

MICHAEL BÖHEIM

## MARKET OPPORTUNITIES FOR AUSTRIAN MANUFACTURING INDUSTRY

*An analysis of Austrian manufacturing industries found that it is highly competitive in some sectors, yet its rise to the top ranks of leading industrialised countries is still hampered by persistent structural deficits. From an international view, Austrian manufacturing industries are already well placed in some future-g geared industrial sectors and technological fields, but in order to fully exploit future opportunities, a two-pronged industrial policy strategy is recommended. This strategic approach combines focusing on core competences in production and original R&D with applying (elsewhere developed) advanced technologies in selected mid- and low-tech market segments.*

The first attempts at analysing the structure and competitiveness of the Austrian manufacturing sector were made in the mid 1980s (Aiginger, 1987). Their findings are basically confirmed by more recent studies, especially with regard to the patterns of specialisation which are unfavourable in a country that enjoys high living and social welfare standards. Nevertheless, the situation has shown a marked improvement in the past 20 years thanks to successful efforts to institute structural change.

In conjunction with this report, a WIFO study (Böheim, 1999) aims to use these structural analyses of the past in order to provide economic policy with a tool to shape medium- to long-term developments with a view to the future. Starting out from an inventory of strengths and weaknesses shown by the Austrian manufacturing industry<sup>1</sup>, the study delves into market opportunities and delimits the margin available for economic policy to realise the future potential of Austria as best as possible.

### ABOVE-AVERAGE GROWTH OF VALUE ADDED, EMPLOYMENT AND PRODUCTIVITY

At +5 percent p.a., the value added achieved by Austrian manufacturing industries grew at almost double the EU average (+2.7 percent) in 1989-1996. The greatest

This contribution is based on a WIFO study commissioned by the Federal Ministry of Foreign Affairs, and the Federation of Austrian Industry (110 pages, ATS 700 (€ 50.87); for orders please contact Christine Kautz, phone (+43 1) 798 26 01/282, fax (+43 1) 798 93 86, e-mail Christine.Kautz@wifo.ac.at. Michael Böheim (Michael.Boeheim@wifo.ac.at) is an economist at WIFO. The author wishes to thank Michael Peneder for valuable information and suggestions. The data were processed and analysed with the support of Sonja Patsios.

<sup>1</sup> In Böheim (1999) static and dynamic indicators for 97 manufacturing industries on the NACE 3-digit level were analysed.

Table 1: Real net output growth

	Average annual percentage changes 1989-1996
Total manufacturing industry	+ 5.0
<i>10 best and worst performing Austrian manufacturing industries</i>	
Highest growth rates	
Other general purpose machinery	+14.4
Parts and accessories for motor vehicles	+13.6
Bodies for motor vehicles, trailers	+12.0
Domestic appliances n.e.c.	+11.6
Machinery for production and use of mechanical power	+10.9
Electricity distribution and control apparatus	+10.9
Agricultural and forestry machines	+10.6
Insulated wire and cable	+10.6
Structural metal products	+10.5
Bricks, tiles and construction products	+ 9.8
Greatest declines	
Wearing apparel; dressing and dyeing of fur	- 7.2
Tanning and dressing of leather	- 5.9
Footwear	- 4.5
Basic iron and steel, ferro-alloys	- 4.3
Ceramic goods	- 4.2
Basic precious and non-ferrous metals	- 4.0
Ships and boats	- 3.0
Fish and fish products	- 2.8
Luggage, handbags, saddlery and harness	- 2.8
Other transport equipment n.e.c.	- 2.7

Source: DEBA, own calculations.

strides were made by the categories known as other machinery parts and accessories for motor vehicles, bodies for motor vehicles, domestic appliances, and electricity distribution and control apparatus. Their edge was primarily the result of catching-up processes and successful structural change in parts of the Austrian manufacturing industry (Table 1).

Even though some sectors could boost their productivity significantly, the rapid growth still generated positive employment effects in 16 industries (Table 2). The greatest job growth rates were achieved mainly by industries of the mid-tech segment, the greatest job losses were suffered by traditional labour-intensive industries which were most severely affected by structural adjustment processes. Altogether, the decline of 2.2 percent p.a. in industrial employment in 1989-1996 was slightly greater than the EU average (-1.9 percent).

Productivity rose much faster in Austria than the corresponding European average (+7.3 percent p.a. as against +4.7 percent; Table 3). The high average is the result of a broad high-growth base (except industries producing instruments for measuring, checking, testing and navigating, which are technology-driven) with productivity growing fastest in the mainstream industries<sup>2</sup>. A decline in produc-

<sup>2</sup> WIFO has developed a taxonomy of manufacturing industries, which categorises them by the importance of factor inputs, as labour- or capital-intensive and technology- and marketing-driven industries and (as a residual category) mainstream industries. More details are given below when discussing the structural analysis. The concept as such is described by Peneder (1999A).

Table 2: Employment

	Average annual percentage changes 1989-1996
Total manufacturing industry	- 2.2
<i>10 best and worst performing Austrian manufacturing industries</i>	
Highest growth rates	
Bodies for motor vehicles, trailers	+ 5.3
Prepared animal feeds	+ 4.9
Parts and accessories for motor vehicles	+ 4.5
Plastic products	+ 2.6
Other general purpose machinery	+ 2.2
Panels and boards of wood	+ 2.1
TV and radio transmitters, apparatus for line telephony	+ 2.0
Builders' carpentry and joinery	+ 1.8
Bricks, tiles and construction products	+ 1.7
Structural metal products	+ 1.5
Greatest declines	
Wearing apparel; dressing and dyeing of fur	-11.5
Ships and boats	-11.4
Other transport equipment n.e.c.	- 9.0
Optical instruments and photographic equipment	- 8.0
Jewellery and related articles	- 7.5
Coke, refined petroleum and nuclear fuel	- 7.2
Railway locomotives and rolling stock	- 6.9
Basic precious and non-ferrous metals	- 6.5
Dairy products; ice cream	- 6.0
Footwear	- 5.8

Source: DEBA, own calculations.

tivity was observed in just three industries: steep in the tanning and dressing of leather and fish and fish products, minor in basic iron and steel.

In two thirds of the industries, productivity rose faster in Austria than in the EU. The greatest advances in catching up were made by agricultural and forestry machines, jew-

Table 3: Labour productivity of Austrian industries

	Average annual percentage changes 1989-1996
Total manufacturing industry	+ 7.3
<i>10 best and worst performing Austrian manufacturing industries</i>	
Highest growth rates	
Domestic appliances n.e.c.	+15.1
Electric motors, generators and transformers	+14.1
Agricultural and forestry machinery	+13.6
Instruments for measuring, checking, testing, navigating	+13.6
Machinery for production and use of mechanical power	+13.3
Optical instruments and photographic equipment	+12.8
Lighting equipment and electric lamps	+12.4
Insulated wire and cable	+12.2
Other general purpose machinery	+12.0
Accumulators, primary cells and primary batteries	+11.8
Lowest growth or greatest decline	
Tanning and dressing of leather	- 5.7
Fish and fish products	- 1.5
Basic iron and steel, ferro-alloys	- 0.4
Luggage, handbags, saddlery and harness	+ 0.2
Ceramic goods	+ 0.5
Footwear	+ 1.4
Miscellaneous manufacturing n.e.c.	+ 1.8
Panels and boards of wood	+ 2.1
Basic precious and non-ferrous metals	+ 2.7
Sawmilling, planing and impregnation of wood	+ 2.9

Source: DEBA, own calculations.

Table 4: Labour productivity: comparison between Austria and EU

	Difference of average annual percentage changes 1989-1996 in percentage points
Total manufacturing industry	+ 2.6
<i>Austria ahead of EU</i>	
Agricultural and forestry machinery	+10.1
Jewellery and related articles	+ 9.5
Electric motors, generators and transformers	+ 9.4
Domestic appliances n.e.c.	+ 8.5
Machinery for production and use of mechanical power	+ 8.2
Instruments for measuring, checking, testing, navigating	+ 8.2
Accumulators, primary cells and primary batteries	+ 7.8
Paints, coatings, printing ink	+ 7.6
Insulated wire and cable	+ 7.5
Other chemical products	+ 7.5
<i>Austria trailing EU</i>	
Tanning and dressing of leather	- 9.5
Ceramic goods	- 4.1
Fish and fish products	- 3.5
Luggage, handbags, saddlery and harness	- 3.2
Miscellaneous manufacturing n.e.c.	- 2.3
Coke, refined petroleum and nuclear fuel	- 2.1
Sawmilling, planing and impregnation of wood	- 2.1
TV, radio and recording apparatus	- 1.9
TV and radio transmitters, apparatus for line telephony	- 1.7
Panels and boards of wood	- 1.6

Source: DEBA, own calculations.

ellery, electric motors, domestic appliances, and instruments for measuring, checking, testing and navigating (Table 4). They considerably improved their productivity performance, which points to dynamic catching-up and rationalisation processes. On the other hand, 15 industries (such as tanning and dressing of leather, ceramic goods, fish and fish products, luggage, handbags, saddlery and harness, miscellaneous manufacturing) were found to trail in their productivity.

In Austria, the degree of specialisation (for a definition see box) in the EU's top ten growth industries does not show any straightforward pattern (Table 5). Whereas the refined petroleum sector and the pharmaceutical industry – two of Europe's three most successful industries, with a net output growth of 10.2 and 7.3 percent p.a., respectively – show a decidedly negative degree of specialisation in Austria.

Industries of the other top ten EU categories achieved a comparatively satisfactory position. With regard to railway locomotives and rolling stock, domestic appliances, optical instruments and photographic equipment, their contribution to the total value added in Austria is higher by about a quarter than the EU average. For other food products it corresponds to the EU average.

## STRUCTURAL PROBLEM AREAS

The five industries with the highest degree of specialisation in Austria are rather heterogeneous in nature. Specialisa-

Table 5: Performance of selected Austrian manufacturing industries

	Net output of EU	Specialisation 1996 <sup>1</sup>
	Average annual percentage changes 1989-1996	
<i>Highest EU growth rates</i>		
Coke, refined petroleum and nuclear fuel	+10.2	- 1.2
Medical equipment	+ 7.8	.
Pharmaceuticals	+ 7.3	- 0.2
Railway locomotives and rolling stock	+ 7.1	+ 0.3
Electronic valves and tubes, other electronic components	+ 6.0	.
Parts and accessories for motor vehicles	+ 5.9	- 0.4
Other food products	+ 5.7	+ 0.1
Domestic appliances n.e.c.	+ 5.3	+ 0.3
Optical instruments and photographic equipment	+ 5.2	+ 0.4
Fruits and vegetables	+ 5.1	- 0.4
<i>Greatest EU declines</i>		
Industrial process control equipment	- 6.5	.
Basic iron and steel, ferro-alloys	- 5.6	+ 0.8
Footwear	- 5.5	- 0.2
Knitted and crocheted articles	- 2.7	.
Jewellery and related articles	- 2.4	- 2.0
Other transport equipment n.e.c.	- 2.4	+ 0.0
Office machinery and computers	- 2.4	.
Tanning and dressing of leather	- 1.7	- 0.4
Basic chemicals	- 1.4	- 0.2
Luggage, handbags, saddlery and harness	- 1.4	- 0.6

Source: DEBA, own calculations. – <sup>1</sup> For a definition see box.

tion is marked in labour-intensive industries such as machine-tools and made-up textile articles, but also in relatively traditional industries such as knitted and crocheted fabrics. The marketing-driven sports goods industry similarly ranks in the top group. Austrian manufacturing industries do not specialise in those high-growth, value-adding and research-intensive high-tech industries which are particularly important for a high-wage country, although the country has one mid-tech industry – TV, radio and recording apparatus – among its specialisations.

Degree of specialisation in the Austrian manufacturing industry  $i$  compared to its EU counterpart

$$Spec_i^A = \ln \left[ \frac{\left( \frac{VA_i^A}{VA_{Man}^A} \right)}{\left( \frac{VA_i^{EU}}{VA_{Man}^{EU}} \right)} \right],$$

$VA \dots$  value added,  $i \dots$  industry (NACE 3-digits),  $Man \dots$  total manufacturing.

By definition  $Spec_i^A$  lies within the range  $]-\infty; +\infty[$  with (higher) positive values indicating a (higher) degree of specialisation in the Austrian manufacturing industry  $i$  compared to its EU counterpart. If there is no specialisation pattern (i.e., shares of value added for an industry are the same in Austria as the EU)  $Spec_i^A$  will be equal to zero.

Table 6: Specialisation

	Net value added of EU	Specialisation 1996 <sup>1</sup>
	Average annual percentage changes 1989-1996	
<i>Highest specialisation</i>		
Knitted and crocheted fabrics	+ 0.5	+ 2.0
Machine-tools	+ 0.9	+ 1.9
Sports goods	+ 2.6	+ 1.8
TV, radio and recording apparatus	+ 2.6	+ 1.4
Made-up textile articles	+ 3.9	+ 1.4
Pesticides, other agro-chemical products	+ 3.4	+ 1.2
Man-made fibres	+ 1.5	+ 1.2
Structural metal products	+ 2.5	+ 1.2
Fish and fish products	+ 0.2	+ 1.1
Textile fibres	+ 2.5	+ 1.0
<i>Lowest specialisation</i>		
Miscellaneous manufacturing n.e.c.	+ 3.0	- 2.6
Ships and boats	- 0.8	- 2.4
Jewellery and related articles	- 2.4	- 2.0
Coke, refined petroleum and nuclear fuel	+10.2	- 1.2
Publishing	+ 2.4	- 1.0
Electricity distribution and control apparatus	+ 2.2	- 1.0
Detergents, cleaning and polishing, perfumes	+ 2.8	- 0.8
Wearing apparel; dressing and dyeing of fur	+ 0.4	- 0.7
Luggage, handbags, saddlery and harness	- 1.4	- 0.6
Other chemical products	+ 2.1	- 0.5

Source: DEBA, own calculations. - <sup>1</sup> For a definition see box.

Austrian manufacturing industries are not particularly specialised in Europe's highest-growth industries (Table 6). Of the ten Austrian manufacturing industries that have the highest degree of specialisation, made-up textile articles and pesticides show a markedly above-average growth of value added in the EU. Sports goods, TV, radio and recording apparatus, structural metal products, and textile fibres are slightly below the EU average of +2.7 percent. Knitted and crocheted fabrics and machine-tools, the two industries that have the highest degree of specialisation in Austria, added little value in the EU on average in 1989-1996, and they are among Europe's lowest-performing industries.

In their international trade development, Austrian manufacturing industries found themselves in an extremely unfavourable position between 1989 and 1996. Fewer than a third of the industries were able to boost their global market share (exports as a percentage of global imports). Seen overall, Austrian manufacturing industries lost 0.28 percent of their global market shares.

The only sectors to raise their world market shares between 1989 and 1996 were motor vehicles and, distinctly behind, food products, refined petroleum products, tobacco products and other transport equipment. The greatest increases in Austrian exports were recorded for bodies of motor vehicles, trailers, motor vehicles, prepared animal feed, parts and accessories for motor vehicles, and plastic products – each of these industries raised its market

Table 7: Dynamic view of foreign trade by Austrian industries

	Austria	EU
	Changes of global market shares 1989-1996, percentage points	
Total manufacturing industry	- 0.3	- 0.1
<i>10 best and worst performing Austrian manufacturing industries</i>		
<i>Highest market share growth</i>		
Bodies for motor vehicles, trailers	+ 2.3	-12.5
Motor vehicles	+ 1.5	+ 6.5
Prepared animal feeds	+ 1.3	-10.3
Parts and accessories for motor vehicles	+ 1.2	+ 4.8
Plastic products	+ 1.1	- 2.1
Beverages	+ 0.9	- 2.8
Dairy products, ice cream	+ 0.8	-15.4
Other first processing of iron and steel	+ 0.7	- 0.8
Furniture	+ 0.7	- 6.7
Fruits and vegetables	+ 0.7	- 0.8
<i>Greatest market share decline</i>		
Man-made fibres	- 7.1	-17.3
Articles of paper and paperboard	- 6.5	- 8.4
Knitted and crocheted fabrics	- 5.4	-13.4
Wooden containers	- 4.8	- 6.7
Tanks, reservoirs, central heating radiators and boilers	- 3.7	- 3.6
Sports goods	- 3.4	- 3.6
Tubes	- 3.2	-19.6
Steam generators	- 3.1	+47.2
Rubber products	- 2.8	- 6.3
Paints, coatings, printing ink	- 2.6	-13.1

Source: DEBA, COMPET, own calculations. - <sup>1</sup> Exports as a percentage of global imports.

share by more than 1 percentage point p.a. Whereas in the EU as such, three of the industries that achieved the strongest export growth rates in Austria (bodies for motor vehicles, trailers, prepared animal feed products) lost (considerable) market share, their Austrian counterparts recorded slight gains. For motor vehicles, and parts and accessories for motor vehicles, on the other hand, the average market share growth was substantially greater in the EU than in Austria (Table 7).

Seen from a static angle, builders' carpentry and joinery, structural metal products, railway locomotives and rolling stock, tanks, reservoirs, central heating radiators and boilers, and articles of paper and paperboard had achieved the greatest presence on the world market. In almost all of these industries Austria lost market shares in 1989-1996. Nevertheless, their performance reflected that of the EU average, with the exception of the railway locomotives and rolling stock sector where Austrian manufacturing industries lost some market share while EU industries in general gained slightly (Table 8).

## THE STRUCTURE OF THE AUSTRIAN MANUFACTURING INDUSTRY

### FACTOR INPUTS, MARKETING AND INNOVATION

A constant stream of investments into the quality of a location is a feasible strategy for high-wage countries to avoid

Table 8: Static view of foreign trade by Austrian industries

	Global market shares <sup>1</sup>	
	1996 In percent	Changes 1989-1996 Percentage points
Total manufacturing industry	2.0	- 0.3
<i>10 best and worst performing Austrian manufacturing industries</i>		
Highest market shares		
Builders' carpentry and joinery	10.6	- 1.4
Structural metal products	10.5	- 1.7
Railway locomotives and rolling stock	10.3	- 0.6
Tanks, reservoirs, central heating radiators and boilers	8.6	- 3.7
Articles of paper and paperboard	7.4	- 6.5
Bodies for motor vehicles, trailers	7.3	+ 2.3
Articles of concrete, plaster and cement	7.1	- 0.8
Ceramic goods	6.7	- 1.9
Other non-metallic mineral products	6.3	- 1.5
Tubes	6.2	- 3.2
Lowest market shares		
Cutting, shaping, finishing of stone	0.4	- 0.2
Coke, refined petroleum and nuclear fuel	0.4	+ 0.2
Jewellery and related articles	0.4	+ 0.1
Office machinery and computers	0.3	- 0.1
Ships and boats	0.2	+ 0.0
Aircraft and spacecraft	0.2	+ 0.1
Watches and clocks	0.2	+ 0.0
Vegetable and animal oils and fats	0.2	+ 0.1
Ceramic tiles and flags	0.2	- 0.1
Fish and fish products	0.0	+ 0.0

Source: DEBA, COMPET, own calculations. – <sup>1</sup> Exports as a percentage of global imports.

competition on price which they would otherwise lose against competitors with comparative factor cost advantages. Competitive advantages may be determined exogenously by the factors prevailing on a location, or endogenously by strategic investments made by companies which are frequently of intangible character (technological know-how, brands, etc.). The purpose of such a strategy is to differentiate products by quality and additional benefits, which in turn will limit their substitutability by cheaper products.

The new WIFO taxonomy, which was first used in the 1998 European Union competitiveness report (Peneder, 1999A, European Commission, 1998), categorises industries by their characteristic factor inputs as labour- or capital-intensive and technology- or marketing-driven industries. Industries which are not clearly weighted towards ei-

ther factor are included in a residual "mainstream" category. By assigning these mutually exclusive categories, it is possible not only to identify patterns of specialisation but also to analyse the interaction between product differentiation and competitiveness.

Compared to Japan and the USA, industries in the European Union tend to be specialised in the traditional labour- and capital-intensive sectors but are underrepresented in technology- and marketing-driven segments. On the global market, European industries have their strongest position in the mainstream category, especially in segments that require a particular know-how. Labour-intensive industries in Europe contribute a relatively large fraction to the value added, but a disproportionately low share to exports.

*The main structural problem faced by Austrian manufacturing industries is their overspecialisation in sectors with a large proportion of less qualified work and under-specialisation in technology-driven sectors.*

The pattern is even more pronounced in Austria (Table 9). The contribution made by its labour-intensive industries to the overall net industrial output is almost 60 percent higher than in the EU in general. This relatively high degree of specialisation in labour-intensive industries and low degree of specialisation in technology- and marketing-driven industries shows clearly that Austrian manufacturing is based much too strongly on traditional industries with little value-adding capacity, when compared to the EU and even more when compared to third countries. For a high-wage country such as Austria it is particularly problematic to specialise in labour-intensive and thus highly wage-elastic industries, as they will be most strongly affected when production is shifted to countries which offer comparative wage advantages. Whereas the European industries specialise in capital-intensive sectors, this does not apply to Austria: here the contribution of capital-intensive

Table 9: Taxonomy of Austrian manufacturing industries

	Net output	Employees	Exports	Imports	Specialisation <sup>1</sup>	Net output	
						Austria	EU
						Average annual percentage changes 1989-1996	
						Percentage shares 1996	
Mainstream industries	24.0	23.0	31.6	25.8	+ 0.02	+ 8.4	+ 2.8
Labour-intensive industries	25.0	29.7	15.7	15.2	+ 0.54	+ 5.4	+ 2.1
Capital-intensive industries	17.4	14.7	18.7	18.4	- 0.12	+ 1.0	+ 2.8
Marketing-driven industries	19.3	20.3	11.5	13.2	- 0.11	+ 4.0	+ 2.8
Technology-driven industries	14.3	12.3	22.5	27.5	- 0.37	+ 6.2	+ 2.6
Total manufacturing industry	100.0	100.0	100.0	100.0		+ 5.0	+ 2.7

<sup>1</sup> For a definition see box.

Table 10: Industry categories and their global market shares

		Austria		EU			Japan		USA	
		1989	1996	1989	1996	1989	1996	1989	1996	
		In percent								
Total		2.22	1.95	27.00	26.92	19.20	14.47	20.17	18.79	
Globalisation	High	1.75	1.30	25.35	24.70	22.61	16.38	20.49	18.11	
	Medium	2.92	2.76	26.95	28.15	17.66	14.14	19.03	19.32	
	Low	2.13	2.42	36.16	36.48	4.45	4.45	21.32	21.39	
Market growth	High	1.95	2.15	25.95	25.23	23.70	17.14	23.68	20.93	
	Medium	2.33	1.75	27.69	27.52	20.82	14.16	17.19	16.95	
	Low	2.40	1.91	27.07	28.53	11.69	10.84	20.91	18.65	
Productivity	High	2.24	2.14	29.55	31.20	21.82	16.41	23.77	21.43	
	Medium	2.31	2.06	26.87	24.94	22.23	17.63	20.35	20.50	
	Low	2.09	1.61	21.18	20.42	8.05	5.17	8.88	8.27	
Wages	High	2.15	2.05	28.90	30.60	21.00	16.86	24.09	22.42	
	Medium	2.21	1.99	28.10	25.20	22.86	17.46	20.08	18.74	
	Low	2.35	1.77	21.40	20.00	9.70	4.72	8.88	8.93	
Product differentiation	High	1.71	1.28	22.91	23.13	19.11	14.75	23.33	19.81	
	Medium	2.72	2.81	31.74	32.02	24.12	17.14	17.60	18.59	
	Low	2.75	2.45	28.92	28.09	8.36	6.16	16.25	15.34	

Source: DEBA, COMPET, own calculations. – Globalisation . . . total foreign trade volume (exports and imports, excluding intra-EU trade) as a percentage of domestic consumption, market growth . . . increase of domestic consumption, productivity . . . real net output per employee, wages . . . expenditure per employee, product differentiation . . . standard deviation of export unit values across markets and products.

industries to the overall net industrial output is just above 80 percent of the EU average.

### GLOBALISATION, PRODUCT DIFFERENTIATION AND HIGHLY PRODUCTIVE SECTORS

At the EU level, the manufacturing sector shows a deficit of dynamically growing industries with a high degree of globalisation and product differentiation. The shift towards highly productive industries occurred much later than in the USA and Japan. The same applies to Austria with regard to globalisation and product differentiation, but not when it comes to market growth: contrary to the EU, the most rapidly growing industries in Austria have a higher world market share than those with average or slow growth (Table 10) – a hint that structural change has been successful and that Austrian manufacturing industries are increasingly specialising in growth sectors.

*Austria's world market share is comparatively small in industries which are highly globalised and which offer highly differentiated products; it is above-average in highly productive sectors.*

Mirroring the overall European structure, Austria has the highest market share in industries with the highest costs per employee, confirming once again that the EU in general and Austria in particular are a high-wage region. The same applies to productivity: Austrian manufacturing industries with high productivity have a higher market share than less productive industries – in Austria, as much as in

Europe, the relatively high wage costs are compensated by better productivity.

### ONLY ONE IN TEN INDUSTRY SECTORS SUCCEEDS IN COMPETITION ON QUALITY

As a high-wage country and faced with increasing competition from suppliers enjoying comparative cost advantages, Austria is forced to emphasise product differentiation and to shift production to high-price market segments or less price-sensitive industries if it wants to secure and further raise its living standard in the long term. In order to survive against international competition, Austrian manufacturing industries need to produce top quality goods geared to customer requirements that can be sold on the global market.

Economic theory states *ceteris paribus* that demand and price will normally correlate negatively. An economy which sells products of greater unit values on the global market and still produces an export surplus must therefore furnish better quality than its competitors. Using the four market segment categories provided by *Aiginger* (1997, Table 11), we find that only one tenth of the Austrian manufacturing industries can successfully compete on quality, the most important segment for a highly developed industrialised country; 22.3 percent of the industries succeed on price, but more than two thirds of the Austrian manufacturing industries operate in areas characterised by structural problems.

### FUTURE-ORIENTED STRUCTURAL CHANGE AFTER CATCHING UP

Austrian manufacturing has completed a long and successful struggle to catch up. Starting out from a production

Table 11: Austrian industries on the world markets

1996

*Successful competition on quality*

Quantity surplus, positive trade balance, export unit values higher than import unit values

9 industries, e.g.:

Sawmilling, planing and impregnation of wood  
 Basic iron and steel, ferro-alloys  
 Pulp, paper and paperboard  
 Structural metal products  
 Tanning and dressing of leather

*Successful competition on price*

Quantity surplus, negative trade balance, export unit values lower than import unit values

21 industries, e.g.:

Panels and boards of wood  
 Ceramic goods  
 Tubes  
 Articles of paper and paperboard  
 Dairy products, ice cream

*Weak competition on price*

Quantity deficit, positive trade balance, export unit values higher than import unit values

45 industries, e.g.:

Refined petroleum products  
 Basic chemicals  
 Cement, lime and plaster  
 Vegetable and animal oils and fats  
 Basic precious and non-ferrous metals

*Structural problems*

Quantity deficit, negative trade balance, export unit values lower than import unit values

19 industries, e.g.:

Coke oven products  
 Bricks, tiles and construction products  
 Detergents, cleaning and polishing, perfumes  
 Other food products  
 Rubber products

Source: DEBA, COMEX, own calculations.

that was heavily biased towards primary goods and the domestic market, it has become integrated in the global economy in spite of difficult conditions (ten years of military occupation, inadequate equity base, geographical proximity to the East Bloc, delayed entry in the European Community, lack of major corporations and headquarters). Today Austrian manufacturing industries rank top in Europe on labour productivity; the global market share of Austrian exports has grown from 0.7 percent in 1955 to 1.1 percent. Production and productivity have risen faster than in other countries. In the years before 1996 some curbing in the dynamics of labour costs and more stable exchange rates, together with structural change and the opening of Eastern Europe, have made it possible to reduce the high foreign trade deficit of the industrial sector.

Changes in the framework (globalisation of the economy and its attendant competition between business locations, economic and political integration, technological, organisational and social change, the need to consolidate government budgets) have caused a fundamental change in the consensus-focused "Austrian model", which had been so successful in the past. The result is a new challenge to change industrial and corporate organisational structures. A country that achieves an above-average level

of productivity needs to be transformed, at least partially, from being a technology user to becoming a technology developer. For a high-wage industry subject to ambitious social and environmental standards, there is no other way but to outsource price-elastic production sectors and sectors that involve a high degree of unskilled labour, and to concentrate on high-value market segments with a high level of specialised know-how and original R&D. Business services are available to adjust production to the ever more highly differentiated requirements of investors. Several parts of the analysis show that Austria has not yet fully completed the transition from a country in the process of catching up to one holding a leading position, even though internationally operating managers have arrived at an altogether satisfactory assessment of Austria as a business location (*Aiginger – Peneder, 1997*).

---

*The substantial rise in productivity results primarily from shifts to highly productive industries and the loss of market shares suffered by labour-intensive industries both serve as indicators that the structural change has not yet been completed.*

---

An analysis of the strong and weak facets of Austrian manufacturing can be summarised as follows:

- Value added of Austrian manufacturing grows significantly faster in nominal terms (+5.0 percent p.a.) than the EU average (+2.7 percent).
- Employment in European industries is declining because they are boosting their productivity in their effort to catch up with the USA. Forced to streamline their operations, only a few industries are able to translate growth into new jobs. Austrian manufacturing is similarly exposed, and its loss of jobs (−2.2 percent) approximately equals the European average (−1.9 percent). Austria has more industries with (higher) job growth than the EU in general, but also more industries with (higher) job losses – a hint towards structural change.
- Austrian manufacturing is more dynamic than the EU's both in the overall view (Austria +7.3 percent; EU +4.7 percent) and when looking at individual industries. In more than three quarters of all industries productivity grows more rapidly than the EU average – a sign of a dynamic process to catch up with European standards.
- In its foreign trade, Austrian manufacturing has been generally able to maintain its global market position in spite of minor losses; yet the number of losing industries is triple that of winning ones. Looking at industrial

groups, we find that the greatest losses were suffered by mainstream and labour-intensive industries, while erosions were negligible in technology- and marketing-driven industries.

- In their positioning on international markets, Austrian manufacturing industries are still hampered by a catching-up process: a large majority of them operates in "problematic" market segments (unsuccessful competition on price, structural problems). Only a few industries score in the competition on quality, and the situation is only slightly better with regard to competition on price. Generally, Austria's performance is better in the global market than in the EU's internal market.
- In terms of specialisation, Austrian manufacturing is not in the best shape. The structural problems showing up in European manufacturing (compared to the USA and Japan) are even more prominent in Austria. Compared to EU levels, overspecialisation in labour-intensive industries and underspecialisation in technology-driven industries are symptoms of weaknesses in the structure of Austrian manufacturing. These structural problems are partly compensated by specialisation in industries that require skilled labour. By occupying market niches in TV, radio and recording engineering, in electronic components and communications equipment, Austrian firms in the high-tech segment have established an excellent market position.

---

*Persistent deficits in its industrial structure stand in the way of attaining a lead position in the global market.*

---

An analysis of its competitiveness confirms that Austrian manufacturing is still in the process of catching up. Its faster productivity growth is partly the result of shifts to more productive industries. Market share losses in labour-intensive industries are indicative of the ongoing structural change. Nevertheless, the industrial structure still suffers from substantial deficits which are detrimental to Austria as a business location:

- The shift towards highly productive, dynamically growing high-tech industries with a high degree of globalisation and product differentiation has only just started.
- For a country priding itself on its high living and social welfare standards (which in turn push up production costs), it is problematic to specialise in labour-intensive industries, while technology-driven industries contribute only a small fraction to production and foreign trade.
- Austrian manufacturing has not yet transformed itself from technology user to technology developer. Its bal-

ance of patents is distinctly negative. Foreign-owned businesses achieve higher productivity and a higher R&D rate. Expenditure on R&D, while higher than shown in earlier statistics, is still too low to place Austria among the top ranks.

- In its foreign trade, Austrian manufacturing has not yet positioned itself in the competition on quality. The market share of industries competing on price is still high, and import unit values are higher than export unit values.

Completion of the EU's internal market and EMU both push towards more internationalisation and concentration on core competences. It would appear that innovation deficits and the absence from dynamic markets can be corrected by improving the framework.

---

*Austrian companies will find their future market opportunities in segments where they have already established considerable competence and market position, in high-tech niches, but also in traditional industries through upgraded products.*

---

#### PROMISING PROSPECTS, MARKET NICHES, CROSS-SECTORAL TECHNOLOGIES AND COMPETITIVE FACTORS

Based on an analysis of competitiveness, a multi-dimensional approach is used to identify potential market opportunities for Austrian manufacturing. Ten indicators are combined to determine those industries which offer the greatest promises for the future development in Austria, an approach which has two essential advantages: First, the large number of indicators warrants that all essential aspects which are relevant for present and future industrial development are taken into account. Secondly, by aggregating individual results (totting up points) we arrive at an overall evaluation of market opportunities at the individual sectoral level, thus meeting a need of economic policy (ranking by potential). Supplemented by an analysis of non-sector specific criteria (cross-sectoral technologies and competitive factors), such a ranking can be used as a foundation for future-gearred economic and industrial policy measures<sup>3</sup>.

At the sectoral level, Austria has its best market opportunities in the pharmaceutical industries, manufacturing of

---

<sup>3</sup> The future potential of industries was determined using a system of five quantitative and five qualitative indicators. For methodological details see Böheim (1999).



electronic components, communications equipment, motor vehicles, and electricity distribution and control apparatus (Figure 1). In terms of clustering, these promising sectors can be arranged in three groups – electronics (including medical engineering), transport and pharmaceuticals.

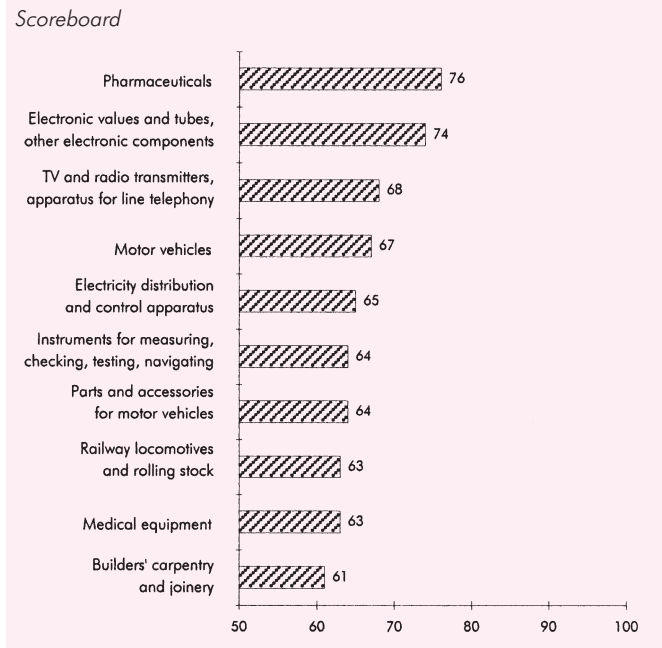
On an international scale, Austrian manufacturing is too small to achieve market or technological leadership in any given industry. Yet in these three groups it does have realistic market opportunities in some market segments and clusters. In other sectors, market niches can be pinpointed where Austrian companies have already exploited favourable circumstances to achieve a strong position and know-how headstart over their competitors, establishing a strong market position and, in some cases, even global leadership.

Promising segments (within or outside the above groups) can be found in areas where Austria is already enjoying a strong position (in terms of R&D expenditure and/or production), where a “critical mass” of major Austrian companies has created lead markets, in high-tech applications, and in the development and manufacturing of special products and small series (Table 12).

In addition, there is considerable promise for Austria in the so-called cross-sectoral technologies, which apply not just to a single industry but span entire manufacturing sectors (ITA, 1998, Klusmann, 1998):

- *Information and communications technology*: industries that integrate data transmission (telecoms) and data processing are considered to have the highest growth dynamics in the short to medium term. The merger of PC, fax, mobile telephone, TV and recording equipment to produce a multi-media high-end system is turning the Internet (World Wide Web) into an electronic market place for industries (e-commerce). This “virtual market” is especially interesting for small and medium sized enterprises (SME) because it offers a world-wide platform for their products at low fixed costs. E-commerce also opens up new opportunities to traditional sectors (such as bookselling). For Austrian companies, e-commerce promises opportunities as market participants, but also as developers of special technologies to operate virtual markets (software, voice recognition, image processing, multi-media services).
- *Simulation models for R&D*: the use of computer simulation as a substitute for experiments and prototypes is increasingly gaining ground for time and cost reasons – e.g., in materials production, or in the design of engines and motor vehicle components. A special aspect is the integration of advanced measurement techniques in simulation models.

Figure 1: Promising industries



- *Microsystem engineering*: microsystems incorporate innovations from biotechnology, microelectronics, nanotechnology and systems engineering. Because of their small size (often just a few millimetres), “intelligent” microsystems have a wide range of applications: machinery and equipment, mobile testing systems, medicine, custom-made materials). Here again, Austrian manufacturing industries can achieve an international position by exploring market niches.
- *Biotechnology*: biotechnology is set to produce profound change not just for the pharmaceutical industry but also for agriculture and food processing. In this market with its huge future potential, Austria’s market opportunities are limited to a few fields determined by existing strengths and research expertise: immunology, fermentation (antibiotics) and monoclonal antibodies.
- *Environmental engineering*: with regard to environmentally compatible production methods, Austria offers strengths in specific industries (metal and paper industry, surface technologies) and traces of a lead market in terms of environmental awareness and legislation. Austrian manufacturing industries have acquired expert know-how in waste disposal and recycling and in waste water treatment. Renewable energy sources (solar and wind energy, biomass) are gaining in importance.

## STRATEGY FOR AN INDUSTRIAL POLICY

Considering that Austria is a small but highly developed industrial country, there is no point in offering an overly di-

Table 12: Promising market segments

	Industries	Market segments
Electrics, electronics industry	Electronic valves and tubes, other electronic components, electricity distribution and control apparatus, TV and radio transmitters, apparatus for line telephony, instruments for measuring, checking, testing, navigating	Special applications, small series (e.g., high-tech computer chips)
Pharmaceutical industry	Pharmaceuticals	Immunology, fermentation (antibiotics), monoclonal antibodies
Automotive industry	Motor vehicles; parts and accessories for motor vehicles	Development of engines, four-wheel engineering, small series, special-purpose vehicles, supplies
Railway engineering	Railway locomotives and rolling stock	Railway superstructures, light-railway stock, bogies
Medical engineering	Medical equipment	Replacement of organs and functions, blood pressure testing, computer tomography
Wood-working industry	Wood and wood products	Construction carpentry, wood-working technologies (e.g. quality test by mapping processes, microwave drying), powder-coating
Organic food and raw materials	Meat, fruits, vegetables, dairy products	Seeds, organic foodstuff
Material- and metal-working industry	Basic metals	High-tech steel, light and compound materials, powder metallurgy

Source: WIFO.

verified portfolio of products or starting off on sudden technological leaps, which were rarely successful in the past. A promising strategy will have to be two-pronged:

1. developing existing strengths by concentrating on core competences in fields where Austria has a (potential) lead,
2. ongoing transition from technology user to technology developer.

*A strategy for a future-oriented industrial policy will focus on extending existing strengths and encouraging continuous technological development with a view to achieving leadership in selected fields.*

Austria has the best chance to succeed in becoming a leader in major and relevant markets by concentrating on the following areas:

- those (few) markets where Austrian manufacturing industries have exploited special demand conditions to establish a lead market – here, structural, social and economic prerequisites have been matched, and targeted encouragement of R&D can secure a sustained headstart even in international markets;
- the use of high-tech approaches in basically mid-tech fields which are neglected by other industrialised countries, drawing on Austria’s strength in producing mid-tech products of top quality, and on the insight that successful strategies will always start out from extending and improving on existing strengths (ITA, 1998);
- in market niches for special products and applications, where customisation and small “made-to-measure” series decide on market success – market leaders tend to neglect such niche markets because of their specific de-

mand conditions (superior quality, small series, special technologies and processes, high flexibility) so that small but highly specialised enterprises find considerable market opportunities which may even be developed into global market leadership;

- in markets where the main product is sold in conjunction with top-quality services. In demanding to exploit the full product potential, customers require suitable ancillary services (e.g., installation, tailoring of standard products to specific customer requirements, training, maintenance). A typical feature of this market is that the main product can be supplied by several vendors (perhaps even at a lower price). The product is differentiated by its associated services which thus become the main product that decides on market success. This opens up crucial opportunities for specialised and highly flexible service providers.

In concentrating on core competences, a desirable side effect of the strategy would be to help Austria develop a clearer profile as a business location. Contrary to other industrialised countries which have successfully positioned their specialisations (such as Switzerland, which is known for pharmaceuticals, watches, special machines, chocolate and financial services), Austria has defined few contours of its industrial profile. One exception would be the automotive industry where consistent locational and promotional efforts have been able to establish clusters. A fully focused industrial profile sends a signal to international investors (multinationals) and exerts a critical impact on relocation and investment decisions.

In order to be accorded a place among leading industrial countries, Austria needs to take the major step from technology user to technology developer in the medium run, at least in selected fields, and it needs to encourage the innovative spirit of industries to ensure its sustained international competitiveness as a business location. This will be

achieved not by any “technology leaps” but by ongoing technological development. Next to promoting the provision of top quality products – an approach that has already been encouraged in the past – initial steps in this direction in the short run are the use of high-tech methods and the exploitation of market niches. In the longer term, however, it will be necessary to ensure that selected high-tech market niches are covered by Austrian scientists and industries. Rather than concentrating on “new” markets, this strategy will be easier to pursue in areas in which Austrian manufacturing industries have already established a strong market position and acquired sufficient experience to manage the transition from using to developing high-tech procedures and products.

## CONCLUSIONS

Manufacturing in Austria is well positioned internationally in several industries and technologies with a promising future outlook. Generally, business managers have rated Austria’s suitability as a business location as satisfactory. Nevertheless, globalisation and growing economic integration call for continuous efforts to improve locational factors. Competition is heating up between business locations for attractive investments which secure a maximum of jobs and value added. Accordingly, it is necessary to develop and improve on own strengths, which Austria has to offer mainly in the mid-tech field, and to thrust into selected high-tech market niches so as to optimally exploit future market opportunities (Böheim, 1999).

There are few ways in which economic policy can directly interfere with and control competition on location. The rules of the EU’s internal market require that industrial policy be neutral with regard to state intervention and aim for horizontal aid which does not distort competition. Essentially there are just two ways open to strengthen competitiveness:

- improving the chances of Austria as a business location by providing excellent infrastructure, superior education and training and service-oriented government structures so that high-value jobs such as in corporate headquarters and research facilities will be created in Austria;
- allowing Austrian companies their share of profits from their business activities and furnishing a competitive tax system that enables them to expand from their Austrian base.

Given these prerequisites, Austrian companies will extend their employment level in Austria and abroad, and even mid-sized companies can achieve a leading position in market niches, starting on the road to internationalisation.

As a more long-term economic policy strategy to tap the future potential of Austrian manufacturing industries, a broad and systematic approach should be envisaged which takes into account the specific institutional frame. Next to a reform of the overall system of education, science, research and technology, which requires long-term action due to its complexity and assorted interests involved, there appear to be five operational measures which are suitable for short-term implementation:

- pilot projects for technological and organisational innovation,
- greater mobility between universities and the business community,
- institutions to co-ordinate interdisciplinary focus subjects (e.g., centres of competence, energy utilisation agency),
- encouragement of cluster formation,
- promotion schemes differentiated by project risk and time horizon, with specific objectives and regular evaluation.

## REFERENCES

- Aiginger, K., Die internationale Wettbewerbsfähigkeit Österreichs. Strukturberichterstattung 1986, WIFO, Vienna, 1987.
- Aiginger, K., “The Use of Unit Values to Discriminate Between Price and Quality Competition”, *Cambridge Journal of Economics*, 1997, 21 (5), pp. 571-592.
- Aiginger, K., Peneder, M., “Die qualitative Wettbewerbsfähigkeit der österreichischen Industrie”, in *Handler* (1996), pp. 43-55.
- Aiginger, K., Peneder, M., *Qualität und Defizite des Industriestandorts Österreich*, WIFO, Vienna, 1997.
- Böheim, M. (1998A), “Wirtschaftsförderung in Österreich: Der Reformbedarf des Systems aufgrund geänderter Rahmenbedingungen”, in *Böheim – Gretschmann* (1998).
- Böheim, M. (1998B), “Die Zukunft der Wirtschaftsförderung in Österreich. Der Reformbedarf des Systems aufgrund geänderter Rahmenbedingungen”, *WIFO-Monatsberichte*, 1998, 71(4), pp. 281-287.
- Böheim, M. (1998C), “Analyse des bestehenden Kooperationsgeschehens”, in Aiginger, K., Czerny, M., *Kooperationen in einem erweiterten Europa. Industrielle Mittelbetriebe im Transformationsprozeß der MOEL*, WIFO, Vienna, 1998.
- Böheim, M., *Marktchancen für die österreichische Industrie*, WIFO, Vienna, 1999.
- Böheim, M., Gretschmann, K., *Zukunftsperspektiven der österreichischen Wirtschaftsförderung im europäischen Kontext*, WIFO, Vienna, 1998.
- European Commission, *Die Wettbewerbsfähigkeit der Europäischen Industrie*, Brussels, 1998.
- Handler, H., *Wirtschaftsstandort Österreich: Wettbewerbsstrategien für das 21. Jahrhundert*, Vienna, 1996.

Hutschenreiter, G., Leo, H., "Technologiepolitik und Wirtschaftsförderung", in Geldner, N., et al., *Neue Formen der Erfüllung öffentlicher Aufgaben*, WIFO study commissioned by the Federal Ministry of Finance, Vienna, 1998.

ITA, *Delphi-Report Austria*, 3 volumes, Vienna, 1998.

Klusmann, S., "Neues Zeitalter", *Manager Magazin*, 1998, (12), pp. 241-267.

Peneder, M., (1999A), "Intangible Investment and Human Resources: The New WIFO Taxonomy of Manufacturing Industries", WIFO Working Papers, 1999, (114).

Peneder, M., (1999B), "Kritik der Länder-Ranglisten der Wettbewerbsfähigkeit", *Wirtschaftspolitische Blätter*, 1999, (4), forthcoming.

Tichy, G., "Österreichs technologische Chancen – eine Expertenumfrage", *ITA-Newsletter*, 1998, pp. 4-5.

### *Market Opportunities for Austrian Manufacturing Industry – Summary*

After a long process of catching up and successful integration into the world economy, Austrian manufacturing industry now ranks among the best in Europe in terms of productivity, with the share of Austrian exports in the world market rising in the long run. The curbing of labour cost increases and the stabilisation of exchange rates, together with structural change and the opening of the borders to Eastern Europe, have led to a reduction of the high foreign trade deficit of the industrial sector.

However, the changing economic policy environment presents new challenges and demands a faster adaptation of industrial structures and organisations. As a country with an above-average level of productivity, Austria must be transformed at least partially from a technology user to a technology developer; for a high-wage industry with ambitious social and environmental standards, there is no other way but to outsource price-elastic production sectors as well as operations involving a large part of unskilled labour and concentrate on high-value market segments with a high level of specialised know-how and original developments. Business services are available to adjust production to the ever more highly differentiated requirements of investors. Several parts of the analysis show that Austria has not yet fully completed the transition from a country in the process of catching up to one holding a leading position.

Among Austria's persistent structural weaknesses delaying its sustainable establishment among the group of leading industrialised countries, over-specialisation on labour-intensive sectors of industry with concurrent under-specialisation on technology-driven industries as well as its inadequate positioning in quality-driven competition in the world market need to be mentioned. Nevertheless, the overall assessment of Austria as a business location by internationally experienced managers turns out to be satisfactory. Future market opportunities for Austrian manufacturing industry can be identified

- in market segments in which Austria has already established its competence and its market position,
- in niche markets of high-tech industrial sectors,
- in traditional sectors of industry where existing strengths can be maintained and consolidated through the upgrading of products.

If technological criteria are applied, the following cross-sectoral technologies are classified as most promising for Austria:

- information and communications technology,
- simulation models for development purposes,
- micro-system engineering,
- bio-technology,
- environmental engineering.

If competitive factors are used as a yardstick, Austria stands the best chances of being a market leader

- in the (few) markets in which Austria has a lead-market character on account of specific demand conditions,
- in the use of high technology in mid-tech areas which tend to be neglected by other industrialised countries,
- in market niches for special products and applications, provided the fulfilment of individual customer wishes and the production of small series "made to measure" determine the success in the market,
- in markets in which high-quality services are sold along with the principal product.

The economic policy conclusions to be drawn from the analysis are many-faceted. As a longer-term economic policy strategy aimed at the optimum realisation of the future potential of Austrian manufacturing industry, a systemic approach of the widest possible scope, taking account of the specific institutional framework, is to be considered. Operational measures (pilot projects, greater mobility between science and the business community, cluster formation, incentive-compatible state aid) ought to support this process.

There are few ways in which economic policy can directly improve Austria's initial position in locational competition. Essentially, the role of the government is limited to the provision of the best-possible economic conditions and targeted intervention in the event of market failure (economic support measures to create incentive-compatible structures and to strengthen the innovative drive of the Austrian economy).