Marin, Dalia:

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Munich Discussion Paper No. 1995-7

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Online at https://doi.org/10.5282/ubm/epub.610

LEARNING AND DYNAMIC COMPARATIVE ADVANTAGE: LESSONS FROM AUSTRIA´S POSTWAR PATTERN OF GROWTH FOR EASTERN EUROPE*)

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*) This paper has been prepared for the 17th Economic Policy Panel, Copenhagen 1993 and for the Conference "New Trade Theories: A look at the Empirical Evidence", Milano 1993. This research has been supported by the Ford Foundation (grant no. 910-0383), by the SPES programme of the Commission of the European communities (grant no. E/90100033/PRO) and by the Austrian Ministry of Economic Affairs. I am indebted to Alejandro Werner for his thoughtful comments and to Bernhard Böhm and Reinhard Koman for excellent research assistance. Wolfgang Franz provided valuable suggestions in an earlier version of this paper.

Abstract

This paper looks at Austria's pattern of development and its lessons for Eastern Europe. Austria's development path is characterized by two features. In the post-war era Austria was among the countries with the fastest convergence rate. At the same time Austria's movement up the technological ladder was slow compared to other European countries. The paper uses insights from recent dynamic theories of trade to explain these two stylized facts. It is argued that resource endowments, international knowledge spillovers, learning, and government policy have contributed to Austria's post war growth and the evolution of its pattern of trade over time. The paper looks at two lessons for Eastern Europe. First, Austria as a possible economic case for a gradual approach to economic reform. Second, in light of the Austrian experience a recent industrial and trade policy proposal for Eastern Europe is discussed.

1. Introduction

This paper looks at Austria's postwar pattern of development and its relevance for Eastern Europe. More specifically, the paper studies the relationship between growth of per capita income and the sets of industries a country specializes in. It is this relationship which is relevant for a combined study of Austria's past economic development and its implication for Eastern Europe's development potential in the future. I will argue that Austria's post-war growth has been driven by its change in factor endowments one the one hand and by its pattern of specialization on the other. The expected change in income levels in Eastern Europe after having transformed to market economies are commonly used to infer their future trade pattern. The argument made in this paper that Austria's factor endowments and its trade pattern have determined its comparative advantage and its growth rate of GDP uses insights from recent dynamic theories of international trade (Grossman and Helpman 1991 and Young 1991) which emphasize dynamic comparative advantage based on endogenous innovation and learning. Austria's development path has shown a peculiar feature. In the post war-era Austria has moved from textiles and steel to machinery and electronics. There was also a gradual shift from manufacturing into tourism, and then in the late 1980s, a rapid move into business services. This structural transformation of its production sector towards knowledge-intensive output has been slow compared to other western industrial countries and came about with a small relative share of R&D in GDP. Nonetheless, Austria experienced a rapid growth in productivity during this period, which contributed to Austria's robust economic performance. The Austrian government has pursued an active policy of industrial targeting and of encouraging international knowledge spillovers by attracting foreign investment and by subsidizing R&D in reverse engineering which has led-the Austrian economy to catch up with other western industrialized countries.

The selection of Austria as a case from which to learn for Eastern Europe is by no means accidental. There are at least three reasons why Austria's postwar trade and growth experience might provide lessons for Central and Eastern Europe (CEE).[1] First, Austria shares with CEE a historical similarity of institutions and economic structure while taking different political paths. Austria's interwar factor endowment and level of income has been similar with CEE before socialist planning so that these countries' dynamic comparative advantage is expected to be in similar sectors

like Austria's after having transformed to market economies. The historical similarity argument relies on the logic developed by Chenery and Syrquin (1989) according to which countries development process follows a uniform pattern. The "stylized facts" of economic development documented by Chenery and Syrquin for a cross section of countries establish that countries move from agriculture to manufacturing and finally into services as their per capita income levels rise. Chenery and Syrquin identified also an empirical regularity within the manufacturing sector passing from food, textiles, clothing and steel to machinery and electronics as economies mature. A recent study by Collins and Rodrik (1991) actually uses this logic to make predictions about the future trade potential of Eastern Europe. Collins and Rodrik (1991) assume this empirical regularity and use Austria's (and other countries') postwar pattern of development to predict future trade flows of Eastern Europe and the former Soviet Union.[2] The study is based on cross section regression analysis. This paper tries to get insights for the future development potential of Eastern Europe by looking at the experience of an individual economy. As a case study the paper complements the predictions obtained by the cross section approach by providing the opportunity for a richer understanding of the processes that have governed the development experience of economies comparable with Eastern Europe.[3]

Second, the shared historical heritage together with Austria's robust post-war economic performance have actually led some of the CEE to take Austria as a benchmark model to follow. Some of the CEE have been contemplating whether they can achieve similar economic performance by imitating the post-war development path of Austria in passing through similar sets of industries and in adopting similar sets of policies.[4]

Third, Austria's reconstruction after World War II might provide insights to the question of whether trade and industrial policy have a role to play in the transition. More specifically, does it matter for CEE's growth potential what kind of industries remain in Eastern Europe after transformation to market economies? Should transitional policies be used to help CEE to keep some of the "high-tech" industries that supplied the former Soviet market and that are now about to disappear?[5] After World War II the Austrian government has reinforced the output mix that has resulted from the German annexation via a policy which heavily favored the "new" industries that have been created in the territories of Austria by the Third Reich

during the Second World War. I will argue that the decision of the Third Reich to locate part of the German war production in Austria has had a long lasting impact on Austria's pattern of development that still shapes the economic policy debate in Austria of today.

The remainder of the paper comes as follows. Section 2 documents the peculiar feature of Austria's postwar pattern of growth. It starts with comparative evidence on Austria's growth performance and on the type and sequence of industries Austria has traversed in the course of its development. Section 3 then suggests some theoretical explanations for the evolving relationship between the growth rate of output and Austria's pattern of trade following the model of innovation and trade (Grossman and Helpman 1991) which incorporates quality competition and dynamic comparative advantage. The section provides also empirical evidence for the predictions derived from this model. In section 4, I turn to an additional explanation based on "learning" and "history" (Krugman 199 and Young 1991). A concluding section 5 explores the implications from the findings for Eastern Europe.

2. Austria's Growth and Trade Pattern in International Perspective

2.1 The Legacy of the Past

As Table 1 documents, Austria experienced superb growth in the early post World War II period. Within three years since the end of the war Austria reached almost its prewar level of industrial production. This development by far outperformed that of Germany.

Table 1:

POST WORLD WAR II GROWTH PERFORMANCE

	Index of Industrial Production (1938 = 100)			
	1948	1950	1955	1959
Austria	92	145	225	265
Germany	52	94	170	211
France	108	121	160	207
United Kingdom	127	145	179	190
Belgium	121	128	167	170
Italy	102	163	198	259

Source: OEEC (1960) in Koren (1961)

This explosive growth of industrial output went hand in hand with a rise in the share of investment in Austria's GDP from the prewar level of 7% to 20% in 1951 and a rise in the share of exports in GDP from 1952 19.7% to 28.0% in 1954.[6]

The initial conditions after the war were shaped by two features. First, the presence of a large German military industrial complex. During 1938-45 Germany expanded its military production to the territories of Austria. Austria was an attractive location for the German war production because of its low wages and the high qualification of its labour force. The war industries induced a knowledge spillover from the German high-tech sector. The war industries in the Austrian territories were dominated by large firms which based their output on the exploitation of economies of scale. After World War II these industries were nationalized and came under the control of the state.[7]

Second, a dramatic reduction in Austria's endowment with human capital largely due to the elimination of the Jewish population by the Nazis. The Jewish population in the interwar period played an important role in the knowledge industries (universities), in the financial sector and in entrepreneurial activities in

the small business sector. Before World War II, 200.000 Jews lived in Austria which were extraordinarily well educated and industrially experienced.[8]

The war industries and the depletion of the human capital stock led to a dramatic shift in the pattern of trade before and after World War II. The share of industries like oil, chemicals, iron and steel, machinery and vehicles in total manufacturing exports increased sharply, while the same share of consumer goods and luxury industries like leather, yarn and thread, cotton, clothing declined (see Table 2).[9] At the same time the size of the small business sector declined along with an expansion of the share of large firms (with more than 1000 people employed).[10]

Table 2:
PATTERN OF EXPORTS BEFORE AND AFTER WORLD WAR II
OF SELECTED COMMODITIES

	in percent of total exports		
	1937	1957	1959
oil products	0.1	1.1	0.6
chemicals	2.7	4.3	3.9
leather and leather goods	2.0	0.3	0.5
yarn and thread	6.9	2.8	2.4
cotton	1.2	0.8	1.1
iron and steel	9.8	19.6	16.9
machinery and vehicles	9.7	14.4	15.3
clothing	5.2	1.6	1.7

Source: Rothschild (1961)

The government decided to encourage the growth of the "new industries" generated by the German annexation and not to return to the prewar pattern of specialization. An investment policy program was implemented that gave subsidized loans for investments in activities designed to increase exports. These subsidies were financed

out of foreign aid which Austria received within the framework of the European Recovery Program from the United States. The extent to which the program favored basic industries becomes clear from the following numbers. In the period between 1948 and 1959 the total sum of subsidized loans to industry amounted 9.5 billion AS of which 64% has been allocated to the basic sectors in which large state owned firms dominated. The consumer industries' share in subsidized loans (textile, clothing and leather) where 25% only.[11] The large scale industrial targeting of the post-war basic industries contributed to the exploitation of knowledge spillovers from German high-tech firms. The Austrian steel industry moved up the technological ladder, exploited economies of scale and, by the beginning of the 1960s, became one of the most advanced steel producers of the world.[12]

To sum up, after World War II Austria started its economic development with a depletion of its knowledge base of extraordinary size and with accumulated knowledge in the war industries which resulted from technical spillovers from the German high-tech military sector. In the 1950s the process of knowledge accumulation was reinforced by a government policy of targeting the basic sector industries. The destruction of Austria's knowledge base during World War II led to a complete decline of the Austrian research sector which used to be one of the finest in the world. It also led to a decline in Austria's specialization in textiles, clothing and leather. At the same time the accumulation of knowledge in the war related industries led to a rapid increase in Austria's specialization in these industries. As we will see in the next section, this change in the pattern of specialization in the early post World War II period has had a lasting impact on Austria's pattern of development. The basic sector industries still figure prominently in Austria's industrial output of today and the R&D sector never regained its prewar importance. In fact, in the post-war period, Austria's R&D sector has had only a limited role to play in the growth process compared to its role as an engine of growth in other western industrialized countries.

2.2 The Stylized Facts of Austria's Pattern of Growth

This section sets the stage with a description of some of the basic features about Austria's post-war pattern of growth. To put this information into perspective I also provide data for other industrialized countries. The data raise specific questions

about Austria's structural transformation and economic growth. I will suggest some theoretical explanations for these facts based on models by Grossman and Helpman (1991) and Young (1991) in the following two subsequent sections.

There are three prominent features of the data:

1. Among the small OECD countries Austria (and Finland) has exhibit the fastest post-war convergence rate. This has gone hand in hand with a narrowing gap in income levels between Austria and Germany.

2. This catching-up process has come about with a low though increasing share of R&D in Gross Domestic Product (GDP), with a deficit in the technological balance of payment (net imports of patents and licenses), and with a relatively small number of skilled workers devoted to research compared to other western industrialized countries.

3. The speed by which the Austrian manufacturing sector moved up the technological ladder was slow compared to other western industrialized countries. Put differently, Austria's pattern of trade has exhibited some degree of persistence over time.

Table 3 and Table 4 show fact 1. According to the data from the Heston and Summers (1991).international comparison project (Mark V), Austria reduced its gap in per capita income to the US by 54.7 percent in the 1950s (from 30.7 to 47.5). During the same decade, the reduction in income gap to the US was more pronounced only in Germany and Japan. In the following two decades (in the 60s and 70s) Austria has closed the gap faster than any other country except Japan. This process has come to an end in the 1980s. During the last decade Austria has widened its gap to the United States as well as to Germany (although Germany also experienced a slow down in its convergence rate).[13] Table 4 compares Austria's growth experience more closely with Germany's. In the period 1964-74 Austria's faster growth has been achieved with about the same investment rate than in Germany, while in 1974-84 this rate has fluctuated around 23% and 29%. Germany's investment rate came down to 21% in the same period. In the last decade Austria's investment rate too has come down somewhat contributing to its less favorable growth performance.[14] In the last three

decades Austria became a truly open economy. This has been the case also for Germany although its trade shares (goods and services) remain below those of Austria's (as one would expect for a larger country).[15]

Table 3:

PER CAPITA INCOME GROWTH, 1950-1988
USA=100*

	1950	1960	1970	1980	1988
Japan	16.3	30.8	55.7	63.8	68.7
Austria	30.7	47.5	53.7	64.5	62.2
Germany	36.4	63.9	69.3	75.5	73.7
UK	55.8	63.0	61.4	65.1	65.8
France	44.2	56.6	68.2	74.5	68.4
Italy	31.5	47.1	55.3	65.9	65.5
Belgium	52.5	57.6	64.8	71.7	65.5
Finland	37.5	51.6	58.4	67.6	70.4
Switzerland	80.5	98.0	95.1	89.5	89.5
Sweden	61.2	71.1	77.0	75.4	75.3
USA	100.0	100.0	100.0	100.0	100.0

Source: Heston and Summers (1991)

*Ratio of per capita income in the country relative to that of the United States

Table 4:

GROWTH IN AUSTRIA AND GERMANY IN COMPARISON

	1954-64	1964-74	1974-84	1984-91	1954-91
GDP					
Austria	5.6	4.7	2.1	3.0	3.9
Germany	7.1	3.8	1.8	3.1	4.0
Investment rate[d]					
Austria	22.8	25.8	24.7	23.8	24.3
Germany	25.9[a]	25.0	21.0	20.2[b]	22.9[c]
Export-share[e]					
Austria	21.4	25.5	35.9	43.6	30.7
Germany	15.6[a]	20.3	27.1	32.5[b]	24.3[c]
Import-share[e]					
Austria	19.9	26.3	35.7	44.1	30.5
Germany	15.0[a]	20.3	26.6	30.3[b]	23.7[c]

Source: Austrian Institute of Economic Research, OECD, National Accounts, Statistisches Bundesamt

a) 1960-64
b) 1984-90
c) 1960-90
d) in percent of GDP, average share over period
e) goods and services, average share over period

Fact 2 is illustrated in Table 5. Among the countries shown Austria has the smallest knowledge generating sector. In 1989 the ratio of R&D expenditures to GDP is 1.38% in Austria as compared to 2.81% in Germany and as compared to the shares of the other western industrialized countries given in the Table. The Austrian knowledge sector grew however quite rapidly from 0.63 percent in 1967 to 0.95 percent in 1975 and to 1.52 percent in 1992. In comparison Germany's knowledge sector grew from 1.60 percent in 1965 to 2.24 percent in 1975 and to 2.76 percent in 1992. Thus, Austria's knowledge sector expanded much faster than Germany's (compare the percentage increases of 50% vs 40% in 1965-75 and 60% vs 23% in 1975-92). Similarly, the number of researchers as a percentage of the economically active population is

Table 5:

AUSTRIA'S R&D ACTIVITY AND POLICY IN INTERNATIONAL COMPARISON

	R&D Expenditures as Percentage of GDP	Researchers as Percentage of Economically Active Population	Percentage of Total R&D Funded by Government	Percentage of R&D Conducted by Industry Funded by Government
		Austria		
1963	0.29	0.2	40.4	13.4
1967	0.63	0.24	45.6	8.6
1975	0.95	0.51	52.8	9.2
1981	1.17	0.56	46.9	7.4
1985	1.27	0.60	48.1	7.9
1989	1.38	0.67	43.4	5.6
1992	1.52	—	45.9	—
Japan	3.07 (1990)	1.41 (1990)	17.9 (1990)	1.3 (1990)
United States	2.76 (1992)	0.76[a] (1992)	47.0 28.6[b] (1992)	28.4 (1992)
West Germany	2.81 (1990)	1.41 (1990)	34.1 30.6[b] (1990)	10.9 (1990)
France	2.42 (1991)	1.2 (1990)	48.8 34.4[b] (1991)	19.8 (1990)
United Kingdom	2.21 (1990)	0.98 (1988)	35.8 21.7[b] (1989)	16.7 (1990)
Finland	1.88 (1990)	1.1 (1989)	35.3 34.9[b] (1989)	3.1 (1989)
Switzerland	2.86 (1989)	1.42 (1989)	22.6 20.8[b] (1989)	0.8 (1989)
Sweden	2.54 (1991)	1.19 (1989)	38.4 31.3[b] (1989)	11.5 (1989)

[a] only scientists and engineers, excluding technicians and others, [b] excluding defence

Source: Main Science and Technology Indicators 1992/2, OECD, Paris 1992, Basic Science and Technology Statistics, OECD, Paris 1991, International Statistical Year for Research and Development, OECD, Paris 1967 and 1968, Österreichisches Statistisches Zentralamt, Statistisches Handbuch für die Republik Österreich

much smaller in Austria relative to other western industrialized countries. In contrast to the share of R&D expenditure, however, this share hardly increased in the last 15 years. This fact should be borne in mind below when policy issues are discussed. An additional feature of Austria's R&D sector will turn out to be important for later discussions: The percentage of R&D expenditures borne by the government is much larger in Austria than in any of the other countries. Even when defense related R&D spending is not excluded, the United States and France are the only countries with a higher government share (47.0% and 48.8% compared to 45.9% in Austria).[16]

Turning to fact 3, the evolution of Austria's trade pattern is given in Table 6. The table documents that structural transformation of the Austrian manufacturing sector has been distinctive in several respects. First, in 1984 almost 40 years after the end of World War II the basic sector industries still figure prominently in Austrian exports. By 1984 the Austrian basic sector (iron and metal ore, oil, mining and paper) accounted for about 26% of total exports and 28% of value added in manufacturing. After the war these industries had a share of about 30% and in the interwar period a share of about 20%. Second, although the textile industry has been shrinking substantially in the last 25 years, the consumer industries (textile, clothing, leather, and food) still account for a large proportion (15.4% in 1984) of exports in Austria. Third, in the years between 1964 and 1984 the structural transformation towards knowledge-intensive output (from steel and textiles to machinery and vehicles, to electrical machinery and electronics) has been slow compared to other countries. This relative slower structural transformation of the Austrian manufacturing sector can be seen from Table 7 which gives estimates of the rate of structural transformation for Austria and a variety of other western industrialized economies.[17] The measure for the speed of transformation is computed as the sum of the absolute values of the changes in shares of exports or output accounted for by different sectors. The comparison makes clear that between 1974 and 1984 the other economies' (especially Germany's) change in output mix occurred in much more compressed time. This suggests that the Austrian pattern of specialization has exhibited some amount of persistence over time which might reflect a possible larger role of history in the evolution of the trade pattern than in the other countries (see section 3.3). Fourth, in the three years between 1984 and 1987 Austria experienced a much more rapid structural transformation of its manufacturing sector than in the previous two decades. Entrepreneurs moved upstream from steel

Table 6:

STRUCTURAL TRANSFORMATION OF AUSTRIA's MANUFACTURING SECTOR

	Share of Sector's Exports in Total Exports			Share of Sector's Output in Total Output			Ratio of Net Exports to Apparent Domestic Consumption[b]		
	1964	1984	1987	1964	1984	1987	1964	1984	1987
GAINERS[a]									
paper and wood	9.2	9.6	10.5	9.9	10.0	11.2	19.1	19.3	21.0
machinery and vehicles	18.2	23.0	24.7	11.6	15.2	17.2	-28.9	-13.3	-19.9
iron & metal goods	7.1	7.1	7.3	9.1	8.1	8.7	40.9	49.2	49.8
electrical and electronics	8.8	11.3	13.3	5.4	8.0	9.4	-2.95	0.78	0.47
chemicals	9.8	14.7	13.7	11.2	14.3	13.6	-14.8	-10.6	13.3
LOOSERS									
iron and metal ore	20.3	13.5	11.0	10.4	8.7	7.5	40.9	49.2	49.8
oil	0.6	0.9	0.4	3.8	8.1	3.8	-26.4	-51.8	-50.3
mining	4.5	1.8	1.7	2.7	1.5	1.7	-37.1	-42.6	-19.7
textiles	11.3	7.3	7.2	10.3	4.6	4.9	-4.7	-8.7	-10.7
leather	1.8	2.7	2.2	2.4	1.7	1.5	-1.7	-2.1	-10.9
UNCHANGED									
food	2.6	3.3	2.9	13.5	12.0	12.4	-11.4	-8.4	-7.2
clothing	2.4	2.1	2.2	3.9	2.5	2.7	9.2	-23.0	-26.6
stone,glass,ceramics	3.4	2.7	2.9	5.9	5.2	5.6	3.5	1.6	1.6
	1964–74	1974–84	1984–87	1964–74	1974–84	1984–87			
speed of change[c] per year	1.99	1.48	2.51	1.81	1.22	3.22			

Sources: Austrian Institute of Economic Research Databank

[a] A sector is defined as a gainer (looser or unchanged) if its share in total exports has increased (declined or remained unchanged). The sectoral classification follows the "Fachverbandsgliederung" of the Austrian Chamber of Commerce.

[b] Apparent Domestic Consumption = Output + Imports – Exports

[c] Measured by the sum of the absolute values of the changes in shares of exports or output accounted for by different sectors $\sum_i |s_t^i - s_{t-1}^i|$ where s_t^i denotes the share of sector i in period t

into the manufacturing of machinery and electronics. By 1987 iron and metal ore accounted for 11% of exports, in 1984 this percentage share was 13.5%. The relative shares of exports (and value added) of electrical and electronics increased from 11.3 to 13.3 and that of machinery from 23.0 to 24.7. As can be seen from Table 6, the coefficient measuring the annual rate of structural transformation in the reallocation of exports nearly doubled in the period between 1984-87 as compared to 1974-84.[18]

Table 7:

SPEED OF STRUCTURAL TRANSFORMATION IN INTERNATIONAL COMPARISON

	Annual speed of change[a)]		
	1974-84	1984-88	1974-88
Austria	0.95	1.27	1.05
West-Germany	1.67	2.26	1.41
Sweden	1.08	1.57	0.80
Switzerland	0.59	1.55	0.34
Italy	0.72	1.63	0.68
Finland	0.93	1.94	1.24
U.K.	1.11	1.76	0.79
Japan	2.06	2.03	1.89
USA	1.43	0.88	0.99

Source: OECD, Industrial Structure Statistics

[a)] measured by the sum of the absolute values of changes in shares of output accounted for by different sectors. $\sum_i |s_t^i - s_{t-1}^i|$ where s_t^i denotes the share of sector i in period t.

2.3 The Role of Policy

The Austrian government saw its role of intervening in the economy not confined to the reconstruction period after World War II. In fact, in the post-war period the government adopted an activist industrial policy based on three pillars: generous

promotion of investment in the form of tax incentives and subsidized-interest loans, a policy of attracting foreign direct investment by providing tax-holidays, and a complex system of promoting exports via special export financing instruments.[19] The subsidies to industry have been clearly favoring the large state-owned firms in the basic sector industries. In the 1970s industrial policy promoting industry (which includes the policies ERP, BÜRGES, Gewerbestrukturverbesserung, and other smaller programmes) benefited to 37.8% the basic sector industries, to 9.8% the consumer goods industries and to 30.6% machinery and electronics.[20] In some sense the policy was a continuation of the industrial policy of the 1950s and 1960s which was based on exploiting economies of scale by favoring the production in large firms and by promoting economic activities in which considerable knowledge has been accumulated over the years. The policy of encouraging international knowledge spillovers has led the Austrian economy witness a sustained flood of foreign direct investment. The policy has been impressively successful as the following numbers make clear. In 1970 21.6 percent of employees of the manufacturing sector worked for firms of foreign subsidiaries. This share increased to 30 percent in 1989.[21]

With the slow-down of Austria's convergence rate in the mid 1980s the Austrian government became increasingly concerned whether structural transformation of the manufacturing sector has gone in the "right" direction. The government commissioned a study on assessing structural change in Austria which was meant to serve as a basis to guide potential redirections in the policy of industrial targeting.[22] The structural report by the Austrian Institute of Economic Research to the government pointed to the following structural weaknesses in the manufacturing sector. First, Austria's relatively small R&D sector and the net importing of high-technology has been taken as evidence of a lack of entrepreneurial dynamism of the Austrian economy. Second, the relatively high share of basic sector industries and of traditional consumer goods industries in which low wage countries have comparative advantage have been seen to point to future structural problems.[23] Based on this assessment a policy of reallocating resources from basic and traditional sectors to high-technology was recommended.[24] A new subsidy programme was introduced (TOP Aktion in 1981), later followed by the creation of two new institutions (Innovationsagentur, Innovations- und Technologiefonds) which were designed to promote and channel subsidies to high-tech industries. The most dramatic shift in policy occurred, however, in 1985/1986 when the government declared a change in its policy toward the state-owned sector.

Losses of extraordinary size in the state-owned industries (in 1985 the losses amounted AS 11.8 billion) made the government remove the "soft-budget constraint" which used to govern its attitude toward this sector by refusing to cover any future losses of this sector. This shift in attitude toward the state industries and large scale attempts to promote the high-tech sectors has been the most pronounced redirection in industrial policy since the end of World War II.

The pattern of Austria's post war growth and its assessment by economic experts raises the following questions. First, what factors account for the small size of the R&D and high-tech sectors in Austria? Second, what forces contributed to Austria's relative slow industrial transformation of its production sector downwards knowledge intensive output? Third, why has Austria grown more rapidly than other European countries (except Finland) despite its small knowledge generating sector and despite its slow structural transformation of its industrial output? Finally, what explains the slow-down in Austria's catching-up process since the mid 1980s?

In order to answer these questions we need a theory that establishes a link between economic growth, the size of the R&D sector and the sets of industries a country specializes in. It is since recently only that we have a theory that provides a framework for examining how these three phenomena are connected. Grossman and Helpman (1991) offer a dynamic theory in which R&D and the pattern of specialization evolve endogenously as the outcome of decisions of forward-looking entrepreneurs responding to perceived profit opportunities. Firms devote resources to R&D when they expect returns on their investments. These returns come in the form of economic rents in imperfectly competitive product markets. Firms compare the anticipated streams of monopoly profits with expected costs of innovation. The costs of R&D and the expected return that innovators stand to gain are both affected by conditions in product and factor markets. Accordingly, a country's pattern of growth will turn out to be driven by one single force: its relative composition of factor endowments.[25]

3. Theoretical Explanations

I begin this section by summarizing the model of dynamic comparative advantage by Grossman and Helpman (1991), which links the rate of growth and the long-run pattern of trade to a country's relative resource supplies. I will then turn to learning and to the history of a country's production structure as additional explanations for a country's pattern of growth. In light of the data presented in the previous section, "learning" and "history" will prove to be relevant for understanding Austria's development. The two theories presented in this section complement each other by focusing on different elements that drive growth. The Grossman and Helpman model determines endogenously the rate of innovation while abstracting from the factors determining the full productive potential of this inventions. The Young model determines endogenously the rate of learning from existing R&D breakthroughs, while taking the rate at which innovations are introduced as given. Both theories are expected to provide elements of an answer about Austria's post-war growth.

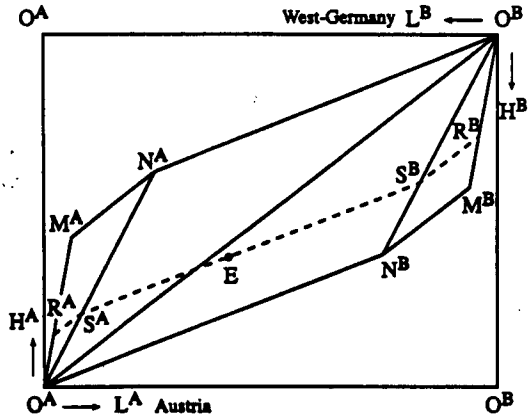
3.1 Dynamic Comparative Advantage

Consider two countries A and B with firms in each country competing worldwide in research. Each of these two economies has three sectors: a R&D sector which produces intermediates goods, a sector producing high-technology goods and a sector producing traditional goods. Each of these sectors uses two factors of production: human capital and raw labour. The R&D activity is assumed to be the most human capital intensive and producing the traditional good the least. Firms in the traditional sector and the high-technology sector face a perfect competitive environment. The R&D sector is developing superior quality intermediate goods which are used as inputs in the high-technology sector. Firms in the R&D sector face oligopolistic competition and are assumed to compete in a Bertrand (price setting) fashion. A research success makes the firm the industry leader until the next quality improvement comes along. When that happens the industry leader's profit falls to zero. Innovators look ahead to their own eventual displacement, as later quality improvements will make their own innovative products obsolete. They will calculate the expected returns to investing in an improvement of an existing quality product by taking the finite duration of their profit stream into account. Firms

compare this anticipated stream of oligopoly profits with expected costs of innovation. The latter depend primarily on the rewards of the factor used most intensively in R&D: human capital. The profitability of producing these intermediate goods determines the rate at which superior quality goods are introduced. The better quality of intermediate goods the R&D sector produces, the lower are the costs in the high-technology sector. Total factor productivity rises with the average quality of intermediate inputs. Hence, a country's growth rate is determined by the speed by which the R&D sector introduces superior quality intermediate goods.[26]

The pattern of specialization in R&D activity, high-technology goods and traditional goods in country A and B can be illustrated with the use of Figure 1. The horizontal dimension of the rectangle gives the world endowment of unskilled labour $L = L^A + L^B$, and the vertical dimension gives the world stock of human capital $H = H^A + H^B$. The line segments O^AM^A, M^AN^A and N^AO^B represent the vector of resources allocated to R&D, to the manufacturing of high-technology goods and to producing traditional goods, respectively in the long-run equilibrium of the integrated world economy. The slopes of the three segments imply that R&D is the most human capital intensive activity and that manufacturing traditional goods the most unskilled labour-intensive activity. We now divide the integrated world economy into two separate countries A and B and we ask then whether these two countries will produce the same level of innovation and aggregate outputs of goods as the integrated world economy. Consider a division of the integrated world economy such as drawn by point E. As drawn the point lies below the diagonal making country A relatively well endowed with raw labour. Consider now the following allocation of resources. Country A devotes O^AR^A to R&D, R^AS^A to the production of high-technology goods, and S^AE to the production of the traditional good. Country B devotes O^BR^B to R&D, R^BS^B to producing high-technology goods, and S^BE to manufacturing the traditional good. It can be shown that this allocation of resources (and any other allocation with endowment points within the parallelogram $O^AN^AO^BN^B$) will reproduce the equilibrium of the integrated world economy.[27]

.Figure 1



As can be seen from the figure the two countries will specialize in the following sets of industries. Country A with its relative abundance with raw labour conducts relatively less R&D than its trade partner country B, compared to its relative output of the traditional good. Country A will also have the smaller high-technology sector relative to country B. The reason is the following. By having the relative smaller number of research successes, country A captures leadership positions in a relatively fewer number of high-technology industries. Aggregate output of the high-technology sector in each country depends on the number of research successes in each country, since outputs of the industry leader will be the same independent of in which country the industry leader is located.

This pattern of specialization in production has the following implications for the pattern of interindustry trade. The unskilled-labour-rich country A specializes relatively in producing traditional goods, while the human-capital-rich country B specializes relatively in both R&D and in producing the high-technology goods. Since the residents of country A consume the same share of world output of every good, country A will develop a sectoral trade deficit in high-technology. The human-capital abundant country B, on the other hand, imports the traditional good on net and exports high-technology. If the labour-rich country A runs a deficit on the trade account balanced by a surplus on the service account, the labour-rich country A may become a net importer of both high-technology and the traditional

consumer good. In that case the share of imports in its total consumption of the high-tech goods will exceed the share of net imports in its total consumption of the traditional good.

The predicted pattern of specialization has implications also for the relative rates of growth in the two economies. The model predicts equal rates of productivity growth in the high-tech sectors in each country. As we have just seen, however, the high-technology sector will be smaller in the labour-rich country A than in the human-capital-rich country B. Since the aggregate rate of growth of manufacturing output in each country is the weighted average of the rates of productivity growth in the two sectors (high-tech and traditional), it follows that real output growth will be slower in the labour-rich country A than in the human-capital-rich country B. Moreover, the labour-rich country A will experience also a slower growth rate of GDP than the human-capital-rich country B.[28]

Let me summarize what we can learn from this model about the evolution of Austria's dynamic comparative advantage. The model guides us to look at Austria's factor endowments in order to understand both its pattern of trade and its growth rate of GDP. The model predicts first, that Austria — with its relative high share of basic sector industries and traditional consumer industries and its relative low share of high-tech industries and its modest R&D sector — ought to be found to have a relative scarcity of human capital and highly skilled labour and a relative abundance of natural resources. According to the model in which innovation is endogenous and competitiveness is created in the research lab, Austria has a relatively small R&D sector and specializes in traditional goods and basic sector industries not because there is a reluctance in the Austrian system to innovation, as some economists have argued, but because comparative advantage dictates this pattern of production. The model predicts furthermore, that Austria with its relative slow movement of its production sector towards knowledge intensive output over time ought to be found to have a slower growth in its endowment with human capital and with it a lower rate of growth of its share of R&D in GDP relative to other western industrialized countries. Finally, the model predicts that Austria with its relative small R&D sector ought to have experienced a lower rate of growth of GDP than other western industrialized countries. In the next section I will expose each of these predictions of the theory to the data. I start with the first. Has Austria indeed a

relative paucity of human capital and a relative abundance of natural resources as the theory has led us to predict?

3.2 Evidence

3.2.1 Trade Pattern

Table 8 and Table 9 document Austria's factor endowment bundle in comparative perspective. As can be seen from Table 8 Austria is by no means poor in its endowment with natural resources. It enjoys substantial relative endowments of land suitable to raise crops and feedstock and is rich in forestry suitable for extracting lumber. Austria is relatively well endowed also with raw minerals. As it becomes apparent from the Table, Austria had some oil reserves in the past which became somewhat exhausted over the last 15 years. These figures explain quite obviously Austria's relative specialization in wood, paper, iron and steel, glass and stone. According to the Heston and Summers data given in the last column of the Table Austria is below average among industrial countries in its capital-to-labour ratio.

Alternative measures of the relative endowment of human capital and skilled labour for Austria and other western industrialized countries are given in Table 9. By all these measures Austria lags behind the other countries. However, the numbers make also clear, that Austria has been narrowing the gap substantially over the last 15 years. This shift in Austria's comparative advantage might explain the increased relative importance of R&D as an economic activity and the structural transformation of its production sector toward knowledge-intensive output.

In order to examine more closely the evolving relationship between Austria's trade performance and its R&D activity we look again at Table 6. In the last column the Table gives the ratio of net exports (exports minus imports) to domestic consumption (output plus imports minus exports) for thirteen Austrian manufacturing industries. This ratio is one measure of revealed comparative advantage. Austria has a deficit in its overall trade account that is balanced by a surplus in its service account. As we have learned from the theoretical section, in the presence of an overall trade deficit comparative advantage of a sector is not

Table 8:

AUSTRIA'S ENDOWMENT WITH NATURAL RESOURCES AND PHYSICAL CAPITAL IN INTERNATIONAL COMPARISON

	Ratio of Arable plus Pasture Land to Economically Active Population[a)]	Minerals[b)]	Ratio of Coal Output to Economically Active Population[c)]	Ratio of Oil and Gas Output to Economically Active Persons[c)]	Ratio of Physical Capital stock to Economically Active Persons[c)]
			Austria		
1971	22.7	30.3	6.29	13.19 18.89[e)]	25.19[f)]
1986	19.9	23.3	5.69	6.10 16.03[e)]	27.84
	1985		1985	1985	1986
Japan	0.9	n.a.	1.61	0.45	47.39
United States	36.8	n.a.	39.60	76.93	31.67
West-Germany	4.3	n.a.	29.78	6.52	37.40
France	13.2	n.a.	4.24	3.37	37.62
United Kingdom	6.9	n.a.	23.08	62.48	22.09

Sources: Grossman (1990), Summers and Heston, Mark V,(1991), Österreichisches Statistisches Zentralamt, Nutzenergieanalyse 1988, Heft 1066, p. 92, Wien 1992; Ergebnisse der landwirtschaftlichen Statistik, various year, Industrie- und Gerwerbestatistik, various years.

a) in hectares per economically active individual x 10, for Austria including forest land.
b) in tons per economically active individual x 10, including iron and non-iron ore, magnesium, calcium sulphate, quartz and quartz sand, kaolin, anhydrite, iron glimmer, trass, illite and crude clays.
c) in tons of oil equivalents per economically active individuals x 10.
d) in thousand units of 1985 international prices.
e) includes hydraulic power.
f) 1979

Table 9:

AUSTRIA'S ENDOWMENT WITH HUMAN CAPITAL IN INTERNATIONAL COMPARISON

	Share of Professional and Technical Workers in Economically Active Population		Percent of Cohort Enrolled in Higher Education			Degrees Awarded in Physical Science and Engineering[a]			Percent of People with Academic Degrees[d]	
	Percent	Year	Percent	Year	Cohort	Bachelors	Graduates	Year	Percent	Year
Austria	5.5	1951							2.3	1951
	6.2	1961							2.6	1961
	8.6	1971	3.8	1966/67	18–25		0.82	1965/66	3.2	1971
	11.5	1981	8.1	1975/76	–"–		1.16	1975/76	3.8	1981
	13.1	1985	13.6	1985/86	–"–	5.94	1.17	1985/86	5.5	1985
	14.7	1990	17.4	1989/90	–"–	7.27	1.44	1989/90	7.2	1991
				1985				1985		
Germany	13.9	1984	23.9		19–22	5.80	1.41		5.9[b]	1982
France	14.1	1982	26.9		18–22	8.03	3.04		5.5	1982
United Kingdom	15.9	1981	18.7		18–20	15.44	3.52		6.0	1984
United States	14.8	1985	41.7		18–24	17.39	4.39		8.9[c]	1984
Japan	10.6	1985	32.1		18–21	14.31	2.14			

Sources: International Labour Office, Yearbook of Labor Statistics, various years, Grossman (1990), Österreichisches Statistisches Zentralamt, Österreichische Hochschulstatistik, various years, Mikrozensus und Volkszählung, various years, Statistisches Handbuch für die Republik Österreich, various years, Beirat für Wirtschafts- und Sozialfragen, Qualifikation 2000, Wien 1989

a) as a fraction of the Economically Active Population x 10000

b) excluding Fachhochschulen

c) 5 or more years of college

d) in Economically Active Population

necessarily revealed by the sector exporting on net. Austria might as well have comparative advantage in a sector in which it imports on net as long as the share of imports in total domestic consumption remains relatively low. According to this criterion Austria has comparative advantage in the following sectors: paper and wood, iron and metal ore, iron and metal goods, stone, glass and ceramics, and recently in chemicals and electronics. The table also shows the sectors which have gained comparative advantage and those that have lost over the last three decades. Can the increased importance of R&D activity at least partially account for this movement in the sectoral mix? This is examined in Table 10. The Table shows the correlation between Austria's cross-sectional trade performance and the sectoral intensity of R&D. In the Table two measures of revealed comparative advantage are used: the share of exports in total domestic output and the ratio of net exports to domestic consumption. As indicators of R&D intensity the ratio of R&D spending to industry sales and the fraction of employees in a sector engaged in research are taken. When the share of exports in total domestic output is used as a measure of revealed comparative advantage in the computation, the correlation coefficients suggest a clear positive association between the sectors in which Austria enjoys comparative advantage in 1987 and the sectors in which R&D investments are undertaken intensively. With the ratio of net exports in domestic consumption as the alternative measure of comparative advantage the same association becomes weaker, but the relationship is still there. An additional feature of the results will turn out to be important for later discussions about Austria's growth. Table 10 shows that there was hardly any statistical association between R&D intensity and Austria's revealed comparative advantage in 1969 and 1984. Thus, the shift in Austria's comparative advantage in R&D intensive sectors has taken place almost entirely in the second half of the 1980s. Given the increase in Austria's endowment with human capital in the 1960s and 1970s (shown in Table 9), we would have expected this shift in Austria's comparative advantage in high-tech industries to occur much earlier than between 1984 and 1987. This leaves us with a puzzle: What accounts for the slow movement of Austria's production sector towards knowledge intensive output? We will turn to this question in the next section.[29]

Table 10:

CORRELATION BETWEEN MEASURES OF R&D INTENSITY AND MEASURES OF AUSTRIA'S REVEALED COMPARATIVE ADVANTAGE

Correlation between 18 Manufacturing Sectors[a)]			
	1969	1984	1987
(1) and (3)	.232	.317	.483
(1) and (4)	-.464	-.302	.088
(2) and (3)	-.316	.168	.433
(2) and (4)	-.485	-.381	-.000

(1) R&D Expenditures as a Percentage of Sales
(2) Number of Researchers per Employees
(3) Exports as a Percentage of Output
(4) Net Exports as a Share of Apparent Domestic Consumption

a) The Manufacturing Sector consists of mining, oil, stone and ceramics, glass, chemicals, paper, paper processed, wood and furniture, food, leather, foundry, metals, machinery and steel, vehicles, iron and metal goods, electrical and electronics, textiles, clothing

Source: Bundeswirtschaftskammer, Forschung und Dokumentation in Österreich, various years, Austrian Institute of Economic Research

To sum up, the data seem to suggest that Austria with its greater relative endowment of natural resources has specialized in sectors that use these factors intensively. The abundance of natural resources in Austria, together with its over time acquired human capital (especially since 1984) suggest a pattern of specialization and trade much like given in Table 6.[30]

3.2.2 Slow Rate of Transformation

In this section we turn to the second question posed in section 2.3. Why has Austria experienced a slower speed by which the manufacturing sector moved up the

technological ladder compared to other western industrialized countries like Germany? The prediction of the Grossman and Helpman theory is that Austria ought to have experienced a slower expansion of the factor used most intensively in the R&D and high-technology sectors: human capital. When a country's endowment with human capital grows more slowly than in an other country, the activities that use this factor most intensively — R&D and high-tech — will need to expand more slowly to absorb the supply of this factor.[31] Put differently, when a country's endowment with human capital grows more slowly than in an other country, the rewards for this factor will be larger in the former relative to the latter, implying a lower profitability of undertaking innovations in the former compared to the latter. The question therefore is: Has Austria's endowment with human capital indeed grown slower than in Germany? This is examined in Table 11.

Table 11:

GROWTH OF HUMAN CAPITAL AND R&D ACTIVITY
average growth rate in %

	Austria			Germany	
	Human Capital[a)]	R&D[b)]		Human Capital[a)]	R&D[b)]
1961-83	2.32	4.27[c)] 7.49[d)]	1961-82	3.51	3.27[e)]
1983-87	5.65	1.78	1982-87	2.13	2.82[f)]
1983-91	4.94	2.34	1982-89	2.76	2.20[g)]

a) Percent of people with academic degrees in Economically active population.
b) R&D expenditures as a percentage of GDP
c) 1967-83, d) 1963-83, e) 1964-81, f) 1981-87, g) 1981-89.

Source: Statistisches Bundesamt Wiesbaden, Östereichisches Statistisches Zentralamt, OECD

Several points of Table 11 are noteworthy. Austria's stock of human capital grew less than in Germany in the period of slow structural change in Austria (1961-83) and expanded faster than in Germany in the period of rapid structural change (1983-

87). These two facts are consistent with what the theory has led us predict. However, comparing the growth rate of the R&D sector with the rate of growth in human capital in the relevant subperiods reveals a striking divergence between these two rates in Austria. Austria's R&D sector expanded much more rapidly than its endowment with human capital in the period of slow structural change, while it expanded substantially below the rate with which human capital grew in the period of rapid structural change. What accounts for this much faster growth of the knowledge sector in Austria in the period 1961-83 if not the growth in human capital? The answer is: policy.[32] A look at table 5 reveals that the percentage of R&D expenditure borne by the government is much larger in Austria than in Germany (compare the government shares 45.9% vs 34.1%). We can now summarize what we have learned so far about Austria's dynamic comparative advantage. The story goes like this. Austria has exhibited a slower change in its output mix towards high-tech industries relative to Germany until the mid 1980s because its endowment with human capital was growing less than Germany's and because its small R&D sector was growing faster (relative to its human capital) than in Germany. The knowledge sector, in turn, was growing more rapidly in Austria in spite of a slower increase in Austria's endowment with human capital due to the government policy to promote R&D. The policy induced expansion of the R&D sector contributed to an acceleration in Austria's growth rate of GDP but constraint the growth of the high-tech sector. This obstacle for the high-tech sector to grow is reflected in a slower speed by which the manufacturing sector moved up the technological ladder compared to Germany. This explains why we did not find a correlation between R&D intensity and Austria's revealed comparative advantage before 1984 in the previous section. Austria has acquired comparative advantage in high-technology industries in the late 1980s only, because more of the available factor human capital was allocated to the R&D sector leaving fewer of these inputs to the high-tech sector. This way the policy induced expansion of the R&D sector has crowded out the resources – high skill labour — the high-tech sector needed for growing.[33]

3.2.3 Comparative Growth Performance

In this section we turn to the last question posed in section 2.3. Why has Austria as a small country grown faster than other western industrialized countries like Germany which have much larger knowledge generating sectors and which are of

much larger size?[34] One possible answer is — an answer that would be given within the framework of a neoclassical growth model in which technical change is exogenous — that Austria has been catching-up because it lagged behind other OECD countries in its capital accumulation making its gap between the marginal productivity of capital relative to the interest rate wider and thus capital formation more profitable. Accordingly we would expect higher investment rates in Austria compared to other western industrialized countries. A look at Table 4 of section 2.2 indeed confirms that Austria had a larger investment rate compared to Germany since 1974 (24.7% compared to 21% in Germany in the period 1974-84 and 23.8% versus 20.2 in 1984-91). However, this is not the whole story. We can see from Table 12, which gives crude estimates of total factor productivity (TFP), that the difference in capital accumulation between Germany and Austria cannot account for all the differential in the growth rates. The contribution of technical change as measured by total factor productivity to economic growth in Austria has been large and considerable above that of Germany. This suggests that other factors may have been important for Austria's growth.

The Grossman and Helpman model, in turn, predicts that Austria with its relatively small R&D sector is expected to have a lower rate of growth of GDP than other western industrialized countries. Smaller economies devote less resources to R&D than larger ones, and as a result they innovate less and grow slower. A smaller economy might innovate more and thus grow faster than a larger one only, if it happens to have more human capital than the larger one. This, however, does not hold anymore if the small country happens to be integrated with the larger one. In this case the small country can benefit from the knowledge stock of the larger country.[35] These cross-country knowledge flows have been clearly at work between Austria and Germany.[36] Table 13 looks at one possible source of these knowledge flows: Austria's incoming foreign direct investments (of which 40% originate from Germany). More than 30 percent of the Austrian labour force employed in manufacturing works for firms of foreign subsidiaries.

Table 12:

ESTIMATES OF TOTAL FACTOR PRODUCTIVITY GROWTH AUSTRIA AND GERMANY

Time Period	Growth of				Average	Percentage Contribution of			
	Output	Labour	Human Capital[a)]	Capital	Capital Share	Labour	Human Capital[b)]	Capital	TFP
Austria									
1954–61	6.29	0.80	2.58	1.52	0.24	9.35	1.06	5.90	83.69
1961–71	4.45	-0.52	1.42	3.10	0.27	-8.27	0.93	18.65	88.70
1971–83	2.83	0.17	2.95	3.47	0.26	4.28	4.11	31.86	59.75
1984–87	1.77	0.00	2.98	2.46	0.28	-0.02	9.52	39.38	51.12
1984–89	2.63	0.16	4.34	2.42	0.29	4.08	9.83	26.56	59.53
1984–91	2.96	0.56	4.45	2.44	0.29	12.23	9.36	24.17	54.24
1954–91	3.90	0.16	3.05	2.77	0.27	2.76	3.89	18.86	74.49
1961–89	3.32	-0.10	3.05	3.11	0.27	-2.12	4.45	25.14	72.54
Germany									
1961–70	4.42	-0.05	3.08	5.65	0.28	-0.69	3.22	36.20	61.27
1970–82	2.19	-0.17	3.90	3.90	0.26	-5.12	12.45	46.81	45.87
1982–87	1.98	0.17	2.45	2.53	0.29	5.50	10.34	36.48	47.68
1982–89	2.43	0.35	3.32	2.53	0.29	9.02	11.62	30.39	48.98
1961–89	2.96	0.00	3.49	4.11	0.28	0.01	8.50	38.54	52.95

Source: Austrian Institute for Economic Research, OECD, National Accounts, Statistisches Bundesamt Wiesbaden

a) Number of people with academic degrees

b) The factor share for human capital is calculated by using the median income of people with academic degrees relative to the median income of total employment.

Table 13:

INCOMING FOREIGN DIRECT INVESTMENT

	Share of employment in foreign subsidiaries in total manufacturing employment in percent
1970	21.6
1984	28.1
1987	27.8
1990	31.1

Source: Östereichische Nationalbank

3.3 Learning and History

In this section I turn to a complementary explanation of Austria's growth based on the Young (1991,1992) model of bounded learning. According to this theory Austria has been growing faster because its movement up the technological ladder has been slow compared to other industrialized countries like Germany. The slower transformation of the Austrian production sector gave firms the opportunity to come down their learning curve and thus to "create" comparative advantage through the accumulation of experience with the same activity. A slow rate of transformation from an old to a new activity as a form of maximizing learning effects might be vital for a country of small size constraint in the option of generating rapid learning and cost reductions by producing larger outputs at each point in time.

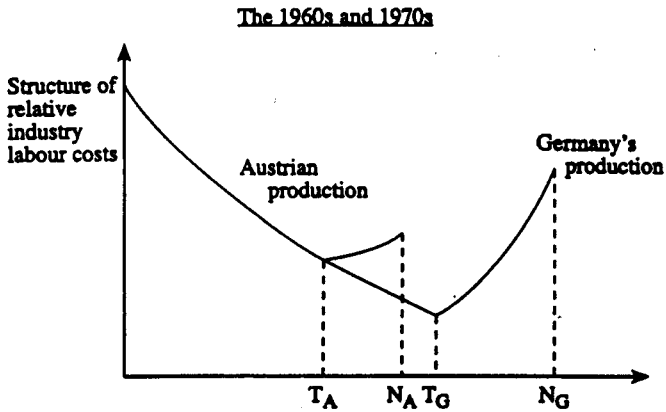
In contrast to the Grossman and Helpman model, Young's model of learning by doing takes R&D breakthroughs as exogenous and determines endogenously the full productive potential of existing technologies. Experience gained in the use of new techniques allows productivity gains via small improvements on otherwise unchanged technology. Young assumes that this process of learning is bounded;

productivity gains from learning by doing cannot go on for ever, they ultimately reach a point in which additional increments to experience yield no additional gains in productivity. Initially the use of new technologies in the production of existing or new goods leads to rapid learning by doing. After some time, the productive capabilities of these technologies are exhausted, and learning slows and ultimately stops. Because learning in each good is bounded, learning by doing cannot be sustained without a continuos flow of new inventions. At any given time, learning by doing will be exhausted in a subset of goods, and will continue in others. The movement of goods out of the learning-by-doing sector into the mature sector in which learning by doing no longer occurs evolves endogenously over time. Bounded learning will lead to an evolving trade structure which exhibits some persistence over time and in which learning generates a movement up the technological ladder.[37]

Figure 2 illustrates how this model might provide a possible answer for why Austria has been growing faster than Germany in the post-war period. The Figure is adapted from Young (1992) to fit the Austrian experience. On the horizontal axis goods are ranked hierarchically by their level of technical sophistication, the more to the right, the more sophisticated the product. The labour cost of producing one unit of each of these goods is given by the curve. The curve is downward sloping indicating that experience in production (learning-by-doing) leads to cost reductions. The curve has a lower bound at T_A below which unit labour requirements cannot fall (learning is bounded). As an economy accumulates production experience, more and more goods attain this lower bound. In the Figure T_A indicates Austria's cumulated learning experience. T_A gives also the most recent industry in which Austria has exhausted its learning possibilities. To the right of point T_A the cost curve is upward sloping. This reflects the assumption that the cost of producing new goods depends upon an economy's familiarity with the production of existing goods. The cost of producing new goods are assumed to be the higher the further beyond the economy's cumulated learning experience a country tries to move. In the Figure a similar curve is drawn also for Germany. As drawn Germany's learned maturity is greater than that of Austria ($T_G > T_A$) and it produces more sophisticated products relative to Austria ($N_G > N_A$). The upward slope of Austria's curve is, however, considerably less than that faced by Germany, because Austria benefits from the learned knowledge and experience transferred by its many foreign investors and managers (of which a large proportion, 40% , originate from Germany). Because of

the targeting policies of the Austrian government, which favored industries with accumulated experience, Austria is mostly producing goods on the downward-sloping portion of its cost curve. In contrast, Germany is assumed to enter new sectors and to explore the frontiers of knowledge which makes its upward-sloping portion of its cost curve larger relative to Austria.

Figure 2



The model might provide an explanation for the larger role of technical change in the growth process in Austria compared to Germany as we have reported in Table 12. Assuming that the increase in price will be less than the increase in labour cost as one moves beyond T_A or T_G on the technological ladder, a reallocation of activities from the left of T_A (T_G) to the right of T_A (T_G) leads to a fall in measured real output. Thus, a premature movement up the technological ladder results in a fall in measured productivity.[38] According to this argument Austria was able to do better than Germany with less inputs because it avoided to push itself into technologies too far ahead of itself thereby profiting from learning by doing. Austria might have been also benefiting from its targeting policies which prevented the economy to be driven ahead of its learning maturity into the production of goods with lower productivity.[39]

Can this model explain also the slow-down in the convergence rate which Austria has experienced since 1984? In the period 1984-87 Austria experienced slower growth than Germany (see Table 12). The slower growth of GDP was associated with an acceleration in Austria's rate of structural transformation (see Table 6). In the same period the policy of industrial targeting was redirected away from sectors with accumulated learning (basic sectors) toward high-tech industries. Within the framework of the models presented in this paper two possible explanations for the slow-down of Austria's convergence rate can be put forward.

First, the removal of subsidies from the basic-sector industries (the sector with accumulated learning) made Austria give up activities in which it has exhausted learning. If this is the right explanation we expect TFP to have accelerated in these years as Austria improved its "learned" maturity. In terms of Figure 2 the exhaustion of learning would be reflected in a movement of T_A to the right along the real line. A look at Table 12, however, reveals that in the period 1984-87 the contribution of TFP to economic growth was at a historical low (in 1986 when these sectors were given up, TFP's contribution to growth was 11.4 percent). An alternative interpretation might go like this. Some of the basic sectors which were given up might not have exhausted learning. The loss of some of these sectors has translated itself to a real loss to the economy. One piece of evidence that provides some support for this interpretation is that the removal of the subsidies went hand in hand with the strongest appreciation of the real exchange rate since the breakdown of the Bretton Woods system. In 1986/87 the Austrian Schilling appreciated vis-à-vis the currencies of Austria's trading partners by more than 15 percent.[40] This real appreciation of the Austrian Schilling together with the removal of subsidies to the basic sector industries might have been driving a large wedge between unit costs of Austrian firms relative to those of its foreign competitors.[41] When comparative advantage is "created" over time by the dynamics of learning a transitory real appreciation of the exchange rate may lead to a permanent shift in comparative advantage. The removal of the subsidies from this sector might have been picked at the wrong time.[42]

Second, the promotion of high-tech industries since the early 1980s together with the redirection of subsidies from the basic sector to the high-technology sector might have as well contributed to the slowdown in the Austrian convergence rate. A subsidy to output of high-technology induces an expansion of this sector;

competitiveness in high-technology products rise. However, this comes at the expense of a country's overall rate of innovation.[43] The reason for this counterintuitive result is the following. The long-run growth effect of an industrial policy is not depending on whether the targeted sector uses technology intensively. The effect of a production subsidy on the rate of innovation depends on the relationship between the targeted sector and the R&D sector. The high-tech sector uses inputs that are more similar in composition to the one required in the R&D sector. Therefore, the two sectors compete intensively on the factor markets for high-skill labour. The subsidy induced expansion of the high-tech sector leads to a shrinkage of the R&D sector. Since the latter sector drives the rate of innovation, the growth rate of output declines.[44]

As documented in Table 6 the reallocation from the basic sector to machinery and electronics (the latter sectors are almost 5 times as much researchers intensive than the former) is expected to have pushed up wages for high-skill labour. The resulting increase in the cost of innovation leads the knowledge sector to decline. One piece of evidence that suggests that this argument has some validity can be seen from Tables 10 and 11. Table 10 and 11 document that the faster growth in Austria's endowment with human capital (relative to the period before 1983) led to a sharp increase in Austria's competitiveness in high-tech (Table 10), while contributing only little to the expansion of the R&D sector (Table 11). This suggest that researchers have been competed away from this sector to the fast expanding high-technology sector resulting in a slow-down in Austria's growth rate. Another piece of evidence can be seen in the comparison of the growth rates of wages in the R&D sector relative to those in manufacturing. Between 1981-84 manufacturing wages increased by 4.6% while R&D wages by 2.3%. This gets reversed during 1984-91. Manufacturing wages rose by 4.8% and that of R&D personnel by 5.9%.

4. Lessons for Eastern Europe

This section looks at the relevance of the Austrian experience for Eastern Europe. The section will deal with three broad questions. First, how far can one push the case of comparison with "similar" countries like Austria. What are the limitations of such a comparative approach. Can one reasonably expect countries to follow a

uniform pattern of development as has been argued by Chenery and Syrquin (1989) for a cross section of countries and as Collins and Rodrik (1991) have assumed in their methodology of forecasting Eastern Europe's future trade flows. Second, the Austrian experience suggests that the speed of structural adjustment has mattered for its post-war growth performance. Can the Austrian experience be used as a possible economic (rather than political) case for gradualism? Third, does it matter for Eastern Europe's future growth potential which sectors remain in Eastern Europe after transformation to a market economy? Should transitional industrial and trade policy be used to promote some of these sectors? What can we learn from the Austrian experience in that respect?

4.1 Limits to the Search for Analogies

The transformation of the Eastern European economies — an event unprecedented in history — provides an unusual challenge for the economics profession. Economist have responded to this challenge with a search for analogies from which lessons can be learned for Eastern Europe.[45] In the area of economic development this search for analogies has taken two forms. One approach looks at historical trends prior to central planning and infers the trade pattern of CEE and the former Soviet Union from the post war development of western industrialized countries with at that time similar per capita income. This is seen to answer the counterfactual question: If Eastern Europe would not have undergone the socialist development where would it stand today? An alternative approach makes predictions from western industrialized countries which are today at comparable levels of development with CEE. This is seen to answer the question: If CEE would not be distorted by central planning today what would its trade pattern look like? The former approach suggests to look at a country like Austria while the latter approach makes countries like Spain and Portugal possible candidates for comparison.[46] Both approaches are based on the assumption of a single path of development. The idea here is that countries undergo similar stages of economic development. Countries at comparable levels of development are therefore expected to specialize in the same sets of industries. Accordingly, a country like Austria can be used as guidance of what might happen to CEEs' trade and growth when becoming market economies. However, the Austrian post-war development path might not necessarily be a reliable source of information for what might happen to CEEs future

development potential as the following two examples try to illustrate. Suppose a country's (say CEEs') comparative advantage were solely based on its endowments with the factors labour and capital. As the country develops, its savings rate increases over time and with it the country becomes more capital abundant. The same country's exports will, however, not necessarily become more capital-intensive. The reason is the following. Assume the country has three sectors, a sector Y that produces the capital-intensive good, a sector X which produces the labour-intensive good, and a non-traded intermediate sector Z. Capital accumulation requires inputs from the intermediate sector Z. Assume furthermore that the Z-sector's capital intensity lies between that of the Y-sector and the X-sector. In order for the country to increase its capital stock the Z-sector needs to expand. The intermediate input sector Z can however increase only by using capital from the most capital-intensive Y-sector which implies that the Y-sector will need to shrink. If these Rybczynski effects are big enough, it may make a country which becomes more capital-abundant in the course of its development switch back to exporting the labour-intensive good X and importing the capital-intensive good Y.[47] The example shows that two countries might start with the same factor endowments and per capita income levels and end up producing different things in the course of their development when they happen to differ in the way the rest of their economy is organized. The Austrian case is illustrative in this respect. Assume the Z-sector is the R&D sector and the two factors of production are skilled and unskilled labour. Assume furthermore that the Y- and X-sectors are now the high-tech and traditional sector and let the knowledge sector Z be the most human capital intensive and the traditional sector X the least. The rapid expansion of the R&D sector in Austriacontributed to an acceleration in the growth rate of GDP but constrained the growth of the high-tech sector Y. This way the Austrian development path was characterized by a slower speed by which the manufacturing sector moved up the technological ladder compared to other countries with similar endowments with human capital.

Austria might be an even more unreliable guide for the future pattern of development of CEEs if CEEs comparative advantage were based exclusively on economies of scale and thus on the history of their production structure. In that case the pattern of development is undetermined. There are several outcomes possible. The industries in which CEEs may specialize as they catch up with western industrial countries will depend on the particular Eastern European country's

relative size, on its prior experience in a particular industry and on whether or not the share of world spending for a particular industry is relatively large or small.[48] There is a good chance that CEEs' might develop a comparative advantage in some of the heavy industries which were overemphasized under central planning simply because of their several decades of experience in these areas.[49] In fact, as the previous section documented the Austrian experience illustrates that history might matter a great deal for a country's pattern of development. Austria inherited from World War II a high share of war related industries which 40 years after the end of the war still figure prominently in Austrian exports.

4.2 An Economic Case for Gradualism?

In the previous section we argued that the Austrian experience might provide limited guidance for CEEs' future development potential precisely because history and learning by doing might matter for comparative advantage. History and learning by doing might however as well provide an economic rationale for a gradual approach to economic reform. Can Austria's development path provide evidence for such a claim? The Austrian case shows that a process of rapid catching up might go hand in hand with a slow rate of structural transformation when learning by doing is an important source of growth. We found some evidence that Austria was able to catch up rapidly with less inputs than other industrialized countries because Austria exploited its learning possibilities by avoiding to move up the technological ladder excessively fast. When learning is a source of comparative advantage adjustment costs become an increasing function of the speed of adjustment. A shock-therapy approach to reform becomes excessively costly when the costs of adjustment arise from the prevention of learning to take place, because it might lead to a permanent loss of industries with long-run viability. A gradual removal of e.g. tariffs on imports reduces the incentive to move out of sectors with learning potential leading to a slower rather than an abrupt shrinkage of these sectors in the transition. This will be desirable as long as a non-negative share of these sectors will survive without any protection. There is a divergence between the private and social valuation of such a move out of a declining sector which arises from the learning spillover that the remaining sector generates to other industries. Gradualism may be a way to internalize this externality.[50] The real question here is how much and which of the existing production can be redesigned and redirected

from the former CMEA (mainly the former Soviet Union) to western markets. Trade data in 1991 indicate a substantial reorientation of the regional trade patterns in Hungary, Poland, and the former Czechoslovakia. At the level of broad product categories, however, only little evidence of reorientation from Eastern to Western markets have been found so far.[51] The fact that over 40 percent of these three countries exports go already to the EC suggests some potential that products previously exported to the East can be made marketable to the West at a positive price. This structural adjustment is however a slow process and will not come over night.[52]

In light of the Austrian growth experience, what are CEEs' prospects for converging to western income levels? The Austrian evidence does not provide confidence in rapid convergence between CEEs and Western Europe.

Table 13:

CONVERGENCE

	Gap[a] in 1950	Investment Rate 50s	60s	70s	Gap Closing[b] 50s	60s	70s
Austria	69.3	20.6	25.8	28.9	16.8	6.2	10.8
Germany	63.6	28.0	30.0	26.7	27.2	5.4	6.2
Finland	62.5	33.1	36.4	35.3	14.1	6.8	9.2

a) Ratio of per capita income in the country relative to the US,
b) Reduction in per capita income gap over one decade
Source: Heston and Summers (1991)

If one takes Austria's growth experience as a benchmark it will take CEEs over 30 years to catch up with Western Europe. This conclusion is not changed when the growth experience of Germany or Finland — the other two best performing European countries are taken as reference. Although Germany's elimination of the gap in the 1950s is quite remarkable.[53]

4.3 Industrial and Trade Policy in the Transition

During World War II Austria inherited an oversized military sector which resulted from the decision of the Third Reich to move part of its military production to Austria. After the war these industries have been promoted with subsidized loans which have been financed out of US foreign aid. The situation in many of the CEEs today after the collapse of the CMEA seems to resemble that of Austria after the war. The pattern of specialization within the CMEA system led to an oversized military sector and heavy industries in many of the CEEs. Almost 50 percent of Hungarian exports to the ruble area consisted of machinery. Electro-engineering products accounted for 75 percent of Poland's exports to the East. Slovakia specialized in supplying military equipment to the former Soviet Union. The rapid fall of output of these sectors since the collapse of the CMEA and the fact that most of these sectors belong to the high end of the technology ladder in CEEs led to a recent proposal to help these "high-tech" industries to restructure with a production subsidy. The proposal is based on the argument that these industries "matter" for CEEs' future growth perspective.[54] Can the Austrian experience be used to support such a proposal? The answer is no. The reasons are the following. First, Austria indeed decided after the war to subsidize the war related industries on a large scale. These subsidies, however, seem to have helped Austria to capture technical spillovers from the German high-tech sector. The technical spillovers from the German high-tech sector seems to be one of the reason why Austria showed this remarkable growth in the first eight years after WW II (see Table 1). Second, subsidizing "high-tech" tends to slow rather than accelerate a country's growth rate. The Austrian case is again illustrative in that respect. I have found some evidence that the slow down in Austria's convergence rate since the mid 1980s has been induced by a reorientation in the policy of industrial targeting towards the high-tech industries. Third, even if we can find sound economic reasons to give these industries some support (and such a case can be made), in formerly centrally planned economies an output subsidy is unlikely to be the first-best policy. The reason is that subsidies to ex-state enterprises affect the incentives of managers to restructure. A large enough subsidy will induce the manager to pursue the "social objectives" set by the government (not to reduce output, when in fact efficiency considerations would dictate such a reduction). This way a subsidy can be thought of as a way to bribe the managers to behave against the profit consideration of the firm.[55] Hence, the problem that the ex-state enterprises in these industries seem to face is, how to get

rid of the government involvement rather than to find new ways to involve the government. Given these arguments, a gradual approach to liberalize trade may be a superior way of supporting industries with learning potential in CEEs. The support comes in a form in which the government keeps a distance from the enterprise sector.[56]

Footnotes

1 Austria's post-war development path is not the only phenomenon of interest for potential lessons for Eastern Europe. The following other phenomena have been suggested. First, Austria's high share of state owned industries combined with a liberalized trade regime might provide insights to the sequencing debate of whether or not trade liberalization should come before privatization in the transition. Second, after the end of World War II, Austria responded to the shortage economy and to accelerating inflation by creating a new institution the so called "Social Partnership." This form of corporatism has helped to reduce social conflict and has been discussed as a "Third Way Model" for Eastern Europe and the former Soviet Union. For the functioning of the corporatist model in Austria see Marin (19??). Finally, the experience of hyperinflation in the interwar period and the dissolution of the Habsburg empire are other episodes of Austrian history that have been studied in this context see Dornbusch (1992a, 1992b).

2 As Collins and Rodrik (1991) document, these regressions perform quite well in predicting the future pattern of specialization. Such equations accurately describe about 70 percent of the post war development path when performed ex-post on actual economies.

3 Dornbusch (1992a, 1992b) is a case study that draws lessons from the Austro-Hungarian Empire for the dissolution of the Soviet Empire. It focuses particularly on the role of foreign aid and on monetary policy during hyperinflation. Menil and Maurel (1992) study trade policy issues of the successsor states of the Austro-Hungarian Empire based on a case study. Other studies that use cross section regressions to make predictions about the future growth potential of Eastern Europe and East Germany are Dornbusch and Wolf (1992), Barro (1991) and Borensztein and Montiel (1992).

4 This has been particularly the case for the exchange rate and monetary policy see Hrncir (1992). Among the countries looking at the Austrian experience are the Ukraine and Slovakia. Recently there has been an initiative of the World Bank to ask Austria to take lead in a Marshall Plan type Productivity Enhancement Program for Eastern Europe based on its own experience with the technical assistance component of the historic Marshall Plan.

5 Promotion of "high-tech" industries in Poland via production subsidies has been recently proposed by Rosati (1992b). In Russia there is a related debate around government support for the military industrial complex which led to the fall of the Gaidar government, see Lipton and Sachs (1992) for the role of the military industrial complex in Russia's economy. For a discussion of other potential reasons why some form of protection might be desirable in the transition period in Eastern Europe see Blanchard et al (1991), Kenen (1991) and Corden (1992).

6 see Nemschak (1955) and Koren (1961). See also Wolf (1992a) who quantifies the different factors contributing to growth in Western Europe in this period.

7 In 1982 19 percent of the labour force was employed in the state-owned industries. This share has declined in the 1980's to 14.6 percent due to privatization, see Austrian Industries (1984).

8 I have tried to give a crude estimate of the extent to which the Austrian knowledge capital stock was depleted by the mass killing and expulsion of the Jews. Assuming a Jewish population of 191.481 people of which 60% were economically active and assuming that 42% of the economically active Jewish population where highly skilled and belonged directly or indirectly to the knowledge sector, we remain with 34.466 people. If we furthermore assume that the share of professional and technical workers plus researchers on the economically active population in Austria was 4% in the interwar period we have 162.245 people. Multiplying the skill share of the total population by a factor of 11 in order to infer the same skill share of the Jewish population has been guided by the share of Jewish

students in all students enrolled at Austrian Universities in the interwar period for which historical documents were available. If this calculation is correct the Austrian knowledge capital stock was reduced by 30%. This is a conservative estimate, however, because the calculation does not include those highly educated people who did not belong to the Jewish community but who have been racially persecuted by the Nazis. Figures that have been compiled by the Institut füer Wissenschaft und Kunst indeed give much larger estimates in the range between 32% to 67% see Stadler (1987).

9 The luxury industries in which small firms dominated, experienced a boom in the Austrian territories of the Habsburg empire. The fashion industries supplied the throne and its entourage see Rothschild (1961). Many of these small textile and clothing firms were owned by members of the Jewish community.

10 Koren (1961) notes that during this time of rapid growth there was surprising little new entry into the small business sector. He attributes this to an unexplainable lack of dynamism and entrepreneurship see p 346. Beside the industrial policy program favouring large (state owned) firms, the shift in the composition of small relative to large firms probably reflected the loss of entrepreneurial talents during World War II.

11 Koren (1961), p. 356, Rothschild (1961). Austria was the country with the highest Marshall Plan allotments, see Eichengreen and Uzan (1992).

12 Koren (1961), p. 402.

13 The widening of Austria's income gap is overstated in the Table, however, since the Summers and Heston data do not include the years 1989 - 91 in which Austria has grown with about the same rate as Germany. This has, however, been induced by the breakdown of the communist empire.

14 For a growth accounting exercise which decomposes ouput growth into its various sources for the different time periods see the later section 3.3.

15 According to the Chenery and Syrquin (1989) typology of 187 countries Austria is, however, ranked as a small inward manufacturing country. In Kunst and Marin (1989) we reject the hypothesis that Austria's growth has been driven by exports when measured by Granger causality. The export-led growth hypothesis is not rejected by the same test for Germany and other OECD countries see Marin (1990).

16 Austria's defense related R&D spending is negligible.

17 Note that Switzerland, Italy, and Finland show also slow changes in output mix over time. The measure of speed of adjustment is not invariant to the level of aggregation and should therefore be taken with caution. Young (1992) using a somewhat longer period (but the same level of aggregation) gets faster speed of structural transformation for these three countries than Austria.

18 This process of faster structural transformation continued through out 1991. Between 1987 and 1991 the share of machinery and vehicles in total manufacturing output increased from 17.2 to 20.7, electronics from 9.4 to 11.6, and the share of iron and metal ore declined from 7.5 to 5.8.

19 In this package import tariffs played a minor role only. However, pressures from influential political groups resulted in higher average and more diversified tariff rates in Austria compared to other EFTA and EC countries, see EFTA (1986).

20 See Szopo P., Aiginger K., Lehner K. (1985) for an attempt to quantify the effect of subsidies to industry in Austria. These figures are giving the average present value benefit and have been

calculated from Szopo et al. In an international comparison of subsidies to industry Austria falls in the class of high subsidy countries see Ford and Suyker (1990).

21 See Pichl (1989). The end of the 1980s witnessed a shift in emphasis toward foreign direct investment. The government startet to promote outward foreign direct investments by Austrian firms, for a sceptical evaluation of this policy see Marin (1989).

22 See Austrian Institute of Economic Research, Österreichische Strukturberichterstattung, Wien 1985

23 For a critical discussion of the economic concepts on which the report based its assessment see Marin (1991), and Köppl and Marin (1990).

24 This reorientation in the policy focus was not unique to Austria. Many of the OECD countries discussed programmes to promote their high-tech industries. In their annual country survey, the OECD identified similar structural weaknesses of the Austrian manufacturing sector see OECD (1985).

25 We postpone the discussion of two other factors that determine a country's pattern of growth, country size and history, to section 3.3. By affecting profits of imperfectly competitive firms, the model also gives economic policy an important role in influencing a country's pattern of growth.

26 Note that in such an environment the private incentives to undertake R&D may be too great due to the profit destruction that each innovation generates. This is the well known Schumpeterian mechanism of creative destruction.

27 For the reasoning why the long-run equilibrium of the trading world economy will replicate the equilibrium of the integrated world economy see Grossman and Helpman 1991 p 185.

28 GDP differs from manufacturing output by the value generated in the R&D sector.

29 With net exports as the measure of comparative advantage the reduction in the negative correlation coefficient over time is taken as evidence for the growing importance of R&D for Austria's pattern of trade. A negative correlation between these two series is not surprising a priori when a country has an overall deficit in its trade balance. For a test of the Heckscher-Ohlin-Vanek theory with Austrian data which comes to inconclusive results with respect to the factor content of Austrian trade, see Kohler (1987)

30 A recent study by Schulmeister (1990) using a somewhat different approach states that Austria has comparative advantage in sectors which are resource and energy intensive and to a lesser extent human-capital intensive. He takes this, however, as evidence for the lack of entrepreneurial dynamism and not as reflecting underlying factor endowments.

31 This is the well known Rybczynski effect.

32 The slower expansion of the R&D sector relative to the growth in human capital since 1983 was also induced by policy and is seen to have contributed to a slow down in Austria's growth, see section 3.3.

33 Note, however, that in spite of experiencing a faster growth of GDP, Austria has not experienced a faster rate of growth of real consumption. With international trade growth rates of domestic output provide misleading measures of national welfare.

34 Austria has a population of 7 million people.

35 For the way international knowledge spillovers contribute to growth see Grossman and Helpman (1991).

36 40% of Austria's trade takes place with Germany.

37 Learning by doing models in which learning is not bounded tend to enhance existing patterns of trade. Once a pattern of specialization is established, it remains unchanged with unbounded learning acting to further lock the pattern in, see Krugman (1987). In contrast, in the model here, bounded learning will still generate some persistence in trade patterns but at the same time it generates a movement up the technological ladder with old goods being discarded in favor of new and more advanced ones.

38 Young argues for Singapore that such a premature movement up the technological ladder led Singapore, as opposed to Hong Kong, have no technical change at all.

39 The political economy environment also contributed to a slow rate of transformation. The strong centralized trade unions accepted and supported technical change because of an implicit agreement between the social partners which guaranteed that technical change takes place within firms and industries rather than outside making change less threatening to workers. This of course, might have as well prevented the sectors which exhausted learning to be given up.

40 The Austrian Schilling is pegged to the Deutsche Mark which appreciated because of the stark devaluation of the US Dollar.

41 An additional evidence in favour of this argument is the observed change in exporters behaviour with respect to exchange rate changes. Before 1986 exporters priced their goods to the market by absorbing exchange rate appreciations in their profit margin leading to opposite movements in the real exchange rate measured in unit costs compared to those measured in export prices. In 1986 and 1987 both exchange rates moved in the same direction indicating that exporters passed on the appreciation to foreign prices leaving some of these markets to foreign rivals, see Köppl and Marin (1990).

42 For the role of policy hysteresis in the presence of learning see Krugman (1987). The timing of the removal of the soft-budget-constraint from the state-owned sector might, however, been right with respect to its effect on incentives of managers of this sector. It seems that at that time the government has been faced with a trade-off between permanently loosing some industries by removing the subsidies from the state-owned sector and missing the occasion of removing the "social objectives" from this sector when the surplus of the bargaining between the government and the managers of state industries became negative due to large losses. The best way to deal with the situation would have been to let the exchange rate devalue.

43 For the long-run effects of various industrial and trade policies in a model with endogenous innovation see Grossman and Helpman (1991).

44 This is just the mirror picture of what happend in the fast growth period before 1984.

45 Recent years have witnessed an explosion of studies in search for analogies for the present context in Eastern Europe. To name just a few: a study on the Marshall Plan as a model for the potential role of foreign aid for CEE and the former Soviet Union see Eichengreen and Uzan (1992), a study on the European Reconstruction period as a model for rapid catching up see Dornbusch et al (1993), a study on the European Payments Union and its relevance for a potential Eastern European Payments Union see Kenen (1991) and Rosati (1992a), a study on the dissolution of the Austro-Hungarian empire for lessons for the dissolution of the Soviet empire, see Dornbusch (1992a,1992b).

46 Collins and Rodrik (1991) use a mixture of both approaches by imposing the average development path of a bundle of countries including Austria, Spain, and Portugal when updating the 1928 trade matrix of Eastern Europe and the former Soviet Union.

47 For the conditions under which this might happen see Findlay (19??). For similar results in a three factor model see Leamer (1987).

48 See Grossman and Helpman (1991), ch. 8, and Young (1991).

49 For this reason Collins and Rodrik (1991) predicted fall of trade among the former CMEA member countries seems to be on the high side as their method does not allow for history as an additional source of comparative advantage. The actual development seems, however, to have already outdated these predictions see Rodrik (1992b).

50 see Gavin (1992) for a different economic rationale for gradualism which is based on a congestional externality caused by excessive unemployment in the transition. See also Mussa (1986) for why adjustment costs by itself are not enough to provide an argument in favour of gradual reform.

51 see Rodrick (1992b)

52 One of the arguments made in favour of big bang reform in this context is that price decontrol requires big bang trade liberalization because of the discipline that foreign competition imposes on monopolistic enterprises. Apparently, there is only little evidence of this disciplining effect, see Rodrik (1992b). An other piece of evidence that casts doubt on the notion that CEEs have "nothing to sell" to western markets are western trading firms' judgement of the quality of goods coming from this region relative to comparable western goods. This evidence suggests that Eastern Europe competes on the lower end of the quality spectrum, see Marin (1992).

53 Dornbusch and Wolf (1992) comes to a somewhat similar figure for East Germany when taking the Asian Tiger's growth performance as reference. See his discussion of the special factors which might speed up the convergence process in the context of East Germany which apply to some extent to CEEs as well. For the German Miracle see Wolf (1992b), for a discussion of the factors explaining the French growth experience during reconstruction see Saint-Paul (1993).

54 See Rosati (1992b). In Poland employment in precision instruments and engineering accounted for 12% of total industrial employment in 1989. Export sales to CMEA of precision instruments fell by 48%, of engineering by 13%, and of electronics by 8% in 1991, see Berg and Sachs (1992).

55 For a model see Boycko, Shleifer, and Vishny (1992). Government involvement has been seen as one of the major reasons for the large losses of the Austrian state-owned industries in the mid 1980s which led the government to abolish the soft-budget constraint from this sector.

56 The possibility that trade might crowd out innovative sectors in CEEs when they open up trade with dissimilar countries can be made as an argument for regional integration among CEE. For the possibility that trade might lead countries to specialize in stagnant sectors see Grossman and Helpman (1991). For a recent proposal for CEEs to join EFTA see Baldwin (1992).

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