between, it was flat or falling. In 1995, 1997 and 1999 it increased by 32%, 28% and 37%, respectively. By contrast, in 1996 and 1998, the market dropped by 5% and 13%, respectively, while in 2000 it was almost flat (+1%). However, the highest sale of multipurpose industrial robots, in their strict definition, ever recorded was in 2000 when it reached nearly 13,000 units. **In 2001, the market fell by nearly 17% to 10,800 units**

The market in the European Union continued to grow...

In the **European Union**, sales of multipurpose industrial robots rose by 19% in 2000 to 29,800 units. **In 2001, sales continued to grow but by a modest 2.5%, reaching 30,500 units.** However, the market varied significantly between countries: -2% and -8% in Germany and France, respectively, to 26% in the United Kingdom and 22% in Spain.

Europe and the United States are rapidly catching up with Japan...

In the early 1990s, **installations of multipurpose industrial robots** in the European Union and the United States only amounted to about 20% and 7%, respectively, of Japan's installations of (all types of) industrial robots. **In 2001, for the first time ever, more multipurpose industrial robots were installed in the European Union than all types of industrial robots installed in Japan.** In fact, it could very well be that the 2001 installations of multipurpose industrial robots in the European Union were in the order of twice as high as the installations of the same robot types in Japan.

Looking at the **operational stock** of industrial robots, again relating Japan's stock of all types of robots to those of multipurpose robots in the European Union and the United States, the same pattern prevails. **The EU stock rose from 23% of that of Japan in 1990 to 61% in 2001. The corresponding figures for the United States were 12% and 27%, respectively.** Again, if separate data had been available for multipurpose industrial robots in Japan, they might very well have shown a stock of a magnitude between that of the United States and that of the European Union.

Estimate of the worldwide operational stock of industrial robots

Total accumulated yearly sales, measured since industrial robots started to be introduced in industry at the end of the 1960s, amounted at the **end of 2001** to some **1,250,000 units, including the dedicated industrial robots installed in Japan.** Many of the early robots, however, have by now been taken out of service. The stock of industrial robots in actual operation is therefore lower. UNECE and IFR estimate the:

Table 1

Installations and operational stock of multipurpose industrial robots in 2000 and 2001 and forecasts for 2002-2005.
Number of units

Country	Yearly installations				Operational stock at year-end			
	2000	2001	2002	2005	2000	2001	2002	2005
Japan (all types of industrial robots)	46,986	28,369	28,400	36,100	389,442	361,232	352,800	351,600
United States	12,986	10,824	11,100	14,200	89,880	97,268	104,700	130,600
European Union	29,796	30,553	32,600	41,800	198,897	219,333	239,700	321,400
Germany	12,781	12,524	12,800	15,300	91,184	99,013	106,000	133,600
Italy	5,897	6,373	7,000	9,400	39,238	43,911	48,400	67,000
France	3,793	3,484	3,800	5,100	20,674	22,753	25,100	35,700
United Kingdom	1,538	1,941	2,100	2,800	12,344	13,411	15,000	20,700
Austria a/	320	330			3,046	3,153		
Benelux a/	630	620			8,211	8,590		
Denmark	307	330			1,414	1,683		
Finland	492	408			2,647	2,927		
Portugal	124	100			700	800		
Spain	2,941	3,584			13,163	16,378		
Sweden	973	859			6,276	6,714		
Other Europe	858	801	900	1,200	10,783	10,869	9,300	10,300
Czech Rep. a/	100	70			915	985		
Hungary	20	30			123	123		
Norway	97	98			540	618		
Poland	100	20			462	384		
Russian Fed. a/	250	250			5,000	5,000		
Slovakia b/								
Slovenia b/								
Switzerland a/	291	333			3,743	3,759		
Asia/Australia	6,221	5,310	5,800	7,700	53,132	56,997	61,100	74,000
Australia	440	270			2,833	2,953		
Rep. of Korea (all types of industrial robots)	4,731	4,080			37,987	41,267		
Singapore a/	300	300			5,370	5,458		
Taiwan, Province of China	750	660			6,942	7,319		
Other countries a/	2,060	2,250	2,500	3,400	8,900	10,840	13,000	21,000
Subtotal, excl. Japan and Rep. of Korea	47,190	45,658	48,400	62,200	323,605	354,040	383,000	557,300
Total, incl. all types of industrial robots in Japan and Rep. of Korea	98,907	78,107	81,300	104,400	751,034	756,539	780,600	964,500

Sources: UNECE, IFR and national robot associations.

a/ Estimated by the UNECE and IFR for some or for all the years.

b/ As from 1999 included in the aggregate "Other countries".

**total worldwide stock of operational industrial robots
at the end of 2001 between a minimum of 757,000 units
and a possible maximum of 1,020,000 units**

The minimum figure above is derived on the assumption that the average length of **service life is 12 years**. A UNECE/IFR pilot study has indicated that the average service life might in fact be as long as **15 years**, which would result in a **worldwide stock of 1,020,000 units**

The **net increase** in the Japanese robot stock fell sharply in the period 1992-1994. The net increase in 1994 was less than a fifth of that in the record year of 1990, underscoring the depth of the Japanese recession. As from **1998, the robot stock in Japan started to decline at an accelerated rate: 0.3% in 1998, 2.3% in 1999, 3.2% in 2000 and by as much as 7.2% in 2001**. The 2001 robot stock was only 87% of that of 1997.

Excluding Japan and the Republic of Korea, the world stock of multipurpose industrial robots amounted at the end of 2001 to 354,000 units, or 9% more than in 2000. In the **European Union** and the **United States**, the stock of industrial robots rose by an impressive 10% and 8%, reaching 219,000 units and 97,000 units, respectively. In Spain the increase was as high as 24%.

Forecasts for 2002-2005

Sales projected to increase by an average of 7.5% per year

The world market for industrial robots is projected to increase from 78,000 units in 2001 to just over 104,000 in 2005 when including all types of industrial robots in Japan and the Republic of Korea, or by a yearly average of 7.5% (see table 1). Excluding Japan and the Republic of Korea, worldwide sales of multipurpose industrial robots are forecast to increase from almost 46,000 units to 62,000 units by 2005, an average yearly increase of 8%.

Sales in Japan expected to show slow recovery ...

Growth in robot investment in Japan will be spurred by an increasing demand for replacement investment. Between 2001 and 2005, sales are projected to increase from 28,000 units to about 36,000 units, which, bearing in mind the slump of 2001, is a rather modest recovery.

Steady growth in Europe and in North America

The robot market in the European Union is expected to grow from 30,500 units in 2001 to 42,000 units in 2005 (see table 1 and figure 1). In North America, the market is estimated to grow by an average annual rate of 7%, which implies that the market will reach just over 14,000 units in 2005.

The operational stock of industrial robots continues to grow, except in Japan

In terms of units, it is estimated that the worldwide stock of operational industrial robots will increase from almost 757,000 units at the end of 2001 to 965,000 at the end of 2005 (see table 1 and figure 2).

The year 1997 was the peak one for the Japanese robot stock, when it reached 413,000 units, including all types of industrial robots. By end 2001, it had fallen to 361,000 units and is projected to fall to 349,000 units in 2003, after which it will start to increase, reaching 352,000 in 2005.

Excluding Japan and the Republic of Korea, the remaining world operational stock of multipurpose industrial robots is forecast to increase from 354,000 units to 557,000 units in the period 2001-2005, an average yearly increase of 12%.

In the United States, the operational stock of multipurpose industrial robots is forecast to reach 131,000 units in 2005. The projection for the European Union is 321,000 units, of which 134,000 in Germany; 67,000 in Italy; 36,000 in France; and 21,000 in the United Kingdom (see table 1 and figure 2).

Figure 1. Yearly installations of industrial robots, 1998-2001 and forecast for 2002-2005

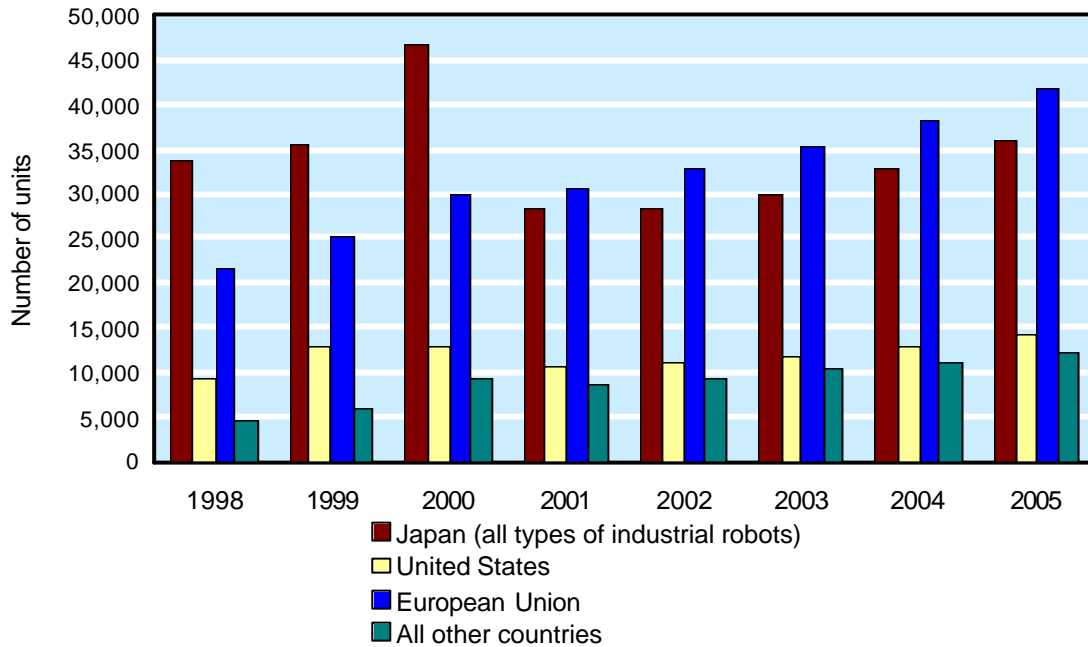
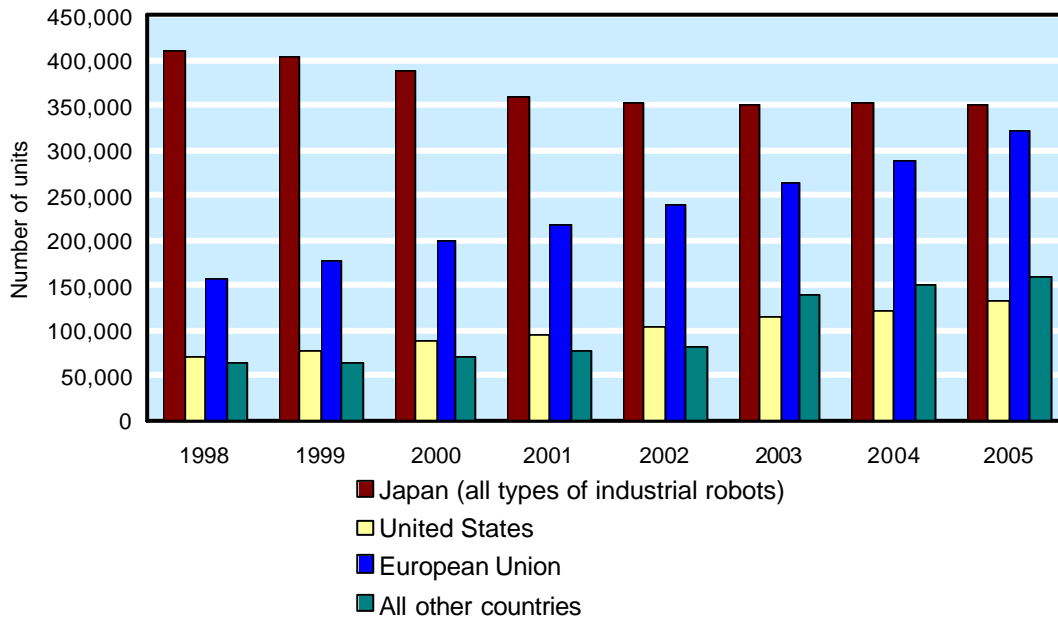


Figure 2. Estimated operational stock of industrial robots 1998-2001 and forecast for 2002-2005



Results in the first half of 2002

Looking at the first half of 2002, the UNECE/IFR quarterly survey on order intake of industrial robots, which includes most of the world's largest companies, showed that worldwide order intake decreased by 7%, compared with the same period in 2001. This figure, however, hides some major differences between regions:

Order intake of industrial robots in the first half of 2002 compared with the same period in 2001:

North America +2%, Europe -15%, Asia +8% and World total -7%

Growth in robot investment is spurred by plummeting robot prices but price decreases are starting to level off...

In the 1990s, prices of industrial robots plummeted while at the same time their performance, measured both for mechanical and electronic characteristics, continuously improved. A UNECE/IFR survey, which covered the period 1990-2000, showed the following changes:

• List price of one robot unit	-43%
• Number of units delivered	+782%
• Number of product variants that can be supplied to customers	+400%
• Total handling capacity (including gripper module)	+26%
• Repetition accuracy	+61%
• Speed of the 6 axes	+39%
• Maximum reach	+36%
• Mean-time between failures	+137%
• RAM in Mbytes	over 400 times
• Bit-size of the processor	+117%
• Maximum number of axes that can be controlled	+45%

Prices of industrial robots, expressed in constant 1990 US dollars, fell from an index 100 to 56 in the period 1990-2001, without taking into account that robots installed in 2001 had a much higher performance than those installed in 1990 (see figure 3 and table 2). When taking into account quality changes, it was estimated that the index would have fallen to 25. In other words, an average robot sold in 2001 would have cost only a fourth of what a robot, with the same performance, would have cost in 1990, if it had been possible to produce such a robot in that year.

In the same time, the index of labour compensation in the American business sector increased from 100 to 152 (see figure 3 and table 2). This implies that the relative prices of robots fell sharply in the period 1990-2001.

Measurements of robot density based on the total number of persons employed

In figure 4, five groups of countries can be distinguished with respect to robot densities, expressed as the number of robots per 10,000 persons employed in the manufacturing industry (ISIC rev.3: D). The **first group** includes **Japan** and the **Republic of Korea**, which collect data on all types of industrial robots and are therefore not comparable with other countries. In 2001, these two countries had robot densities of about 270 and 125, respectively. While the density in the Republic of Korea is increasing rapidly, it has fallen in Japan since the peak in 1998.

The **second group** is topped by **Germany**, which in 2001 had a density of 127, followed by **Italy** with 102 and **Sweden** with 89 robots per 10,000 employed in the manufacturing industry. The **third group** of countries includes **Finland** with 67, **France** with 63, and **Spain** with 62 robots per 10,000 employed in the manufacturing industry. In the **fourth group**, the densities ranged between 52 and 34 in the **United States**, **Benelux**, **Denmark**, **Austria** and the **United Kingdom**. In **Norway** and **Australia** the density amounted to 31 and 21, respectively, while at the bottom was **Portugal** with 8. Countries in Central and Eastern Europe, with the exception of the Czech Republic, have even lower densities.

Figure 3
Price index of industrial robots for international comparison
(based on 1990 \$ conversion rate), with and without quality
adjustment.

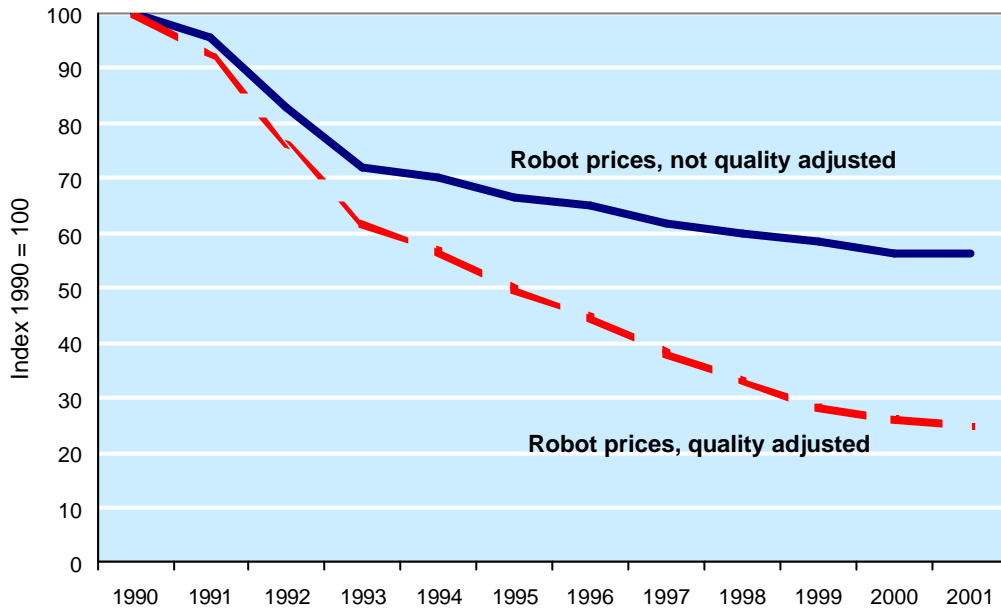


Table 2

Price index (1990=100) for industrial robots based on fixed 1990 US\$ conversion and current US\$ conversion. Indices without and with quality adjustment. Index of labour compensation in the business sector in the United States and hourly wages in dollars, excluding social costs, in the manufacturing industry (ISIC rev.3: D) and in the motor vehicle industry (ISIC rev.3: 34)

Year	1990 \$ conversion		Current \$ conversion		Labour compensation a/	Hourly wages, excl. social costs	
	No quality adjustment	Quality adjustment	No quality adjustment	Quality adjustment		Manufact.	Motor veh.
1990	100.0	100.0	100.0	100.0	100.0	10.8	14.6
1991	95.5	92.2	95.5	93.2	103.9	11.2	15.2
1992	82.9	76.1	69.0	64.5	109.8	11.5	15.5
1993	72.0	61.9	52.1	45.4	112.9	11.7	16.1
1994	70.0	56.5	55.9	47.0	115.5	12.1	17.0
1995	66.5	49.6	58.7	47.6	117.7	12.4	17.3
1996	64.9	44.6	55.1	41.8	120.6	12.8	17.7
1997	61.8	38.2	45.6	30.1	124.5	13.2	18.0
1998	60.1	33.1	45.3	27.5	130.7	13.5	17.8
1999	58.4	28.1	40.0	20.0	136.3	13.9	18.1
2000	56.3	26.0	36.6	17.6	144.0	14.4	18.8
2001	56.3	24.8	30.9	11.2	151.9	14.8	19.4

Sources: United Nations Economic Commission for Europe (UNECE) and the International Federation of Robotics (IFR).

Note: The indices calculated with fixed 1990 US\$ conversion can be seen as a general index without any reference to a particular country while the index calculated from current annual \$ conversion is only relevant for the United States.

a/ Index of labour compensation in the business sector. Source: OECD.

Despite this large range in the robot densities of European countries, it is interesting to note that **the robot density in the European Union is 55% higher than that of the United States**

Robot densities - 1 robot per 10 workers in the motor vehicle industry

Figure 5 shows data on the number of multipurpose industrial robots per 10,000 production workers in the motor vehicle industry. Japan is in the lead with 1,600 robots per 10,000 workers but bearing in mind that Japan includes all types of robots it is not comparable to the densities of other countries. Thereafter follow Italy with a density of 980, Germany 890, United States 700, Spain 670, Sweden 550, France 540 and the United Kingdom 520. The technological level with respect to robotics is thus rather homogeneous in the motor vehicle industry in the above-mentioned countries.

Installations of advanced multipurpose industrial robots with 5 axes or more

When countries collect data they do not always include the same types of robots - some countries concentrate on the more sophisticated robots while others, e.g. Japan, collect data on all types of robots that satisfy the IFR definition. For this reason, country data are not always comparable.

By looking only at the subset of **robots with 5 axes or more**, the comparability between countries is significantly improved (see table 3). While, for instance, Taiwan, Province of China (1997) installed an estimated 750 new robots, only 14% or 108 were robots with 5 axes or more. In the **United States, Spain and Sweden**, on the other hand, **more than 90% of all the new robots installed in 2001 had 5 axes or more**.

Diffusion of service robots

Table 4 gives details about the results of the UNECE/IFR survey of sales of service robots, broken down by application areas. As many companies did not provide market data, the figures reported here probably underestimate significantly the true sales amounts as well as the installed base of robots.

Except for domestic robots (so far mainly lawnmowing robots) and entertainment robots, almost all service robots installed up to and including 2001 are robots for professional use. The major application areas for professional robots are underwater robots, medical robots, demolition robots, mobile robot platforms for multiple use, laboratory robots, and cleaning robots.

Service robots for professional use, installations up to the end of 2001

Of the total number of units of service robots for professional use installed up to the end of 2001, underwater robots with their 3,300 units accounted for 27% (see table 4 and figure 6). Thereafter followed demolition robots with 20% and medical robots with 15%. Laboratory robots had a share of 9% while agriculture robots, mainly robot milking systems, made up 6%. Cleaning robots had a share of just over 2%.

As the unit values differ very significantly between various application areas - from some hundreds of thousands of dollars for underwater robots and medical robots to a few thousand dollars for laboratory robots or a few hundred dollars for domestic or entertainment robots - market data, expressed in terms of value in US dollars, might differ quite substantially from market data expressed in number of units.

Service robots for personal and private use, installations up to end 2001

Service robots for personal and private use are recorded separately, as their unit value is only a fraction of that of many types of service robots for professional use. They are also produced for a mass market with completely different marketing channels.

	2001
Japan a/	272
Rep. of Korea a/	125
United States	52
European Union	81
Germany	127
Italy	102
Sweden	89
Finland	67
France	63
Spain	62
Benelux	51
Austria	48
Denmark	38
United Kingdom	34
Australia	31
Norway	21
Portugal	8
Czech Rep. a/	8

a/ All types of industrial robots.

Figure 4. Number of robots per 10,000 persons employed in the manufacturing industry in 2001

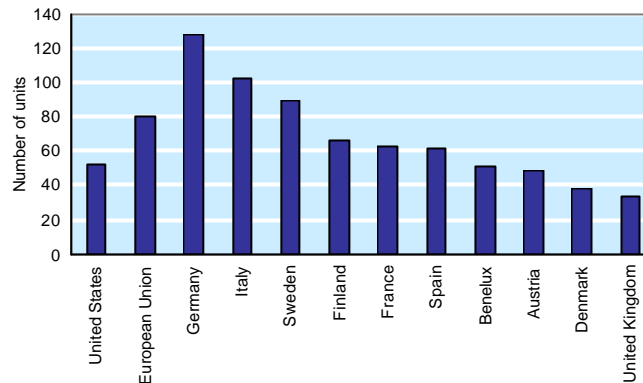


Figure 5. Number of robots per 10,000 production workers in the motor vehicle industry, 2000 and 2001

	2000	2001
France	520	540
Germany	820	890
Italy	850	980
Japan	1,700	1,600
Spain	520	670
Sweden	540	550
United Kingdom	430	520
United States	590	700

Sources: UNECE and IFR.

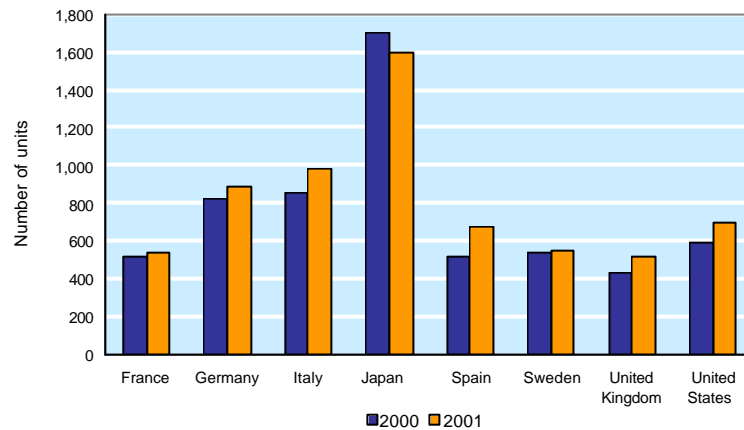


Table 3

Number of multipurpose industrial robots with 5 axes or more

	All robots	Robots with ≥ 5 axes	% share
USA	10,824	10,175	94.0
Spain	3,584	3,341	93.2
Sweden	859	787	91.6
United Kingdom	1,941	1,687	86.9
France	3,484	2,951	84.7
Norway	98	83	84.7
Australia (1998)	347	283	81.6
Switzerland	333	250	75.0
Poland (1999)	42	28	66.7
Germany	12,524	7,994	63.8
Italy	6,373	3,765	59.1
Finland	408	232	56.9
Denmark	330	182	55.2
Austria (2000)	320	157	49.1
Japan a/	28,369	12,200	43.0
Taiwan, Province of China (1997)	753	108	14.3
Rep. of Korea	4,080		

Sources: UNECE, IFR and national robot associations.

a/ The share for non-SCARA robots is 43%. It is assumed that these robots have 5 axes or more.

Note for Switzerland: The share of articulated robots is 75%. It is assumed that these robots have 5 axes or more.

Table 4

Estimated number of service robots installed up to the end of 2001, by application areas, and forecasts for the period 2002-2005

Types of robots	Stock at end 2002	Installations 2002-2005
SERVICE ROBOTS FOR PROFESSIONAL USE:		
Cleaning robots	300	2,560
Floor cleaning		
Tank cleaning		
Window cleaning; wall cleaning		
Other (cleaning aircraft, boats, reservoirs, etc.)		
Sewer robots (cleaning, inspection)	40	110
Wall-climbing robots (cleaning, inspection)	1	5
Inspection robots, general (power plants, nuclear sites, bridges etc.)	120	180
Demolition robots	2,500	1,210
Robots for servicing and/or dismantling nuclear, chemical, waste, military and other hazardous complexes a/		
Underwater robots	3,300	3,000
Inspection		
Work class robots		
Medical robots	1,840	6,050
Surgical robots		
Robot-assisted surgery		
Other		
Robots for disabled persons; Assistive robots;		
Wheelchair robots	160	40
Courier robots; Mail delivery robots	60	150
Mobile robot platforms (multiple use)	320	300
Surveillance robots; Security robots	70	1,830
Guide robots (e.g. in museums)	3	10
Refuelling robots	50	1,120
Fire and bomb fighting robots	140	240
Robots in the construction industry b/		
Robots in agriculture and forestry, of which	680	1,350
Automated milking systems	550	1,000
Hotel and restaurant robots b/		
Clean-room robots b/		
Laboratory robots	1,070	420
Nano robots, micro robots b/		
Space robots b/		
Other types	1,710	6,880
Total number of units	12,400	25,500
Estimate value in \$ millions	2,150	2,900
SERVICE ROBOTS FOR PERSONAL AND PRIVATE USE:		
Domestic robots	21,500	719,000
Vacuum cleaning		
Lawn-mowing		
Other		
Entertainment/hobby/leisure time robots	155,010	1,202,000
Robots in marketing	20	100,000
Total number of units	176,500	2,021,000
Estimated value in \$ millions	160	2,300

Sources: UNECE and IFR.

a/ Included in "Inspection robots, general" or in "Demolition robots".

b/ No information or estimate available or data included in "Other types".

So far, service robots for personal and private use are mainly in the areas of domestic (household) robots, which include vacuum cleaning and lawnmowing robots, and entertainment robots, including toy and hobby robots (see table 4). Sales of lawnmowing robots have started to take off very strongly, with sales in excess of 10,000 units, and should continue to boom. The market potential is very large. Vacuum cleaning robots were introduced on the market at end of 2001. The market is projected to expand during 2002.

Up to the end of 2001, it is estimated that over 20,000 domestic robots, all types included, have been installed. As for entertainment robots, it is estimated that some 150,000 units had been sold up to the end of 2001.

Projections for the period 2002-2005, service robots for professional use

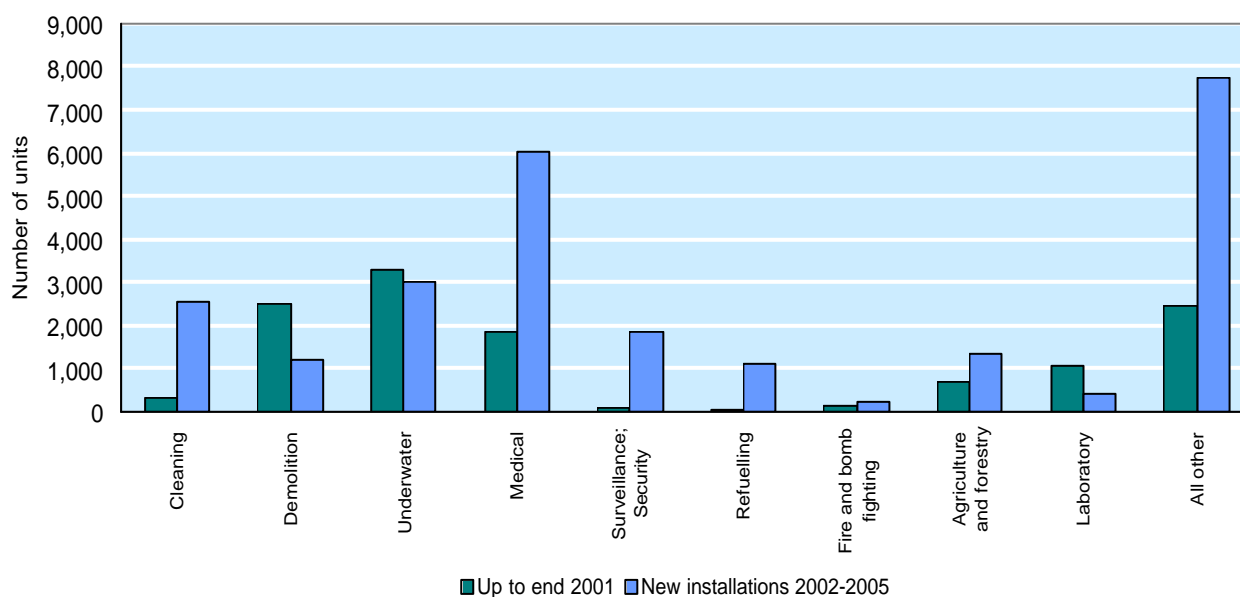
Turning to the projections for the period 2002-2005, the stock is forecast to increase by some 25,000 units (see table 4 and figure 6). Application areas with strong growth are medical robots with some 6,000 new robots being added, underwater robots (3,000), surveillance and security robots (1,800), refuelling robots (1,100) and robotic systems for milking (1,000).

Projections for the period 2002-2005, service robots for personal and private use

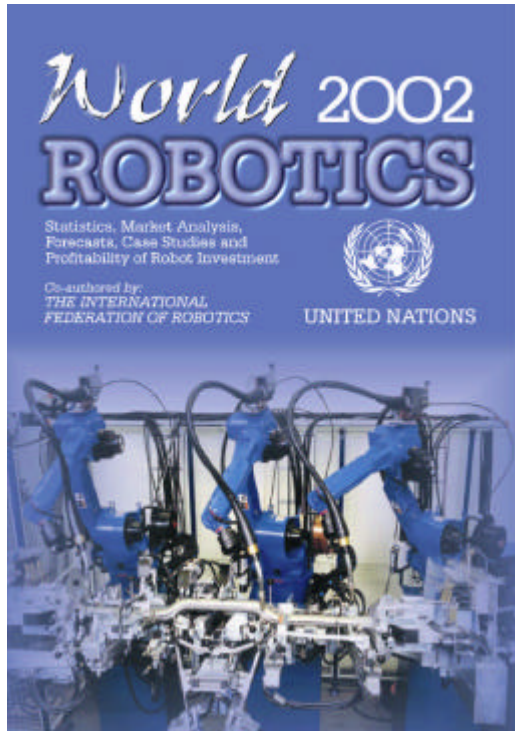
Domestic (household) vacuum cleaning robots were introduced on the market at the end of 2001. The initial interest by the Swedish market (some 5,000 units sold over the last two months of 2001) indicates a significant appeal. The price is rather high - €1,400, but this has not discouraged customers. At the same time it is expected that a number of other companies will enter the market by the fall of 2002 with products that are more reasonably priced. Sales could, provided the price is right, take off at such a rate that by the year 2005, several hundreds of thousands of units could be sold (see table 4).

Regarding lawn-mowing robots, a huge increase in sales is forecast for the period 2002-2005. It is projected that sales of all types of domestic robots (vacuum cleaning, lawn mowing, window cleaning and other types) in the period 2002-2005 could reach some 700,000 units. The market for toy and entertainment robots is forecast to exceed one million units, most of which are, of course, very low cost.

Figure 6. Service robots for professional use. Stock at the end of 2001 and projected installations in 2002-2005



The publication **World Robotics 2002 – Statistics, Market Analysis, Forecasts, Case Studies and Profitability of Robot Investment** is available, quoting Sales No. GV.E.02.0.8 or ISBN No. 92-1-101047-0, through the usual United Nations sales agents in various countries or from the United Nations Office at Geneva (see address below), priced at US\$ 120:



**Sales and Marketing Section
United Nations**

Palais des Nations
CH - 1211 Geneva 10, Switzerland

Phone: +41(0)22 917 26 06 / 26 13
Fax: +41(0)22 917 00 27
E-mail: unpubli@unog.ch

For more information about the publication, please contact:

Mr. Jan Karlsson
Statistical Division
United Nations Economic Commission
for Europe (UNECE)
Palais des Nations
CH - 1211 Geneva 10, Switzerland

Phone: +41(0)22 917 32 85
Fax: +41(0)22 917 00 40
E-mail: jan.karlsson@unece.org

or: International Federation of Robotics (IFR)
Box 5506
S - 114 85 Stockholm
Sweden

Phone: (+ 46 8) 782 08 43
Fax: (+ 46 8) 660 33 78
E-mail: ifr@vi.se