2. Manufacturing

a. Developments in 2004

Manufacturing product soared by 6.6 percent in 2004, due mainly to the rapid expansion of manufacturing exports.

Manufacturing industry continued to rally in 2004 and its product, which accounts for about one quarter of business-sector product, soared by 6.6 percent. The rapid expansion of manufacturing product began in 2003:IV and ended a long period of deep recession, which started with a steep drop in manufacturing production—between October 2000 and June 2001—followed by stagnation until September 2003. The rise in manufacturing product in 2004 stemmed primarily from the sharp increase in manufacturing exports, which grew by 16.3 percent, while sales to the domestic market rose by far less, 1.2 percent. Hence the global economic recovery made a very important contribution to the expansion of manufacturing exports, while the rally in domestic demand, which was largely due to the rise in manufacturing exports, made only a small contribution to the increase in manufacturing sales.

Table 1.8
Manufacturing Industry, Main Indicators, 1990–2004

(rate of change, percent)[a]

				2004	
	1990–2000	2001–2003	2004	Jan–Jun	Jul–Dec
Manufacturing product	5.9	–1.1	6.6	9.1	5.3
Domestic sales (volume)	4.3	–2	1.2	–6.9	8.7
Manufacturing exports (volume)	11.5	–1	16.3	28.1	6.1
Output of electronics industry	11	–5	11.4	17	10
Output of traditional industries	3.8	–3	2.4	4.3	0.9
Output of mixed industries	5.2	5.3	8.1	10.6	4.9

[a] Grouped years: average yearly rate of change. Half-years: change from previous half year.
SOURCE: Based on Central Bureau of Statistics data.

Manufacturing sales to the domestic market rose slightly, despite the marked increase in domestic demand.

There are several reasons for the low rate at which sales to the domestic market rose, despite the marked recovery in domestic uses in general and private consumption in particular. First, the recovery of private consumption was expressed mainly in the increase in consumption of durable goods, most of which are imported (and less in the rise in consumption goods). Second, the construction industry, which is a major purchaser of manufactures, continued to contract in 2004. Third, the long-term upward trend in the market share of imports at the expense of domestic manufactures continued because of the persistence of the long-term trend of reducing prices of imports relative to those of domestically-produced goods. In the second half of the year manufacturing sales to the domestic market rose notably, due to the increase in current consumption (most of which is manufactured in Israel) and because the moderating influence of the construction industry on manufacturing became weaker at that time.

The steep 16 percent increase in manufacturing exports stemmed primarily from the recovery of world trade.

The expansion of exports is explained above all by the recovery of world trade, which grew by 8.8 percent in 2004. This led to a sharp rise in the exports of the electronics industry, which is the leading manufacturing exporter, as well as to an increase in the exports of a large number of additional industries, including chemicals, rubber and plastics, transport vehicles, machinery and metal equipment, and even in the exports of traditional industries, such as food, textiles, and clothing. The expansion of exports encompassed exports to both developed countries (the EU and the US) and developing countries, primarily China, India, and Turkey. The ability of Israel's exports to respond to the rise in world trade rapidly and forcefully stemmed mainly from the excess capacity that had accumulated in manufacturing in the previous three years, when domestic and global demand for manufactures plummeted, as did the utilization of capital and labor. In addition, the demand slump of those years led to a relative fall in production costs in Israel's manufacturing industry, and this operated to increase exports (although according to manufacturing indices the depreciation was eroded somewhat in 2004, its level was still favorable). The domestic factors causing exports to expand were weakened during the year, foremost among them being the conclusion of the recession in domestic demand, the rise in capacity utilization, and the increase in wages. In fact, during 2004 as a whole the expansion of exports in most manufacturing industries was moderate, compared with the surge at the beginning of the year.

The steep rise in global demand removed the main effective constraint on increasing output during a recession—lack of demand. As a result, the utilization of capital and labor soared, and this was expressed in the sharp increase in labor productivity (product per hour worked) and TFP. The rise in productivity enabled the hourly wage to rise, and even bolstered manufacturers' profitability, bringing it to its highest level since the 1990s. However, the recovery was not enough to bring about a tangible increase in labor input and investment in most manufacturing industries, with the exception of electronics.

1. Manufacturing exports

The share of product destined for export in total manufacturing product has been rising over the years, and is currently 47 percent.

As stated, manufacturing exports expanded in 2004, by 16.3 percent, and this led to a steep increase in all manufacturing production. The share of exports in total manufacturing output has been increasing over time, and currently stands at 40 percent, compared with 29 percent in 1995. The expansion of exports in 2004, as in the entire last decade, was concentrated in human-capital-intensive and high-tech industries—manufacturing control and supervision equipment, medical and scientific equipment, electronic communications equipment, and pharmaceuticals. In these industries the share of value added in output is relatively high, so that their share in manufacturing product is greater than their share in output. According to our estimate, exports account for 47 percent of manufacturing product.

World trade expanded handsomely in 2004, making an important contribution to the growth of Israel's exports.

World trade expanded markedly in 2004, and made an important contribution to the rise in exports as, in common with global exports, Israel's exports are influenced by the improvement in global demand and the increased openness to international trade. A by-industry examination of the development of Israel's exports shows that its rapid increase relative to that of world trade was not due to the accelerated rise of world trade in advanced goods, in which Israel's exporters specialize, but rather to the increased market share of each individual industry. For the purpose of this examination we made use of US by-industry trade data, which served as an index of the development of global demand (because of the availability of these data and the high correlation between them and Israel's exports). We found that the increase in trade in pharmaceuticals and control and supervision equipment and in medical and scientific equipment, in which Israel's manufacturers have specialized, outstripped that in the trade between the US and the EU. However, trade in electronic components and in electronic communications equipment, which are also important export industries, grew more slowly. This indicates that the change in the composition of trade did not serve to increase Israel's exports. As Table 1.9 shows, the rise in Israel's exports in 2004 relative to the index of world trade encompassed most manufacturing industries, even including textiles, which have contracted severely in recent years, and the exports of the electronic components and electronic communications industries, which have lagged considerably behind the development of trade in the last two years.

The rapid growth of exports encompassed both those intended for developed countries (the US and the EU) and those destined for developing countries, mainly China, India, and Turkey.

An examination of the development of nondiamond exports by country of destination shows that Israel's exports to the US and the EU expanded by more than the increase in trade between them. Exports to the EU, which account for one third of Israel's exports, were up by 18.4 percent (in nominal dollar terms), while exports to the US, which constitute 30 percent of Israel's exports, rose by 16 percent. Altogether, Israel's exports to those two trade blocs grew by 17.3 percent, outstripping the growth rate of trade between the US and the EU, 11.9 percent. In addition to the rise in exports to the developed countries, there was a sharp increase in Israel's exports to the developing countries in 2004, and this stemmed primarily from the steep rise in exports to Turkey, India, China, Hong Kong, and Taiwan. Although those countries are experiencing rapid economic growth, and hence are increasing their imports from the rest of the world, Israel's exports to them expanded this year by far more than their imports (except China). Note that exports to those countries, which accounted for 7.8 percent of Israel's exports (in 2003), constituted 5 percentage points of the total rise of 16.3 percent in Israel's exports in 2004, most of the increase in exports to those countries being in electronics and chemicals, in which Israel has a comparative advantage, while some exports are of intermediates (e.g., electronic components) for products which will be marketed in the west.

One explanation for the expansion of manufacturing exports in 2004 (apart from the rise in world trade) lies in the macroeconomic level rather than in that of the individual industry, because the expansion of manufacturing exports incorporated most industries and most countries of destination. The main explanation is connected

Table 1.9
Israel's Total Exports and US Total Trade, 2004

(rate of change, percent)

	Share of manufactured exports	Israel's total exports Real	Nominal ($)	US trade EU	Total
Total manufactured exports	100.0	16.6	21.6	11.9	15.8
Total excl. electronics	68.7	13.8	21.5	11.9	15.9
Electronics (excl. electronic components)	23.5	25.4	25.0	15.3	18.6
Electronic communications	12.3	21.7	20.2	5.8	22.0
Equipment for control and supervision and medical and scientific equipment	11.2	29.3	30.2	17.5	15.3
Electronic components	7.8	15.7	12.1	0.3	8.4
Chemicals, fertilizers and pesticides	10.4	12.4	24.7	13.4	16.3
Pharmaceuticals	5.6	18.7	33.4	17.5	13.2
Rubber and plastics	6.6	10.4	17.2	14.2	14.2
Textiles	4.1	10.1	13.2	6.4	10.1

SOURCE: Based on Central Bureau of Statistics and US foreign trade data.

Table 1.10
Israel's Trade with China, India and Turkey, 2004

(rates of change, percent)

	Growth rate	Increase in total imports	Increase in imports from Israel (Israel's exports)	Increase in imports from Israel ($ million)	Increase in exports to Israel (Israel's imports)
China	9.0	36.0	30.6	214	33.7
India	6.4	33.6[a]	78.7	149	22.2
Turkey	7.0	27.2	73.3	336	22.6
Taiwan	4.1	31.9	96.2	274	29.4

[a] Last three quarters of 2004 compared with equivalent period in 2003.

SOURCE: Based on data from the Central Bureau of Statistics, and internet sites of the State Institute of Statistics of Turkey, the National Bureau of Statistics of China, and the Government of India Ministry of Commerce and Industry.

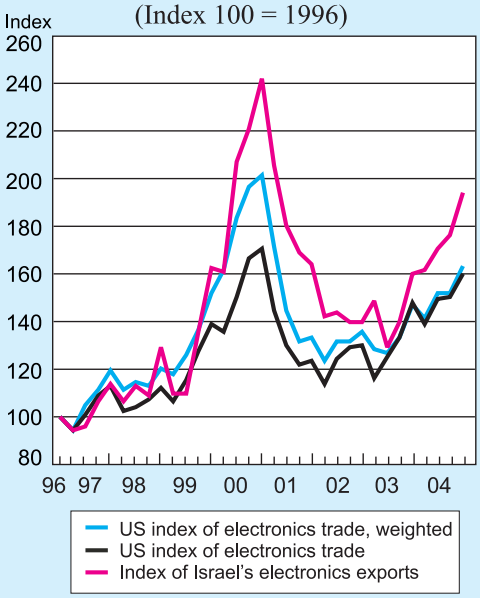
The sharp rise in the market share of Israel's exports in most industries and most countries of destination indicates that the explanation for this lies in the macroeconomic situation rather than in the individual industry.

with the weakness of domestic demand in the last three years, which enabled factor inputs—labor and capital—to shift from industries producing for the domestic market to export industries. Cheaper factor inputs in Israel relative to prices abroad (real depreciation) made Israel's exports more competitive, and hence Israel's market share in global markets grew. A complementary explanation is connected with security developments: Israel's market share in world markets fell in 2002 in spite of the slump in domestic demand and sharp real depreciation. The dip in exports at that time was explained by the exacerbation of the security situation, which caused buyers abroad to avoid visiting Israel and to fear that shipments of orders would be disrupted (see Bank of Israel, Annual Report, 2002). The security situation improved in 2004 and this may have made it possible to benefit fully from the real depreciation, which has been sustained since then. Thus, the depreciation served to increase the market share of Israel's exports in world markets. Another explanation, which was pertinent in the past, is that Israel exports products whose sensitivity to world economic slumps and peaks is relatively great (investment goods and other products whose income-elasticity is above average), so that in the years that world trade was depressed (as was the case in 2002) Israel's market share declined. In the electronics industry, for example, the goods that Israel exports were far more sensitive to the slumps and peaks of the 1999–2001 period than the other products of the industry.

The rising trend of the share of exports in total manufacturing product in the last decade derives primarily from Israel's growing economic openness to both imports (the process of tariff reduction) and world trade.

While the increase in the share of exports in total manufacturing product in 2004 was very impressive, this was not unique to 2004. In the last decade there has been a clear upward trend in the share of manufacturing exports in manufacturing output and product. There are several explanations for this (which have been discussed in this chapter in previous years). First and foremost, Israel's increasing openness to imports (the tariff-reduction process) and the greater exposure of the world to trade (reflected in the rise in the extent of world trade relative to product). These two trends have made it more worthwhile to utilize Israel's comparative advantage in high-tech manufacturing, causing labor-intensive manufacturing, in which Israel is at a comparative disadvantage, to be pushed aside, and eventually leading to the expansion of Israel's international trade (equivalent increases in imports

Figure 1.11
The Electronics Industry: Israeli Exports and US Trade, 1996–2004
(Index 100 = 1996)



SOURCE: Israel–based on Central Bureau of Statistics data; US–United States, International Trade Commission.

and exports). Another reason for the increased share of manufacturing exports is the steep rise in the supply of skilled labor in Israel. Many of these workers found employment in the high-tech industry, making the impressive increase in exports of this industry possible (see discussion below). The liberalization of the capital markets also contributed to the process of specialization, as the cooperation of foreign investors in capital ownership enabled the dispersal of part of the considerable risk incurred by specializing in a narrow and volatile industry such as electronics. Other reasons for the rise in the share of exports in product are the government's involvement, which helped the high-tech export industries by means of the grants extended by the Office of the Chief Scientist, the Capital Investments Encouragement Law (one of the criteria for eligibility under which is the contribution of the investment to increasing exports), and participation in international research funds. Note, too, the government's direct investment in the development of advanced military technology, which accorded Israel's industry a comparative advantage in products intended for both the military and civilian markets.

2. Manufacturing sales to the domestic market

The turnaround evident in domestic demand in 2004 caused manufacturing sales to the domestic market to improve over 2003.

Sales to the domestic market, which account for 60 percent of manufacturing sales, rose by 1.2 percent in 2004, an improvement over 2003, when they fell by 4.3 percent. The improvement is the result of the turnaround in domestic demand, expressed in the rise in domestic consumption (from a GDP growth rate of 1.3 percent in 2003 to 5.1 percent in 2004) and in the stabilization of fixed investment, after this had fallen in 2003. The turnaround, the reasons for which are given in the companion Research Department booklet, was due to several factors. Foremost among them was the recovery of exports, which served to increase national income, and the improvement in the security situation, which operated directly and indirectly to increase domestic demand; consumer confidence rallied, incoming tourism rose, and Israel's risk premium declined, serving to ease the national debt burden, increase the value of assets, and enabled the real interest rate to be reduced.

The expansion of domestic demand was met principally by an increase in imported goods, while manufacturing sales to the domestic market grew only slightly, because of the development of the composition of demand.

The increase in domestic demand was met primarily by a rise in goods imports, because of the development of the demand component in 2004: the expansion of private consumption was concentrated mainly in consumer durables, which are import-intensive, while current consumption, most of which is of domestic production, rose more moderately. The improvement in investment stemmed from the rise in investment in the principal industries (primarily in inventories), whereas the slump in construction investment persisted. The construction industry is one of the principal purchasers of domestic manufactures, and in 2003 these purchases accounted for 12 percent of total manufacturing sales to the domestic market.[27] The 8.7 percent decline in the output of the construction industry in 2004 caused the output of the industries

[27] This estimate is based on input/output coefficients for 1995, taking changes in the output of the construction and manufacturing industries in 1995–2003 into account.

producing raw materials for that industry—stone quarrying, sand extraction, carpentry and construction products, metal and mineral construction inputs (glass, ceramics, cement, plaster)—to fall; the sales of these industries, which constitute 10 percent of total manufacturing sales to the domestic market, were down by 5 percent in 2004. The slump in the construction industry also impacted on the electricity distribution industry, plastics, etc.

The long-term upward trend in imports of labor-intensive products at the expense of sales by traditional industries to the domestic market persisted in 2004.

Another factor that contributed to the decline in sales to the domestic market was the long-term upward trend in imports of labor-intensive products, at the expense of sales by the traditional manufacturing industry to the domestic market (see Bank of Israel, Annual Report, 2003). This process derives from the long-term trend of reducing the price of imports relative to domestically-manufactured products, a trend that continued in 2004.[28] The textile, clothing, and footwear industries are a prominent example of the decline in market share: despite the marked increase in domestic consumption of these items, sales of these industries to the domestic market plummeted. The increase in consumption of food, beverages, and tobacco led mainly to a rise in imports, while the industries' sales to the domestic market scarcely grew. Among the traditional industries whose sales to the domestic market expanded were printing, which is hardly affected by competing imports; its output, which is destined almost entirely for the domestic market, rose by 5 percent in 2004.

An examination of sales to the domestic market during the year shows that they dipped in the first half and rose in the second half. This development is not in line with the development of domestic uses, which grew rapidly in the first half of the year and more moderately in the second half. The disparity stemmed from the composition of uses: the slowdown in uses during the year encompassed a slower rate of consumption of consumer durables and investment in the principal industries (most of which are imported), whereas current consumption did not slow, and the decline in investment in construction moderated during the year.

3. Factor inputs, productivity, and profitability

Producers increased output sharply this year while hardly raising inputs of labor and capital, leading to a marked improvement in profitability.

Producers' profitability rose notably in 2004, by virtue of the increase in TFP: producers increased their output considerably while hardly expanding labor and capital inputs. The development of prices did not affect profitability because the increase in production costs (raw material inputs and labor inputs) was in line with the rise in output prices. The growth of productivity greatly increased producers' profits, and the rate of return on gross capital, which was low during the recession years, rose to 13.5 percent in 2004, slightly above the average for the 1990s (13.1 percent). In addition, producers' profitability from employment of labor increased in 2004, because labor productivity rose steeply, and real costs per hour worked (to the producer, at industrial

[28] In 2004 import prices (excluding fuel, diamonds, ships, and aircraft) rose by 3.4 percent, while prices of manufacturing output for the domestic market (excluding fuel) rose by 4.3 percent.

product prices)[29] dipped slightly. The worthwhileness of employing labor from the producer's viewpoint is measured from the ratio between real costs per hour worked and the return on it (product per hour worked). Compared with 2000 (just before the recession), product per hour worked grew by 9.8 percent, while the wage per hour worked rose by only 2.5 percent (in real terms, at manufacturing product prices); hence, it is more worthwhile to employ labor today than it was just before the recession.

Table 1.11

Domestic Sales, Private Consumption and Imports of Selected Industries

(rates of change, percent)

	Industry domestic sales	Imports	Private consumption
Food, drinks and tobacco	0.4	7.4	2.8
Clothing, footwear and leather	-17.4	15.0	7.1
Printing and furniture	6.2	8.4	

SOURCE: Private consumption—national accounts; imports —foreign trade data; sales—industry indices. Data from the different sources are not fully compatible.

Labor input and investment rose slightly relative to the extent of the rally in product and profitability.

The increase in labor input in manufacturing was very slight in 2004; the number of employees in it rose by only 1 percent, and the number of hours worked hardly grew at all (0.7 percent).[30] The extent and level of investment in manufacturing hardly differed from what it had been during the last three recession years either (despite the 9 percent increase). In view of the marked rise in profitability, the positive turnaround in economic and manufacturing activity, the notable decline in the level of uncertainty (see Box 1.2), the buoyancy in the capital market, and the weakness in the labor market (which lowered the costs of raising capital and recruiting labor respectively), and the pro-cyclical fiscal policy (expressed in the reduction of taxes on capital and labor), a palpable improvement in the demand for factor inputs could have been expected. The cautious behavior of firms in recruiting workers and making investments indicates that they were apprehensive about the extent and persistence of the recovery. In addition, the low capacity utilization of the recession years reduced the demand for factor inputs at the time of the recovery: for the moment firms are managing to increase utilization of labor and capital, and thus to meet demand. Another reason for the lack of demand for incremental labor and investment is connected with the fact that the increase in

[29] Although workers experienced a rise in real wages (at private consumption prices)

[30] The source of the data in this section is the CBS's survey of manufacturing indices, and these are not necessarily consistent with the labor force survey data used in Chapter 2.

Table 1.12
Manufacturing Industry, Selected Indicators of Activity, 1990–2004

(rate of change, percent)

	1990–2000	2001–2003	2004
Return on gross capital	13.1	11.8	13.5
Total productivity	1.3	–0.7	4.9
Input/output prices	–0.3	1.1	0.7
Costs per hour worked (real, output prices)	4.7	–1.6	–2.6
Labor productivity	3.4	1.9	5.8
Labor input (hours)	2.4	–2.9	0.7
Gross capital stock (end-year)	7.6	3.4	3.2
Investment	9.5	–6.4	9.0

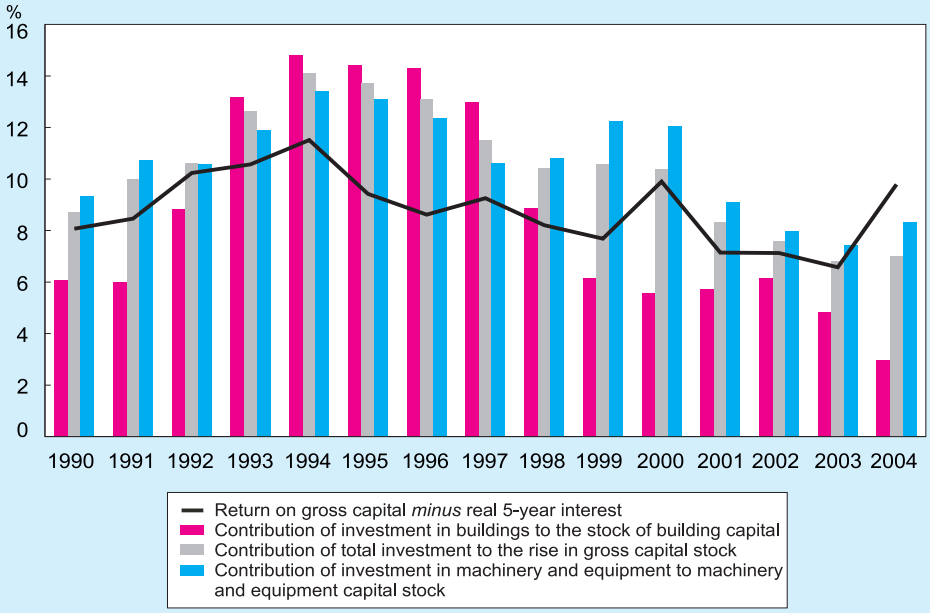
SOURCE: Based on Central Bureau of Statistics data.

manufacturing product did not encompass sales to the domestic market, and the rise in exports in most industries, except for electronics, has not persisted but has diminished in the course of the year. A more detailed examination shows that most of the growth in the number of employees in manufacturing was in the electronics industry, where investment also soared (42.3 percent). Note that even during a period of recovery employment in manufacturing cannot be expected to expand because the long-term trend is of a decline in employment in it. Thus, for example, in the last twenty years the number of persons employed in manufacturing has risen by only 2 percent (while the general population increased by 67 percent), and in the last ten years their number has even fallen (corresponding to trends in other developed countries). As regards investment, although its level in manufacturing has not deviated from that during the recession years (2001–03), capital stock in the industry continued to grow, rising by an annual rate of 3 percent in the last two years, a rate which is far below what it was in the past.

The terms of trade of manufacturing industry deteriorated in 2004, and the rise in input prices exceeded that in output prices.

The terms of trade of manufacturing industry deteriorated in 2004, and factor input prices rose more steeply than output prices. The increase in factor input prices this year stemmed from a sharp rise in prices of imported energy inputs (24 percent), and an increase in those of inputs in the metals, plastics, and paper industries. The greater cost of inputs reflects in part the increase in global demand for finished products; increased costs of this kind do not harm exporters, as the demand for exports has risen, and the increase in global prices of outputs compensates for the higher cost of inputs. Thus, for example, global demand for bromide, potash, and metal products has grown, and hence alongside the marked rise in the price of inputs, exports of these industries have expanded, as has their product prices. While the higher price of inputs affects relative prices and reduces domestic demand for products whose prices have risen (beyond the effect of the deterioration in the terms of trade, which serves to reduce domestic demand for all goods), the total effect in most industries—including chemicals, plastics, and metals—was positive; only the output of the paper industry, most of which is destined for the domestic market, hardly grew at all in 2004.

Figure 1.12
Rate of Return on Capital (*minus* Interest) and the Increase in Capital Stock, 1990–2004



SOURCE: Based on Central Bureau of Statistics data.

4. Developments in manufacturing in the US, and their effect on manufacturing in Israel

An examination of productivity indices in Israel and the US in the 1990s reveals considerable similarity between them as regards both TFP and labor productivity.

a. Productivity in manufacturing in Israel and the US: An examination of indices of productivity in Israel and the US in the 1990s reveals considerable similarity between them in both TFP[31] and labor productivity (product per hour worked). The similar growth rates of TFP and labor productivity could be disappointing, as product per employee in Israel is only two-thirds of that in the US,[32] and hence the growth potential of Israel's manufacturing is greater; on the other hand, this may be perceived as an achievement, however, because US manufacturing industry adopted new technologies in the 1990s which caused its labor productivity and TFP to soar, and Israel's manufacturing industry has not lagged behind.[33]

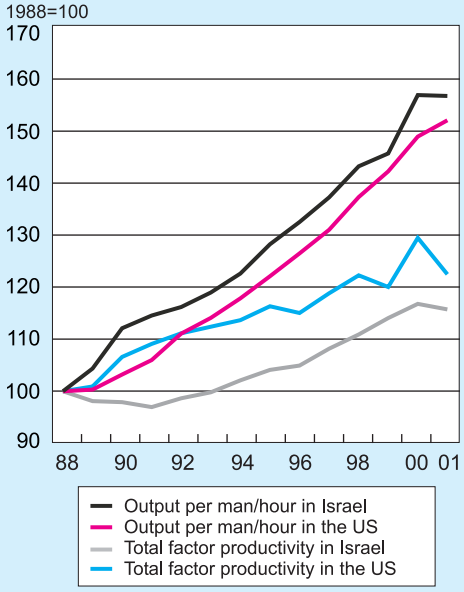
Labor productivity (product per hour worked) depends primarily on the quality of the workers. While the quantity and quality of capital is also very important, these factors are ultimately determined in accordance with the workers' ability to adopt new

[31] The data on US TFP are taken from the Bureau of Labor Statistics, and are calculated differently from those on Israel.

[32] The real gap in product per employee is smaller, because the differences in product per employee in manufactured goods whose tradability is low (food products, cement, etc.) also reflect differences in purchasing power.

[33] A discussion of the long-term link between productivity in Israel and the US can be found in A. Friedman and Y. Lavi (2005) (see footnote 27 above).

Figure 1.13
Total Factor Productivity and Labor Productivity in Israel and the US, 1988–2001



SOURCE: Based on Bureau of Labor Statistics and Central Bureau of Statistics data.

production technologies and maximize the technological advantages implicit in the equipment at their disposal. The quality of workers in manufacturing is important mainly in a situation where manufacturers from all over the world have access to both production technologies and finished product markets. Thus, for example, most of the capital in Israel's manufacturing industry is of imported equipment, in which 'off-the-shelf' technology is implicit, and almost half of Israel's manufacturing product is directed to exports (and the product intended for the domestic market generally competes with imported goods). The value added of Israel's manufacturing industry in producing tradables by means of imported equipment derives to a great extent from the quality and know-how of the labor force relative to that of workers in other countries, whose industries operate under the same conditions. A rise in the quality of the labor force relative to competing countries makes investing in equipment more worthwhile and enables productivity, wages, and the standard of living[34] to rise. An examination of productivity in Israel relative to that in the US in the 1990s shows that

Table 1.13
Total Productivity and Labor Productivity, Israel and the US, 1990–2000

(annual rates of change, percent)

	Total productivity		Labor productivity	
	Israel	US	Israel	US
Total manufacturing	1.3	1.7	3.4	3.7
Traditional industries	-0.3	0.1	2	1.7
Medium-tech industries	1.1	1.5	3.1	2.4
Electronics industries	1.7	4.7	4.6	8.5

SOURCE: Based on data from the Central Bureau of Statistics and the Bureau of Labor Statistics, U.S. Census Bureau.

[34] Investing in equipment could also become more worthwhile as a result of a decline in wages (relative to other countries), in which case capital per worker and product per worker would also rise, but this would be accompanied by a reduction in TFP, reflecting a worrying decline in the standard of living.

the differences in product per worker, capital stock per worker, and workers' ability to utilize the capital stock available to them (quality of workers) remained constant. A more detailed by-industry examination indicates that the increase in productivity in both countries was led by the electronics industries, while productivity stagnated in the traditional industries. The TFP of the electronics industry rose far more rapidly in the US than in Israel. Consequently, even though the share of the industry in total manufacturing product is far higher in Israel than in the US,[35] its contribution to the rise of TFP in manufacturing was much smaller—one third—compared with half the industry's increase in productivity in the US.

The rise in productivity in the US and Israel was led by the electronics industry, while the productivity of the traditional industries stagnated.

b. The quality of the labor force and productivity in manufacturing in Israel and the US: The similarity in the development of productivity indices in Israel and the US reflects the ability of the workers in Israel to compete successfully in a period of rapid technological change. In the last few years the share of educated and skilled workers has grown considerably, and the improvement in the quality of the workforce in manufacturing has contributed to the adoption of new technologies, making it possible to improve product per worker. One way of estimating the contribution of the improvement in the quality of the labor force to the improvement in product per worker is by assuming that the workers' contribution to product is reflected in their wages (i.e., that the value of their marginal output is equal to their wages).[36] For the purpose of the estimation, the workers in manufacturing were divided into four groups according to two levels of skill (skilled workers are those with a degree, members of the liberal professions, persons with technical qualifications, and managers) and two levels of education (educated workers are those with at least 13 years of schooling). We found that the wages of workers who are both skilled and educated is double the average wage in manufacturing (the average in 1995–2003), and that their share rose by 8 percentage points during the period reviewed. Thus, they increased product per worker by 8 percentage points (assuming they replaced 'average' workers). We used the same method to measure the effect of the decline in the share of workers who are neither skilled nor educated. The wage of these workers is 20 percent less than the average wage, so that the 12 percentage-point reduction in their share increased product per worker by 2.4 percent (because they were replaced by 'average' workers). All in all, the improvement in the quality of the labor force in manufacturing between 1995 and 2003 led to an 11.6 percent rise in product per hour worked (see Table 1.14). At the same time product per hour worked increased by 27 percent, so that about 43 percent of its growth stemmed from the improvement in the quality of the labor force.

According to our assessment, almost half the rise in product per hour worked in 1995-2003 derived from the improvement in the quality of the labor force in manufacturing.

[35] Israel's electronics industry accounted for 20 percent in 1990 and 30 percent in 2000, 8 percentage points higher than in the US.

[36] Another assumption is that the value of skilled workers' output does not decrease when their share in the total workforce increases (a justifiable assumption in an open economy).

Table 1.14
Contribution of the Change in the Compostion of Employees to the Rise in Labor Productivity[a]

(percent)

	Weight		Change in weight	Relative wage	Contribution to GDP
	1995	2003			
Skilled, with higher education	14	22	8	200	16
Skilled, without higher education	3	5	2	150	3
Unskilled, with higher education	19	21	2	90	2
Unskilled, without higher education	64	52	-12	80	-9
Total	100	100		100	12

[a] Estimate.

SOURCE: Based on Central Bureau of Statistics data.

The share of skilled and educated workers soared in 1995-2002, yet the wage gap between skilled and unskilled workers in manufacturing did not narrow.

c. Wage differences between skilled and unskilled workers in manufacturing in Israel and the US: The wage gap between skilled and unskilled workers in manufacturing did not contract between 1995 and 2003 even though the rate of skilled and educated workers in manufacturing soared: the share of skilled workers (persons with a degree, members of the liberal professions, persons with technical qualifications, and managers) rose by 10 percentage points to stand at 29 percent, and the share of educated workers (those with at least 13 years of schooling) rose by 11 percentage points, eventually reaching 47 percent at the end of the period.

One possible reason for the rise in the rate of skilled and educated workers while the (gross) wage difference remained stable is that the demand for these workers grew as a result of the rise in their relative productivity, primarily due to technological improvements that were biased towards skilled workers, just when the supply of these workers expanded considerably. It is true that during this period (1995–2003) the share of educated workers (with at least 13 years of schooling) within the prime working-age population (aged 25–54) rose by almost 6 percentage points. On the other hand, there is no evidence that the increased demand for skilled workers was motivated by a rise in their relative productivity, due to technological improvements. This is evinced by the fact that in the US, which leads in the adoption of advanced technologies, the relative wage of skilled workers in manufacturing actually fell in this period (1977–2003). While it is true that this decline was accompanied by a rise in the share of skilled workers in US manufacturing (up by 2 percentage points, bringing their share to 21 percent), this still cannot be considered to explain why the technological changes which were biased towards skilled labor caused the demand for these workers to soar in Israel.

Another explanation stresses the fact that manufacturing products are highly tradable, ascribing the stability of the return on education in Israel to the cessation of the rising trend of return on education elsewhere in the world (as has in fact occurred in the US). The existence of international trade guarantees the link between the relative wage of skilled workers in the rest of the world and that of skilled workers in Israel.

The existence of international trade guarantees the link between the relative wage of skilled workers elsewhere in the world and those of skilled workers in Israel, as well as explaining the stability of the return on education in Israel.

Since the value of the marginal output of skilled workers in Israel is determined by developments in the world as a whole, a rise in the share of educated persons in the labor force will not affect the return on education in Israel but will lead to a structural change in the industry—an increase in the share of persons employed in advanced industries and a decline in the share of persons employed in the traditional ones. An examination of the effect of the rise in the share of skilled workers on by-industry structure shows that 80 percent of the skilled persons employed in manufacturing work in skilled-labor-intensive industries, which are significantly export-oriented (electronics, transport vehicles, and chemicals). The skilled workers employed in these industries led to their expansion (their share in the manufacturing workforce rose by 7 percentage points) as well as to an increase in the share in them of human capital (the share of skilled workers in advanced industries rose from 39 to 53 percent). This increase makes it possible to develop innovative and more complex products (this also occurred within industries, as for example the chemicals industry increased its production of pharmaceuticals, and the military industry began producing unmanned aerial vehicles [UAVs], satellites, and other advanced products). These products are intended for export, so that an increase in the quantity produced does not cause their price to fall or reduce the labor productivity (or relative wage) of skilled workers. Thus, the marked increase in the share of skilled workers in Israel (far exceeding their increase in the US), while maintaining their relative wage, was made possible by the transition to the production of more sophisticated goods for the global market. Part of this change was expressed in a rise in the share of advanced industries in employment, and part in the transition to the production of more sophisticated goods within manufacturing. If a structural change of this kind is not accompanied by technological innovation that is biased towards skilled labor, it cannot be achieved in a closed economy.

Table 1.15

Proportion of Skilled Workers and Those with Higher Education, and their Relative Wages in Manufacturing, 1995–2003

(percent)

	1995	1996	1997	1998	1999	2000	2001	2002	2003
Proportion of skilled workers	18.7	20.3	20.5	22.7	23.3	25.4	25.8	26.7	28.6
Proportion of workers with higher education	35.9	37.8	38.0	39.6	41.1	43.8	44.0	43.6	46.9
Skill ratio[a]	2.63	2.44	2.49	2.21	2.31	2.38	2.52	2.49	2.37
Education ratio[b]	1.68	1.67	1.68	1.69	1.82	1.75	1.85	1.85	1.87

[a] Ratio of wage of skilled workers to that of unskilled
[b] Ratio of wage of workers with higher education to that of workers without higher education
SOURCE: Based on Central Bureau of Statistics data.

The hypothesis that the structural change is a mirror-image, as it were, of a rise in the quality of the labor force in manufacturing enables us to estimate the contribution made by the increased share of skilled workers to the rise in labor productivity by estimating the contribution of the advanced industries—electronics, transport vehicles, and chemicals—in which most of the skilled workers (80 percent) found employment. The contribution of these industries is double—by virtue of the accelerated expansion of their product per hour worked relative to the industry average (a 38 percent increase vis-à-vis a rise of only 14 percent in the other manufacturing industries in 1995–2003), as well as via the increase in the share of persons employed in them; this rose from 25 to 30 percent, so that product per worker in these industries is 75 percent higher than in the other manufacturing industries (average during the period). Altogether, these industries accounted for almost 50 percent of the total increase in product per worker in manufacturing.

Israel's electronics exports were harmed by competition from developing countries, but the industry managed to divert its activity to more advanced and innovative products, where its main competitors are developed countries.

d. The countries competing in the US electronics market: Israel's electronics exports have been harmed by competition from developing countries, but its activity has been diverted to even more sophisticated and innovative products, in which the principal competitors are developed countries. In order to characterize the level of development of the countries with which Israel is competing in the US electronics market, we use US trade data. For this purpose we isolated 12 groups of products in which Israel's electronics exporters specialize, 4 groups from each three-digit industry (the 12 groups were chosen from the 200 of which the electronics industry is comprised). For each group we examined which of them export to the US, what is their market share, and whether the country concerned is developed or developing. We multiplied each country's market share (in each group of products) by its per capita GDP, thereby obtaining an index of the level of development of the average exporter (which we defined as the representative competitor) for each group of products. The results presented in the table summarize the results at the industry level (in order to avoid going into too much detail, we do not present the results at the group of products level; the transition from the group of products to the industry level was achieved according to the share of the group of products in Israel's exports to the US each year).

An examination of per capita GDP in countries which compete with Israel in the US electronics market shows that it is slightly higher than in Israel, and averaged $ 19,000 (in 2004).

An examination of the level of development of the representative competitor (average per capita GDP weighted by its share in US imports) in the various groups of products in 2004 shows that it is slightly higher than Israel's: the per capita GDP of these exporters averages $ 19,000, lower in the groups of products in the electronics components and electronic communications equipment industries and higher in the groups in the manufacturing control and supervision equipment and medical and scientific equipment industries. An examination of the trend over time in 1996–2003 reveals that the per capita GDP of the representative exporter in the electronic communications industry plummeted, but rose in the control and supervision equipment and medical and scientific equipment industries. The most notable decline was in the group of products of electronic components for land telephone lines

and telephone exchanges: the per capita GDP of the representative exporter in this group stood at $ 24,000 in 2000, but then the shares of Canada and Japan, which are wealthy (and also of Israel) plunged, while those of Malaysia and Mexico, which are poorer, soared. As a result, the per capita GDP of the representative exporter fell to $ 13,000. Concurrent with the fall in per capita GDP of the representative exporter in the electronic communications industry in 2000–04, the share of the industry's exports in Israel's total exports also dipped: the share of the four main groups fell from 28 percent of total electronics exports to only 18 percent, while the share of the four groups of products from the control and supervision equipment and medical and scientific equipment industries (which compete primarily with the developed countries) rose from 15 to 24 percent. The diversion of Israel's exports from products which compete with those from developing countries to products which compete with those from developed ones provides further evidence of the comparative advantage bestowed by technological innovation and the comparative disadvantage of producing goods in which it is necessary to keep production costs low.

Table 1.16
Per Capita GDP in Countries Competing with Israel in the US Electronics Market

($ '000)

	Number of product groups	Weight of product groups in electronic exports to the US		Per capita GDP of representative exporters		
		2000	2004	1996	2000	2004
Electronic components	4	28	24	15.7	15.9	15.2
Electronic communcations equipment	4	28	18	20.3	19.9	13.3
Control, supervision and scientific medical equipment	4	15	24	24.6	22.3	26.1
Total	12	71	66	20.4	18.9	18.9

SOURCE: Based on data from the IMF and US foreign trade data.

Box 1.3
Changes in the Encouragement of Capital Investments Law

In April 2004 the government decided to amend the Encouragement of Capital Investments Law. According to the amendment the condition for receiving government aid would be that at least one quarter of the factory's sales would be destined for export; thus, firms producing for the domestic market would not receive subsidies, and these would be diverted to investments in export

industries.[1] In our view, the principal consideration in granting government subsidies to the private sector should be the existence of positive externalities for the economy as a whole. The importance of this criterion was acknowledged in the Research and Development Law, and should also be applied in this case. While it should not be concluded that there is no justification for using government policy in order to help develop areas with high unemployment on the periphery, it should be pointed out that expanding exports does not embody positive externalities per se, so that one cannot advocate subsidizing capital investments merely because they increase exports.

Those who are in favor of the amendment might claim that the expansion of export firms constitutes a net gain to GDP and employment, while the expansion of firms producing for the domestic market comes at the expense of another domestic firm, so that subsidizing investment in export-biased firms yields a greater net contribution to the economy as a whole. This contention in effect advocates the subsidization of exports, something which is known to have an adverse effect on economic efficiency. An economy's exchange rate accurately reflects the substitution rate in production (between producing for the domestic market and for export) and consumption (between consuming a product that has been produced domestically or one that has been imported), so that subsidizing exports deflects the economy from the desired point to an inferior one, where there is excess import consumption (and excess export production) and a shortage of consumption (and production) of domestic nontradables. In the past the government deviated from this rule and subsidized exports of the traditional industries (e.g., textiles and clothing). This made it possible to employ unskilled workers in areas of high unemployment, and helped to generate income smoothing and to expand economic activity (because of structural unemployment in the peripheral areas). Today, however, the subsidization of exports is directed to industries that are skilled-labor-intensive (where wages are high and unemployment in the surrounding area is low), so that there is no justification for preferring export industries to others.

It has also been claimed that exports should be favored because competition in global markets creates perpetual pressure to improve and increase productivity, so that the export sector leads the economy in introducing new technologies and efficient production methods, processes which trickle down to other firms and increase productivity in the economy as a whole. The assertion that exporting firms generate positive externalities for the entire economy is to be found in the economics literature, and cannot be rejected without a far-reaching empirical

[1] In effect, diverting government subsidies in order to encourage export industries is the policy that has been implemented for several years. This is proved by the fact that the extent of investments approved in the export industries—electronics, pharmaceuticals, chemicals, and plastics—amounted to 75 percent of all investments approved in 1996-2000.

investigation. Nonetheless, it can be said that international competition operates not only on exporting firms but also on those that produce import substitutes, as the domestic manufacturing industry is hardly protected by import tariffs (most of the goods produced for the domestic market are import substitutes). In addition, it is not clear whether exporting firms in manufacturing have a genuine effect on non-manufacturing domestic firms in completely different industries, such as finance, commerce, services, transport, and communications. Furthermore, Israel has close economic ties with other countries and is open to new technologies, trade, and foreign investment, so that the potential contribution of increased exports by one manufacturing firm or another to the accelerated incorporation of new technologies or manufacturing processes in the economy as a whole seems negligible.

As has been stated here in the past, the Encouragement of Capital Investments Law distorts the allocation of economic resources by discriminating between manufacturing and non-manufacturing firms, and between large and small firms; it also distorts the allocation of sources between excess use of capital and under-use of labor. The new amendment will also give rise to a distortion in the allocation of production between the domestic market and exports. These distortions harm the economy and are financed by increasing tax rates on capital and labor, which is in itself distorting. The ability of the Encouragement of Capital Investments Law to contribute to the expansion of employment of unskilled workers is declining because the nature of Israel's manufacturing industry is changing: its share of total employment has shrunk considerably, as has the share of unskilled workers in total manufacturing employment (in addition, capital stock per manufacturing worker has soared). It is difficult to find any genuine justification for the extensive subsidization of investment in manufacturing (by excess taxation of the other industries), as the cases in which these investments have positive externalities are few and far between. Moreover, even if it is decided to extend subsidies of this kind, export-biased firms should not be favored over those producing for the domestic market. The purpose of government intervention (as we understand it) is to improve the economic situation of the periphery and to augment (and diversify) the demand for labor there. A good example of involvement of this kind is the government's decision last October to support the employment of new workers in the Sderot region. The program was managed by tender, and the main criteria for providing grants to entrepreneurs were the amount of aid requested in order to employ workers and the average wage they intended to pay.

Box 1.4
Effect of Uncertainty on Investment in Israel's Manufacturing Industry

Uncertainty has an extremely negative effect on investment. Once an investment has been made the situation is irreversible, and the investment may be lost. If, for example, new competitors with better technology emerge or if consumers' tastes change, output prices may fall, leaving the firm with surplus machinery and equipment which is difficult to sell. The theory of irreversible investment stresses the importance of the question of timing in making investments: the potential investor examines the profit he is likely to obtain from making the investment in the present (immediately) compared with the possibility of waiting until further information which will reduce uncertainty is available, and only then, in accordance with that information, does he decide whether to participate in the project.

Thus, for example, a study[2] which examined the effect of uncertainty on the rate of investment in manufacturing in Israel in 1980–1997 found that a rise in the index of uncertainty (standard deviation) from 0.1 to 0.2 led to a decline of 10–12 percent on average in the share of investment in GDP in that period. Uncertainty (as defined in the study) relates to shocks (standard deviation) in the value of the marginal output of capital, and to shocks which could derive from fluctuations in the price of output as well as in productivity. The study was based on the empirical application of the production function with constant returns to scale, and a competitive market which firms may enter freely but where investments are irreversible. Investment decisions are made in conditions of uncertainty regarding output prices, and this gives rise to uncertainty regarding future profits from the investment.

In order to quantify the effect of the increase in uncertainty on the rate of investment in manufacturing we extended the sample period in the model to 2003 and examined two periods: 1994–1998 and 1999–2003, the latter period characterized by many shocks (the second Intifada and the global crisis in the electronics industry). We found that in the second period uncertainty increased (standard deviation of the value of the marginal product of capital in manufacturing) to 0.22, compared with 0.1 in the first period. This rise in uncertainty may explain the 12 percent decline in the average rate of investment between the two periods. All in all, the rate of investment fell by more—17 percent—between the two periods. Hence, additional factors which changed between the two periods—the decline in the GDP growth rate ('the accelerating factor'), the moderation of the influx of immigrants, and the increase in interest rates—also served to lower the share of investment in manufacturing between the two periods.

[2] Menashe (1999), "The Effect of the Aggregate Uncertainty of Real Capital Costs on Investment in Manufacturing in Israel, 1980–1997," Bank of Israel, Research Department, Discussion Paper 99.02 (Hebrew).

Table 1.17
Factor Inputs, Productivity, and Cost Per Hour Worked in Electronics, 1990–2004

(rate of change, percent)

	1990–2000	2001–2003	2004
Production	10.6	–5.2	11.4
Exports	21.9	–10.8	23.2
Cost per hour worked	6.9	–2.8	–4.8
Labor productivity	4.6	–1.6	5.6
Hours worked	5.8	–3.6	5.5
Capital stock	14	6.8	8
Multi-factor productivity	1.7	–5.3	6.2
Investment	19.7	–10.6	42.3
Share in production (%)	21.8	26.3	26.7
Share in exports (%)	26.7	35.2	34.4

SOURCE: Based on Central Bureau of Statistics data.

Table 1.18
Factor Inputs, Productivity, and Cost Per Hour Worked in Mixed Industries, 1990–2004

(rate of change, percent)

	1990–2000	2001–2003	2004
Production	3.8	–2.8	8.1
Exports	8.0	6.5	12.7
Cost per hour worked	3.5	–2.0	–3.1
Labor productivity	3.1	5.8	9.4
Hours worked	2.0	–0.5	–1.2
Capital stock	7.1	–3.2	2.2
Multi-factor productivity	1.1	4.2	4.5
Investment	6.8	–3.2	4.4
Share in production (%)	29.7	32.5	34.6
Share in exports (%)	48.1	46.8	48.2

SOURCE: Based on Central Bureau of Statistics data.

Table 1.19
Factor Inputs, Productivity, and Cost Per Hour Worked in Traditional Industries, 1990–2004

(rate of change, percent)

	1990–2000	2001–2003	2004
Production	3.8	–2.8	2.4
Exports	4.5	–1.0	14.1
Cost per hour worked	3.4	–1.1	–2.6
Labor productivity	2.0	1.1	2.6
Hours worked	1.7	–3.9	–0.2
Capital stock	7.6	–0.4	1.3
Multi-factor productivity	–0.3	–1.8	2.0
Investment	5.9	–6.7	20.2
Share in production (%)	48.5	41.2	38.7
Share in exports (%)	25.2	18.0	17.4

SOURCE: Based on Central Bureau of Statistics data.

Table 1.20
Mixed Industries: Production, Exports, and Labor and Capital Input, 2004

(rate of change, percent)

	Share in manufacturing product (%)	Production	Real exports	Number of employees	Hours worked	Capital stock
Mixed manufacturing	34.6	8.1	12.7	-0.8	-1.2	1.6
Plastics and rubber	6.9	5.8	12.3	-3.1	-5.4	4.2
Mining and quarrying	2.5	-3.2	15.6	-0.9	-3.3	4.9
Miscellaneous	0.8	-0.6	7.2	0.7	-2.0	-2.2
Jewelry & objets d'art	0.6	-3.1	6.5	-5.7	-10.1	-2.2
Chemicals and oil	14.1	12.6	13.6	2.5	2.8	-2.0
Machines and equipment	2.9	-7.0	13.9	-5.6	-5.5	4.1
Transport equipment	6.9	16.6	10.3	3.4	5.3	0.2

SOURCE: Based on Central Bureau of Statistics data.

Table 1.21
Traditional Industries: Production, Exports, and Labor and Capital Input, 2004

(percent)

			Increase in		
	Share in manufacturing product (%)	Production	number of employees	hours worked	capital stock
Traditional industries	38.7	2.4	0.7	–0.2	1.2
Food, beverages, tobacco	10.6	1.3	1.9	0.9	2
Textiles & clothing	3.5	–2.8	–5.4	–3.6	–1.1
Footwear, leather & its products	0.2	–8.2	–9.2	–5.7	–6.3
Wood & its products (incl. furniture)	3	7.5	–0.2	–2.5	–0.7
Paper & its products	1.6	0.1	2.3	–1.1	–1.6
Printing & publishing	4.4	5	5.5	1.7	–3
Non-metallic minerals	2	–8.4	–4.3	–3.8	–0.6
Basic metals	1.6	7.8	1.2	0.2	1.7
Metal products	10	6.3	2.7	3.1	5.5
Motors & electric distribution apparatus	1.9	–3	–4.3	–8.4	–1.5

SOURCE: Based on Central Bureau of Statistics data.