Automotive Clusters and Entrepreneurship

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1. Clusters as a cooperation form at the interface between the OEMs (original equipment manufacturers) and the small and medium enterprises (SME)[1]

The network approach currently pursued in numerous European regions is conceptionally based on Michael Porter's theory of clusters. *By introducing the cluster model, Porter (1998) proposes that in the future, firm competitive advantage will not be determined chiefly by greater efficiencies in the sourcing of inputs, but rather by the ability of firms to exploit the resources available in the "cluster" or network of local individuals and companies,* in *which they operate.*

Networks of suppliers „must be defined as an operative concept, involving both hierarchical and coordination mechanisms, in dynamic environments."

A couple of factors come together here, which are not unique but fairly strong marked in the European context:

- The existence of "industrial districts" in a number of European regions (around Turin, Stuttgart etc.);
- Industrial policies by state actors on different levels (European, national, regional);
- The policy of OEM to avoid becoming dependent on "mega-suppliers", a publicly stated concern of OEMs;
- The potential of communication technology supporting network initiatives.

The development of regional and transnational networks is linked with restructuring processes of Multinationals. "The strategies and structure of Multinational Enterprises (MNEs) have changed over time. The establishments of stand-alone affiliates based on a specific territory, operating autonomously and duplicating activities represent old strategies. *At present an increasing number of MNEs are becoming integrated Europe-wide organisations*. They build, and operate through, production and subcontracting networks that span the whole of Europe … The progress in information and communication technologies (ICT) has made access to networks easier for all firms. Nevertheless, it remains true that *larger firms have more possibilities to build and participate in such networks throughout Europe.*

Policy that aims at retaining employment in SMEs needs to focus, therefore on local impediments to investment and on the difficulties of SMEs to build and to participate in European-wide networks.

- European industrial policies promote in their horizontal approach the development of regional and transregional technology clusters, aiming essentially at the strengthening of SME in the regional economy.
- New clusters are based on old experiences with already existing "industrial districts" in a number of European regions.

[1] Based on *Ulrich JÜRGENS,* Characteristics of the European Automotive System: Is there a Distinctive European Approach?, presentation at the 10th GERPISA colloquium, *6-8 June 2002 , Paris, France*

These cluster-based regional development strategies aim at a support of regional supply contributing also to the convergence of employment levels and incomes throughout Europe, but also aiming to keep a competitive manufacturing in Europe and to attract new investors. These regional development policies have been promoted in several European automotive regions by the development of regional technology networks, i.e. networking activities between SME clusters and technology poles.

Some samples of clustering from the European Regions

- Associazione Costruttori Italiani Macchine Attrezzature per Ceramica (ACIMAC), Italy
- Automotive Industry Computer Integrated Manufacturing Engineering (AICIME), Portugal
- Automobil Cluster Oberöstereich, Austria (representing 169 enterprises)
- Automotive Cluster Styria, Austria (representing 220 enterprises)
- Agroupación Cluster Industrias Componentes Automoción Euskadi (ACICAE), Spain
- Verbundinitioative Automobil NRW, Germany/Northrhine-Westfalia
- Slovenski avtumobilski grozd GIZ ACS, Slovenia (representing 54 enterprises)
- Competence centre automotive region aachen/maas-rhein (car), Germany
- Automotive Industry Association, Czech Republic
- Autocluster France/Nord-Pas de Calais
- Welsh auto forum, set up 1998 as a collective body for the self-help of automotive suppliers, Great Britain/Wales

Regional networks are in general supported in the start-up phase by national or European funds. They provide to its members information and communication services, support of cooperation projects, support of qualification, support of internationalisation, Public Relations and marketing. Based on "best European practices", the European Commission Enterprise Directorate-General (2001) promotes a guideline for the promotion of regional networking and gives detailed information on the basic organizational principles for networks.

European policies aiming at the strengthening of SMEs might be a successful strategy as OEMs try to avoid to depend on "mega-suppliers". The profile of the new interrelationships between OEMs, First Tiers Suppliers and regional SMEs shall be illustrated by the example of the Automobile Cluster (AC) of Upper-Austria, which seems to be one of the most successful.

AC describes itself as the largest cross-industry automotive network of Austria. It is aiming at strengthening the international competitiveness, innovativeness and cooperation of its partnering firms, in particular SMEs. It is being supported by the EU and Austrian funds (Zukunftsfonds des Landes Oberösterreich; with money coming from privatisation of state companies). It is a branch of a regional development and marketing firm (cf. www.automobil-cluster.at).

Support activities provided by an AC team come in five areas:

- Information and communication: a data bank of the AC partner teams, information on network activities, plant visits, etc.;
- Qualification: various activities for further education, workshops, inter-company learning, study tours, etc.;
- Cooperation: cooperation projects between firms and technology transfer institutions;
- Marketing and PR: information material, fares, presentation of partner companies at OEM and tier 1 companies;
- Internationalisation support: networking with foreign automobile initiatives; response to requests of foreign companies concerning cluster firms, etc.;
- Support of cooperation projects encompassing at minimum three AC partners concerning costs for personnel, external services and other.

Austrian and Slovenian Autoclusters

Slovenian Automobile Cluster (**http://www.acs-giz.si/ang/members.html**) was established at the end of **2001**.

The cluster has 35 Partner companies with yearly turnover of € 700 million and is managing many innovative projects.

The cooperation with the Austrian Automobile Cluster has just begun and at the present a background document on cooperation options is under preparation with an intention to have it presented at a conference during the spring of 2004.

The cooperation with the ACstyria Autocluster seems to be in a more advanced stage with the Slovenian side presenting its products at international cooperation exchange PAVE 2003 in Graz. It seems that the Slovenian Automobile Cluster has found many complementaries with the Microelectronics cluster in Villach. There is also active cross border cooperation under the auspices of INTEREG and other regional and EU programmes. First contacts have been made with the auto cluster in Brno, Czech Republic. In the past it has been claimed that in Slovenia the clusters are seen as instruments of the economic policy aiming at improvement of the innovation capacities of the partner companies. In this sense the involvement of the Universities has been the main impulse to the creativity creation and, subsequently to the improvement of the innovation potential. With the opening of the communication chancels to the European, and specifically to the Austrian, clusters this puristic approach is changing in favor to more networking with the possible partners so that the comparative advantages can be demonstrated and the quality standards but also the cooperation modalities are negotiated interactively.

Austrian Automobile Cluster: (http://www.automobil-cluster.at)

- 300 Partners in the Network: With more than 300 Partner companies is the Automobile Cluster the bigger Austrian Network
- Turnover and Work Force: The total of 81.000 employees are producing a turnover of more that 16,2 Billion Euro. From these € 7 Billion are related to the automotive production.
- Export- and R&D-Quote: With 3.07 Percent the R&D-Quote of the partner companies is higher than the average in the branch. Around 58 percent of the products and services are being exported.
- Top-Partner Companies with the highest share in the turnover are: BMW Motoren GmbH, MAN Steyr AG, voestalpine Stahl GmbH, Rosenbauer International AG, AVL List GmbH and Bombardier-Rotax GmbH.

Automotive Cluster Vienna Region (ACVR) - www.acvr.at - is claiming 54 partner companies. The main regional cooperation venues are with the Hungarian auto cluster PANAG (INTEREG III A project) and the seminar on "The suppliers strategies of VW Slovakia" as well as join R&D work with Slovakian SME within the Austrian financed STRAPAMO programme.

ACstyria Autocluster GmbH,(http://www.acstyria.com/default2.htm)

The AC Styria has 185 partner firms (with value-impulse package) and is in contact with further 250 interested companies. At present around 30.000 directly employed are producing an output worth more than € 3.5 billion. In 1996, after the privatization, five companies and two public institutions formed the center of the cluster. Within three years, the Autocluster developed into an irreplaceable instrument in the automotive business. The AC Styria regards it as its mission to; foster the Public-Private-Partnership (collaboration of public, political and economical actors to secure the economic chain of value added), to supply a communication and information platform for all partners of AC Styria, to enhance networking, to foster technology- and knowledge-transfer and to initiate future-oriented education and further training programs. Among the leading partner firms in the AC Styria are: Magna (supplier); AVL (technology services);. Krenhof Industrieprodukte (supplier);. TCM (industrial near services);. Agiplan (consultant); . Lear Corporation (supplier); Austria Mikro Systeme (supplier) and SFG (publicity)

ACstyria Autocluster is very actively organising promotional events, e.g., at international cooperation exchange *Automobilforum 2003*[2] in Graz and is part of (i) the EU supported Network with 250 Partner organisations, (2) of the APS - European Programmes for Technologies & Training, (3) the CLUB for International Project management and many other regional and/or international initiatives**.** Furthermore AC Styria cluster actively supports training measures and workforce qualification enhancement of its

[2] The east European companies were granted 40% reduction of the exhibition fees.

member companies through the development of the automotive training platform www.qualification.at and through price-reduced training sessions and seminars.

Austrian Automotive Association Service GmbH, (http://www.aaa.or.at/), established 2003 is located in the premises of the Austrian Chamber of Commerce as a service organisation to the Austrian automotive sector. This positioning can be seen from the ownership structure: 49% owned by the Chamber of Commerce and "Fachverbände der Metallwarenindustrie"; equal shares of 17% by the ACstyria Autocluster, the Upper Austrian Technology and Marketing Association as well as by the Vienna Region**.**

As a result of the current accession process of the Central and Eastern European Countries (CEEC), ~~the~~ Austria has positioned itself in the geographical centre of the accession candidate countries. On the basis of this central position the Austrian Federal Ministry of Economics and Labour has launched the S T R A P A M O (Formation of Strategic S&T Partnerships with Central and Eastern Europe) regional cooperation programme supported by allocation of grants up to € 100.000 to specific projects.

One of these projects is the "Automotive Toolnet Alpe Adria" with its goal to create a cooperation axis between the Autocluster centred in Graz – and the one in the Slovenian Celje. The main issues are improvement of the Customers – Supplier relations, as well as the identification of the cooperation potential in production/marketing, R&D, and training.

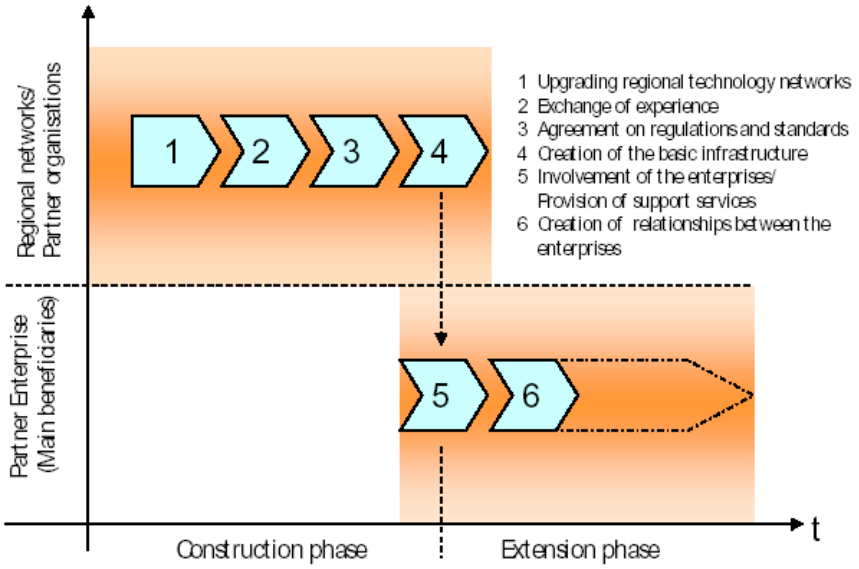
The AC – Upper Austria may be a particularly well-run and successful cluster but it stands here for various cluster activities in other European regions. While it reflects efforts of regional development in the case of Upper Austria in the past it has been seen as an attempt to prevent business going to middle-eastern countries with much lower wages. This may be changing – recently an Upper Austria delegation visited the Slovenian partners and agreed on a study on cooperation possibilities- followed by a conference this spring (2004). Also as the demands for outsourcing grow the World Wide Web has been called upon to serve as system integrator by offering the suppliers opportunities for market screenings and contacts. This is being done under the umbrella of the EU research project Multi Agent Business Environment (MaBE) aiming at enlarging the list of suppliers by providing a standardized questioner allowing for software based evaluation of the offers. The system is specifically oriented to the partner companies but can easily be extended to include the neighboring countries and regions where the quality control is easier and the transportation costs are lower. (Automotive Clusters quarterly, issue 3, 2003).

Sequencing in establishment of transnational networks and the actors and relationships for Auto clusters development

The general venue to cooperation basically is following the sequencing of the establishing of a transnational technology network, as shown below. For example the Austrian STRAPAMO initiative is covering the steps one to four while the next level should be the result of the mutual trust and understanding of the complementaries created during the first stage which are linked to the actors and relationships needed for car development.

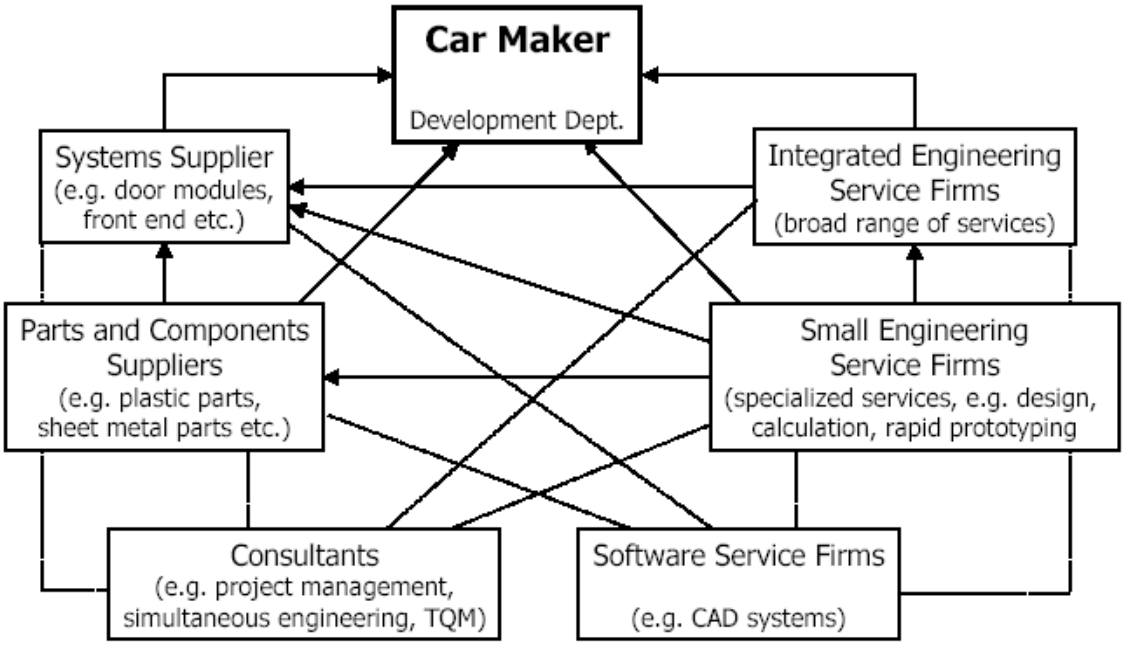
And there are already some eexamples of cross border cooperation between regional clusters:

- Glass cluster in Upper Austria (A), Bavaria (D) and Bohemia (Czech Republic).
- Textile cluster in Lower Austria (A) and Bohemia (Czech Republic).
- Technical cluster in Styria (A) and Slovenia.



Sequencing of the establishment of a transnational technology network

Network for car development (actors and relationships)


Car Maker
Development Dept.
Systems Supplier
(e.g. door modules, front end etc.)
Integrated Engineering Service Firms
(broad range of services)
Parts and Components Suppliers
(e.g. plastic parts, sheet metal parts etc.)
Small Engineering Service Firms
(specialized services, e.g. design, calculation, rapid prototyping
Consultants
(e.g. project management, simultaneous engineering, TQM)
Software Service Firms
(e.g. CAD systems)

II. Incorporating the Automobile Industry in an Input-Output Framework

From the point of view of input-output analysis a vector of inputs to this industry and a vector of distribution of cars to the various industries that constitute the economy in its totality characterize the automotive industry. The special advantage of I-O analysis lies in the fact that it allows for a closer look at the changes in all sectors induced by some shock in one sector[3], e.g. the automotive industry. In this chapter this analysis will be demonstrated only formally, without inserting specific empirically observable numbers, to arrive at some general characteristics. In particular the time paths induced by a sudden negative and a sudden positive shock in one sector will be discussed. The rationale behind a public sector policy intervention is analysed and effects on overall output and employment are derived to make hidden assumptions visible.

Assume that there are two countries both producing in the automotive sector, and both described by a highly aggregated input-output matrix[4]. More specifically, consider the following collapsed representation of the input output structure of each country:

$$\begin{array}{cccccc}
\alpha_{11} & \alpha_{12} & 0 & c_1 & i_1 & g_1 \\
\alpha_{21} & \alpha_{22} & \alpha_{23} & c_2 & i_2 & g_2 \\
\alpha_{31} & \alpha_{32} & \alpha_{33} & c_3 & i_3 & g_3 \\
\omega_1 & \omega_2 & \omega_3 & & & \\
\tau_1 & \tau_2 & \tau_3 & & & \\
\pi_1 & \pi_2 & \pi_3 & & &
\end{array}$$

The elements α in this structure describe the intermediate flow matrix as usual in input-output analysis, i.e. element α_{ij} is the amount of money expended (yearly) for intermediate input j in the production process of commodity i. The sectors 1, 2 and 3 of the economy are specifically aggregated: Sector 3 is the automotive industry, sector 2 is the aggregate of all those sectors that enter as intermediate inputs into sector 3, and sector 1 aggregates everything that is not in sector 2 or 3.

The value added part below the intermediate flow matrix consists of wages ω, profits π, and net taxes τ for each of the sectors. Net taxes are defined as taxes minus subsidies, σ. An increase in subsidies that implies a fall in net taxes τ.

The final demand part to the right of the intermediate flow matrix consists as usual of private consumption c, investment i and government consumption g for each sector.

[3] The structural evolution within this industry still is a matter of hot debate, compare [14].

[4] The changing geographical pattern of the industry has been recently studied by Lung, compare [15].

It is evident that for the analysis of the interaction between two exogenous sources of subsidies and two interacting countries such a sectoral model of a closed economy must be transformed in an open economy model. So let us assume that this can be done by simple adding a vector net exports n (exports minus imports for each sector) to the final demand block. Furthermore, to distinguish between country A and country S let us use superscripts for all variables.

In each column i total cost for intermediate inputs plus value added (wages, net taxes and profits) adds up to gross output value x_i. Just add this last row vector below the value added block.

The flow matrix for country A now looks as follows

$$\begin{array}{ccccccc}
\alpha^A_{11} & \alpha^A_{12} & 0 & c^A_1 & i^A_1 & g^A_1 & n^A_1 \\
\alpha^A_{21} & \alpha^A_{22} & \alpha^A_{23} & c^A_2 & i^A_2 & g^A_2 & n^A_2 \\
\alpha^A_{31} & \alpha^A_{32} & \alpha^A_{33} & c^A_3 & i^A_3 & g^A_3 & n^A_3 \\
\omega^A_1 & \omega^A_2 & \omega^A_3 & & & & \\
\tau^A_1 & \tau^A_2 & \tau^A_3 & & & & \\
\pi^A_1 & \pi^A_2 & \pi^A_3 & & & & \\
x^A_1 & x^A_2 & x^A_4 & & & &
\end{array}$$

For country S the same type of input-output flows can be constructed. Next consider some typical conclusions derived in I-O analysis.

Since profits are defined as residuals, in both regions the profit rate for each sector i is

$$r_i = \frac{\pi_i}{K_i} = \frac{x_i - \omega_i - \tau_i - \sum_j \alpha_{ji}}{K_i} ,$$

with K_i denoting the capital stock of this sector. Using the equality of gross output in rows and columns in each sector gives

$$\begin{aligned}
\pi_1 &= c_1 + i_1 + g_1 + n_1 + \alpha_{12} - \alpha_{21} - \alpha_{31} - \omega_1 - \tau_1 \\
\pi_2 &= c_2 + i_2 + g_2 + n_2 + \alpha_{21} + \alpha_{23} - \alpha_{12} - \alpha_{32} - \omega_2 - \tau_2 \\
\pi_3 &= c_3 + i_3 + g_3 + n_3 + \alpha_{31} + \alpha_{32} - \alpha_{23} - \omega_2 - \tau_2
\end{aligned}$$

Now add some dynamics. The simplest starting point is to assume that all flows in each countries flow matrix grow the same constant rate, γ^A and γ^S respectively. This growth regime traditionally has been called Cassel's uniform growth model. If profit rates of the different sectors were close enough to each other to make capital flows between them unlikely since transaction cost are expected to be higher, then capital stocks in each country and each sector j per definition grow at the rates

$$K_{j,t} = K_{j,t-1} + i_{j,t} - \delta_{j,t} = K_{j,t-1} + (1+\gamma)\cdot(i_{j,t-1} - \delta_{j,t-1}),$$

with $\delta_{j,t}$ denoting depreciation.

Note that in an input-output framework the vector of the newly invested capital goods of a sector is added to the respective column of the underlying capital equipment matrix and as such has to be distinguished from the investment demand for the products of this sector which appears as an element of final demand. Of course, total final demand for investment per sector is the sum of the sectoral demands:

$$\begin{aligned} i_1 &= i_{1,1} + i_{1,2} + i_{1,3} \\ i_2 &= i_{2,1} + i_{2,2} + i_{2,3} \\ i_3 &= i_{3,1} + i_{3,2} + i_{3,3} \end{aligned}$$

The variable $i_{1,2}$, for example, is the amount of investment goods produced by sector 1 and bought by sector 2 to augment the capital stock of sector 2. Note that while the break-up of the economy has been chosen in a way that allows to distinguish all industries that do not deliver any intermediate inputs to the automotive industry (sector 1), this does not imply that investment in the capital stock of sector 3 must not come from sector 1.

The developments of profit rates now follow the paths:

$$\begin{aligned} r_{1,t} &= \frac{\pi_{1,t}}{K_{1,t}} = \frac{c_{1,t} + i_{1,t} + g_{1,t} + n_{1,t} + \alpha_{12,t} - \alpha_{21,t} - \alpha_{31,t} - \omega_{1,t} - \tau_{1,t}}{K_{1,t-1} + i_{1,1,t} + i_{2,1,t} + i_{3,1,t} - \delta_{1,t}} \\ r_{2,t} &= \frac{\pi_{2,t}}{K_{2,t}} = \frac{c_{2,t} + i_{2,t} + g_{2,t} + n_{2,t} + \alpha_{21,t} + \alpha_{23,t} - \alpha_{12,t} - \alpha_{32,t} - \omega_{2,t} - \tau_{2,t}}{K_{2,t-1} + i_{1,2,t} + i_{2,2,t} + i_{3,2,t} - \delta_{2,t}} \\ r_{3,t} &= \frac{\pi_{3,t}}{K_{3,t}} = \frac{c_{3,t} + i_{3,t} + g_{3,t} + n_{3,t} + \alpha_{31,t} + \alpha_{32,t} - \alpha_{23,t} - \omega_{3,t} - \tau_{3,t}}{K_{3,t-1} + i_{1,3,t} + i_{2,3,t} + i_{3,3,t} - \delta_{3,t}} \end{aligned}$$

It is clear that while the nominators (under the assumption of uniform growth and no technological change) will increase at a rate of γ, the denominators still might follow quite different trajectories.

At this point of the argument the role of ***entrepreneurs*** becomes visible. In search for higher profit rates they either transfer capital between sectors[5], or try to influence the variables in the sector where they are active. In the latter case some typical actions can be summarized as:

(1) innovation policies to change intermediate input flows (hurting or favouring entrepreneurs in other sectors)
(2) innovation policies to change labour inputs (hurting or favouring different types of employees)
(3) wage reductions (hurting employees)
(4) reducing net tax (tax minus subsidies) payments (hurting government incomes)
(5) increasing domestic demand (hurting final demand for other sectors output)
(6) increasing foreign demand (eventually hurting domestic households' purchasing power by falling exchange rates)

While policies (1) and (2) provide a lasting rise in productivity, and thus constitute the major contribution of entrepreneurs to social progress, policies (3) and (4) might lead to prisoners' dilemma situations leading to deteriorating aggregate demand and insufficient infrastructure[6]. A judgement on policy (5) necessarily will be rather ambiguous, and usually is avoided by economists. Advertisements and marketing activities do develop the utility space of consumers, thus enabling utilities – and the sale of innovative products – that nobody dreamt of a decade ago. But the long-run social progress invoked by these innovations in many cases is rather questionable. Conquering foreign markets, policy (6), typically is an activity closely linked to national monetary policy and exchange rate policy. We will come back to this brief characterisation of the classical entrepreneur later.

Assume now that a shock in the form of an additional subsidy for investment in the automotive industry, sector 3, in region S appears. In the IO-framework such a shock at time t will first appear as a decrease of net tax $\tau_{3,t}^{S}$, and an immediate increase in $r_{3,t}^{S}$. Since additional profits will at least partly have to be spent on additional investment, this will lead to an increase (measured by vector u) in investment demand from sector 3 in time $t+1$:

[5] Note that this important part of the characteristic of entrepreneurs cannot be described by equilibrium models that assume a uniform profit rate in all sectors.
[6] The role of political institutions, e.g. the nation state, in an economic context consists of providing infrastructure (education, science, transport, utilities, …) that usually is pivotal for any entrepreneurial activity, but is itself not suitable for private enterprises. As a matter of fact, the share of infrastructure in gross output of industrialized countries after World War 2 has a rising tendency.

$$i^S_{1,t+1} = (1+\gamma^S)\cdot i^S_{1,t} + u_1$$
$$i^S_{2,t+1} = (1+\gamma^S)\cdot i^S_{2,t} + u_2$$
$$i^S_{3,t+1} = (1+\gamma^S)\cdot i^S_{3,t} + u_3$$

This development then in turn translates into an increase in profit rates *in all sectors*, which again is partly transformed into additional investment in time $t+2$. Indeed, this is just an example of the usual accelerator process generating additional income and growth.

Since in $t+1$ gross output in each sector did rise due to additional final investment demand from sector 3, the part invested further in $t+2$ must be smaller. Let it be denoted as

$$\begin{matrix} u_{11} & u_{12} & u_{13} \\ u_{21} & u_{22} & u_{23} \\ u_{31} & u_{32} & u_{33} \end{matrix}$$

Element u_{21} for example would be the additional investment demand for goods of sector 2 spent by sector 1 in period $t+2$ due to additional profits earned in period $t+1$, which in turn were initiated by additional profits in sector 3 at time t. Assume further that with this effect at $t+2$ the stimulus is exhausted.

Additional growth over the two years following the original subsidy payment to sector 3 can now be described for each sector as follows.

Table 1: Gross output growth

	t	$t+1$	$t+2$
Sector 1	x_{1t}	$x_{1t}\cdot(1+\gamma)+u_1$	$x_{1t}\cdot(1+\gamma)^2+u_1\cdot(1+\gamma)+\sum_j u_{1j}$
Sector 2	x_{2t}	$x_{2t}\cdot(1+\gamma)+u_2$	$x_{2t}\cdot(1+\gamma)^2+u_2\cdot(1+\gamma)+\sum_j u_{2j}$
Sector 3	x_{3t}	$x_{3t}\cdot(1+\gamma)+u_3$	$x_{3t}\cdot(1+\gamma)^2+u_3\cdot(1+\gamma)+\sum_j u_{3j}$
total	$\sum_i x_{it}$	$(1+\gamma)\cdot\sum_i x_{it}+\sum_i u_i$	$(1+\gamma)^2\cdot\sum_i x_{it}+(1+\gamma)\cdot\sum_i u_i+\sum_i\sum_j u_{ij}$

Remember now that the original subsidy in sector 3, call it Δs, will be larger than the part of it that actually is spent for additional investment, $\Delta s_3 > \sum_i u_i$. Some investment that would have been done anyway will now be financed by the subsidy. Furthermore, by the same argument, $\sum_i u_i > \sum_i \sum_j u_{ij}$, which shows that this is a damped reaction on the initial shock, the strength of dampening depending on the propensity to invest out of additional profits. As standard macroeconomics holds, this propensity crucially depends on interest rates and expected growth rates of demand. With permanently low interest rates and an accelerating growth rate of gross output some additional growth thus can be assumed to come from a change in this propensity. But if a less damped development can be observed in the first two periods due to more optimistic expectations, it is also clear that dampening strikes heavy and suddenly as soon as these expectations are disappointed. To stop the process after period 2 therefore is not only a matter of algebraic convenience but also can be interpreted economically[7].

The rationale for an initial subsidy

It now is easy to show on which assumptions an initial subsidy $\Delta s^S{}_3$ in region S is based. If a subsidy in region S leads to an outflow of capital in region A, then what has been said for S above happens for region A too, but now with a negative sign, $\Delta s^S{}_3 = -\Delta s^A{}_3$. All the effects discussed for positive values of u can be given superscript S in region S and for negative values of u superscript A for region A.

If economic policy aims at overall economic growth, then providing such a subsidy for region S must be based on the assumption that the overall growth rate after some time (e.g. two periods) will be higher than it would have been without it. The expression

$$[(1+\gamma^S)^2 \cdot \sum_i x^S{}_{it} + (1+\gamma^S) \cdot \sum_i u^S{}_i + \sum_i \sum_j u^S{}_{ij}] + [(1+\gamma^A)^2 \cdot \sum_i x^A{}_{it} + (1+\gamma^A) \cdot \sum_i u^A{}_i + \sum_i \sum_j u^A{}_{ij}]$$

must have been assumed to be greater than

$$[(1+\gamma^S)^2 \cdot \sum_i x^S{}_{it}] + [(1+\gamma^A)^2 \cdot \sum_i x^A{}_{it}].$$

[7] The effects on GDP growth in Europe during German reunification followed a similar pattern and stimulated this interpretation.

Simplifying yields

$$[(1+\gamma^S)\cdot\sum_i u^S{}_i + \sum_i\sum_j u^S{}_{ij}] + [(1+\gamma^A)\cdot\sum_i u^A{}_i + \sum_i\sum_j u^A{}_{ij}] = \Delta X > \mathbf{0}$$

As can be seen immediately, two sorts of argument for this inequality to hold can be brought forward. On the one hand, if region S is thought to have an intrinsic growth rate γ^S that is (at least in the mid-run) substantially higher than the growth rate of region A, γ^A, then it is very likely that the overall effect ΔX will be positive. On the other hand asymmetric reactions to investment shocks, i.e. lower absolute values of $u^A{}_i$ and $u^A{}_{ij}$ as compared to the corresponding variables in region S would also help to make ΔX positive. It is indeed hard to reduce investment below a certain level, not to speak of getting rid of an existing capital stock, i.e. negative net investment.

If, based on these expectations, such a policy is initiated and overall growth is enhanced, this then is equivalent to an acceleration of a process typically observed in the course of transformation of new accession countries: capital export. As an immediate consequence capital export will lead to a decrease of employment in region A and an increase of employment in region S. The overall effect, due to a positive ΔX but reduced by some technological unemployment effect of new capital, might still be positive. So even if not only growth, but also employment is on the agenda of central policy makers, the initiative can make sense.

From a fiscal point of view it is clear that taxes derived from higher overall GDP must exceed the money spent initially. Again a low interest rate helps to meet this requirement.

III. The Strategic Dimension

Once the decision for an initialisation of capital flows by means of an investment subsidy has been made, the question of remaining options for regional policy makers and entrepreneurs becomes urgent. As demonstrated above, local growth impediments and unemployment in region A are likely to be immediate effects. The problem for region A therefore consists of how to transform an overall positive effect ΔX into a remedy to the direct losses it will suffer from.

First, the usefulness of direct intervention at the central policy making institution to revise its decision has to be excluded. Not only for reasons of pragmatic difficulties, but also for being economically unwise – international division of labour makes sense and in the end, with appropriate distribution mechanisms, can lead to benefits for all. But with this assumption the central institution disappears as a strategic player. It sets its decision and the remaining players are the two local governments and the group of entrepreneurs.
Start with ***region A*** and consider the following ***three policy options***. One possible policy option consists of ***direct measures*** to keep local entrepreneurs in region A, despite higher profit rates in region S, call these policies p_d^A. Recall that the profit rate could be expressed as

$$r_{3,t} = \frac{\pi_{3,t}}{K_{3,t}} = \frac{c_{3,t} + i_{3,t} + g_{3,t} + n_{3,t} + \alpha_{31,t} + \alpha_{32,t} - \alpha_{23,t} - \omega_{3,t} - \tau_{3,t}}{K_{3,t-1} + i_{1,3,t} + i_{2,3,t} + i_{3,3,t} - \delta_{3,t}}$$

and that the difference between regions was due to a lower $\tau_{3t}^S = \tau_{3t}^A - \Delta s^s{}_3$. To counteract against this threat immediately, region A must be prepared to spend at least the same amount as the proposed subsidy to region S, and it can do so by any combination of direct local expenditure for automotive equipment $g^A{}_{3,t}$, net tax reduction $\tau^A{}_{3,t}$, or influence on wages $\omega^A{}_{3,t}$. Of course, the latter implies that active incomes policy via institutionalised wage bargaining is feasible.
But assume for a moment that policy p_D^A is successfully chosen at time t and entrepreneurs stay in region A. What happens in the next period? The attraction of region S has not vanished, and as a matter of fact, neither region S nor the central institution has so far had any expenditure! Entrepreneurs being aware of this know already in period t that the growth prospects of sector 3 in region S would be as given above,

$$x^S{}_{3t} \cdot (1+\gamma^S)^2 + u^S{}_3 \cdot (1+\gamma^S) + \sum_j u^S{}_{3j}$$

and region A would have to compensate them with an amount corresponding to the difference to the overall prospects in region A. In other words, the cost of strategy p_D^A would be rather high and its success would be to retain the status quo.

A second possibility for region A would be to ***do nothing***, i.e. leave all flows on their intrinsic growth paths, call this policy p_N^A.

Finally let us sketch a third set of policies, named ***flexible response policies*** p_F^A. This set of policies typically looks at future developments in the flows in region S due to the investment shock – and tries to exploit them. E.g. anticipating a shortage in sector k in region S due to increased demand in its automotive sector should lead to enforced exports from A to S of product k. As a consequence net exports and final demand in region A will increase and part of the welfare (growth and employment) will flow back from region S to region A. Building such policies on anticipated human capital shortages is just a further example. Typically flexible response policies need time to lead to substantial effects, the relevant welfare measures will suffer from J-curve effects. But contrary to direct measures, their impact will be lasting.

Taking a look at possible options of ***region S*** reveals that there policies are probably less urgent and thus less sophisticated. The region is favoured by the central institution anyway and at the same time usually has a tighter budget to be spent on local policy.

In region S we distinguish ***two policies***. Policy one again consists of laisser faire, ***doing nothing***, and is labelled p_N^S. The other policy consists of fighting an anticipated direct measures policy p_D^A of region A, it therefore is also a ***direct measures policy***, named p_D^S. Compared to region A the direct measures policy of region S is cheap. It only has to top the efforts of region A by a small but visible amount to attract entrepreneurs despite the efforts of region A. But if this policy coincides with one of the other two policies chosen by region A then it appears to be particularly useless.

Finally turn to the ***entrepreneurs***. Typically their choice consists of taking ***more risky higher*** expected profit rates, or ***less risky lower profit rates***. Let us name the first choice p_H^E and the second choice p_L^E, and assume that they are sufficiently risk averse to stay in region A if direct measures are only taken by region A in period t.

Using these strategy sets the following simultaneous move game of three players in strategic form emerges:

p_L^E

	p_N^S	p_D^S
p_D^A	$z_1^{DNL}, z_2^{DNL}, z_3^{DNL}$	$z_1^{DDL}, z_2^{DDL}, z_3^{DDL}$
p_N^A	$z_1^{NNL}, z_2^{NNL}, z_3^{NNL}$	.
p_F^A	$z_1^{FNL}, z_2^{FNL}, z_3^{FNL}$	.

p_H^E

	p_N^S	p_D^S
p_D^A	$z_1^{DNH}, z_2^{DNH}, z_3^{DNH}$	$z_1^{DDH}, z_2^{DDH}, z_3^{DDH}$
p_N^A	.	.
p_F^A	.	.

Of course, the payoffs should be approximated by empirical work along this theoretical treatment. But as our choice of the strategy set for region A already reveals, we strongly suggest that flexible response should be the best strategy for most plausible parameter constellations.

If region A chooses flexible response, then entrepreneurs in sector 3, anticipating this will choose the high risk strategy, and region S anticipating both will choose to do nothing. This strategy triple looks quite stable and might be a Nash equilibrium. Neither of the players seems to have an incentive to change its strategy once it is chosen.

A second, less optimistic dynamics might follow if entrepreneurs are assumed to play mixed strategies. That is, one part of them chooses the risky jump to region S while the other one stays in region A. Given a larger spread of risk attitudes this could be their best answer to a subsidy race between the two regions. While this eventually might be a superior outcome for firms in the mid-run it probably is sub-optimal with respect to welfare measures.

A third possibility consists of the just mentioned mixed reaction of entrepreneurs, but now interpreted as partial ignorance. In that case expenditure of region S might not help, and could be saved. For region A ignorance or a short time horizon could also lead to the choice of doing nothing. Of course, this interpretation implies a different, more complicated game with bounded rationality.

IV. Some Empirical Results for the Austrian-Slovenian Automotive Cluster

To get an idea about the absolute values involved it is interesting to insert some rough estimates of the respective entries of the I-O flow table used above as they appear in the cluster in Styria and Slovenia.

Austria *(actual figures will be inserted in the next version)*

$$\begin{array}{ccccccc}
\alpha^A_{11} & \alpha^A_{12} & 0 & c^A_1 & i^A_1 & g^A_1 & n^A_1 \\
\alpha^A_{21} & \alpha^A_{22} & \alpha^A_{23} & c^A_2 & i^A_2 & g^A_2 & n^A_2 \\
\alpha^A_{31} & \alpha^A_{32} & \alpha^A_{33} & c^A_3 & i^A_3 & g^A_3 & n^A_3 \\
\omega^A_1 & \omega^A_2 & \omega^A_3 & & & & \\
\tau^A_1 & \tau^A_2 & \tau^A_3 & & & & \\
\pi^A_1 & \pi^A_2 & \pi^A_3 & & & & \\
x^A_1 & x^A_2 & x^A_4 & & & &
\end{array}$$

Slovenia *(actual figures will be inserted in the next version)*

$$\begin{array}{ccccccc}
\alpha^S_{11} & \alpha^S_{12} & 0 & c^S_1 & i^S_1 & g^S_1 & n^S_1 \\
\alpha^S_{21} & \alpha^S_{22} & \alpha^S_{23} & c^S_2 & i^S_2 & g^S_2 & n^S_2 \\
\alpha^S_{31} & \alpha^S_{32} & \alpha^S_{33} & c^S_3 & i^S_3 & g^S_3 & n^S_3 \\
\omega^S_1 & \omega^S_2 & \omega^S_3 & & & & \\
\tau^S_1 & \tau^S_2 & \tau^S_3 & & & & \\
\pi^S_1 & \pi^S_2 & \pi^S_3 & & & & \\
x^S_1 & x^S_2 & x^S_4 & & & &
\end{array}$$

Next, assuming that the European Union will subsidize 40% of every investment in the automotive sector in Slovenia and that therefore every new investment in this sector in Austria (excluding replacement investment) will go to Slovenia gives a rough estimate for s_3^S . Assuming further that the dampening effect is about 70% leads to an approximation for ΔX , namely … €. *(actual figures will be inserted in the next version)*

The entries in the strategic form of the policy game are even harder to approximate. Extensive and detailed empirical work would be needed, a treatment of these questions clearly goes beyond the scope of this paper[8].

[8] Indeed important work in that direction is already on its way, see [16].

SUMMARY and CONCLUSIONS

In this paper we have shown the history, the typical activities and the place of the Austrian and Slovenian clusters in the European Autoclusters network and specifically in the Central European context.
Both the governmentally supported and the entrepreneurial initiatives do have their place in creating a productive cooperative environment in the region – which is on its own a win - win process for all participating parties.

By comparing the developments it became clear that cluster development is a pragmatic and profit oriented process of trust building with the purpose of using the comparative advantages of the each side in order to minimise technological and commercial risks both in the R&D phase as well as in the marketing processes.

Given the active interest in the identification of both complementarities and the comparative advantages we developed a rather simple sectoral model that can be used to derive policy recommendations for regional policy makers. The results of this theoretical framework appear to be situated on several levels:

- At many steps of our argument it became evident that additional empirical data would be necessary even to guide the theoretical modelling process. Not only figures appear to be important, there is also need for institutional detail.
- The role of economic agents seems to be changing dramatically. This not only concerns the often mentioned demise of the nation state. In particular what traditionally has been considered as a driving force of productivity, the heroic figure of the entrepreneur, has not only been completely ignored by mainstream economic theory, it also is hard to disentangle from macro-political and institutional processes in recent real economic dynamics. Its characteristics have to be re-framed and anchored in contemporary social forms.
- Even on the somewhat vague surface that we model important issues for consultancy can be formulated. The concept of ***flexible response policies*** waits to be developed in more detail by specialists for the empirical data at hand[9]. The same is true for strategic analysis by means of applied game theory. Not the least the use of game theorists' analysis to discover possible strategies, to make choice less bounded never should be forgotten.

[9] An interesting work on the interaction of public expenditure and international specialisation is done by Marius Brülhart and Federico Trionfetti [17].

Specifically the ongoing research on cooperation modalities between Upper Austrian and Slovenian clusters is positioned to fully benefit form the proposed methodological approach.

As with any work that just recognizes the comprehensiveness of the cooperation arrangement both in respect to the theoretical and the empirical work[10], we realize how much additional efforts are needed to make the approach practically useful to the decision makers in the field. This is an enormous task that still is ahead of us.

Nevertheless we hope to have stimulated others to join this quest.

[10] Building on non-linear extensions of I-O analysis has been a recent re-discovery of evolutionary economics, an outstanding contribution in this field comes from Hermann Schnabl [18].

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Annex: Some general trends of the European Auto Production

Automobile Production in the European Union (in units)

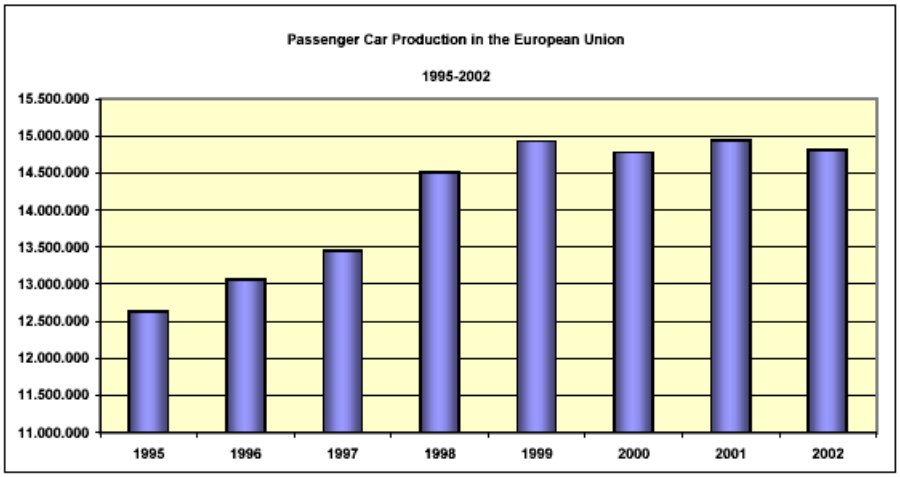
from 1995 - 2002

Units

	1995	1996	ch% 96/95	1997	ch% 97/96	1998	ch% 98/97	1999	ch% 99/98	2000	ch% 00/99	2001	ch% 01/00	2002	ch% 02/01
Passenger Cars	12.636.067	13.061.348	3,4%	13.451.272	3,0%	14.510.472	7,9%	14.933.470	2,9%	14.778.879	-1,0%	14.938.604	1,1%	14.810.460	-0,9%
Light Comm. Vehicles	1.318.462	1.393.245	5,7%	1.570.265	12,7%	1.675.315	6,7%	1.616.931	-3,5%	1.869.194	15,6%	1.765.922	-5,5%	1.646.391	-6,8%
Trucks	348.577	310.204	-11,0%	334.562	7,9%	379.094	13,3%	394.211	4,0%	400.373	1,6%	480.085	19,9%	454.498	-5,3%
Buses	30.519	32.001	4,9%	36.672	14,6%	35.397	-3,5%	33.788	-4,5%	35.376	4,7%	34.321	-3,0%	32.351	-5,7%
TOTAL	**14.333.625**	**14.796.798**	**3,2%**	**15.392.771**	**4,0%**	**16.600.278**	**7,8%**	**16.978.400**	**2,3%**	**17.083.822**	**0,6%**	**17.218.932**	**0,8%**	**16.943.700**	**-1,6%**

ACEA members represent a 95% of total European Production

Source: OICA Correspondents Survey



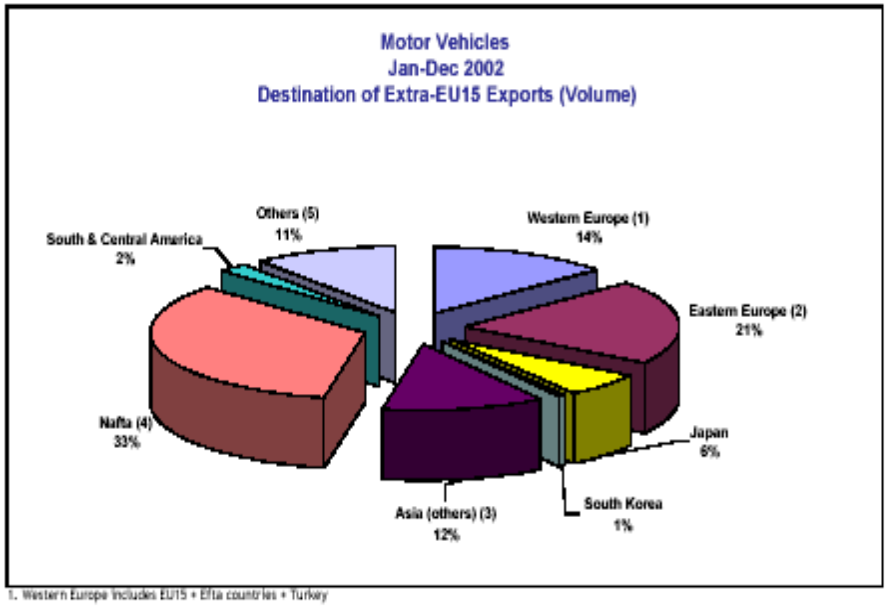
ACEA

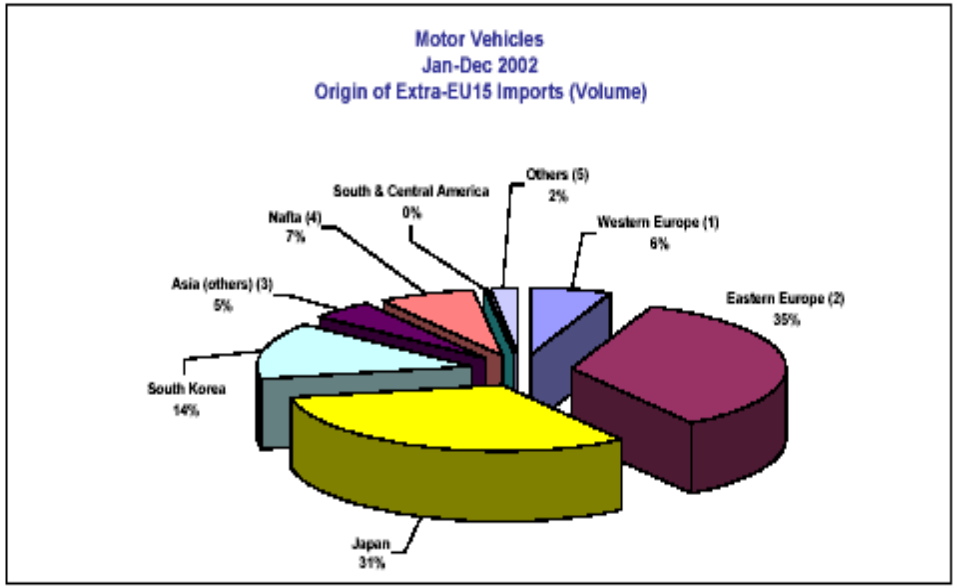
Automobile Trade *(in volume)*

From January to December : 1995-2002

	EU-15 Exports								EU-15 Imports								EU-15 Balance							
	1995	1996	1997	1998	1999	2000	2001*	2002*	1995	1996	1997	1998	1999	2000	2001*	2002*	1995	1996	1997	1998	1999	2000	2001*	2002*
Passenger Cars	2.254.616	2.369.562	2.311.082	2.341.296	2.211.605	2.128.893	2.761.582	3.084.781	1.420.923	1.551.450	1.939.615	2.358.484	2.545.143	1.598.463	2.336.005	2.431.083	833.693	818.112	371.467	-17.188	-333.540	530.430	425.577	653.698
Light Commercial Vehicles (up to 5t)	100.582	175.401	167.893	175.458	128.233	157.042	137.509	138.706	114.796	116.217	163.173	197.999	206.856	220.396	202.279	242.005	-14.208	59.184	4.720	-22.541	-78.619	-63.354	-64.770	-103.299
Trucks	62.989	50.584	61.517	64.432	48.199	63.709	77.077	81.845	3.524	2.570	4.082	3.728	3.460	4.647	4.540	5.080	59.465	48.008	57.435	60.705	44.699	59.059	72.537	76.765
Buses	3.791	6.044	7.943	6.650	4.049	7.122	7.698	4.599	377	526	934	1.282	2.193	2.520	2.424	3.101	3.414	5.518	7.009	5.368	1.856	4.602	5.273	1.498
Motor Vehicles	2.421.978	2.601.591	2.548.435	2.587.837	2.392.048	2.356.763	2.983.864	3.279.937	1.539.614	1.670.769	2.107.804	2.561.493	2.757.652	1.826.025	2.545.248	2.681.275	882.364	930.822	440.631	26.344	-365.604	530.738	438.616	598.662

* Figures for 2001 and 2002 exclude Greece





1. Western Europe includes EU15 + Efta countries + Turkey
2. Eastern Europe includes Russia (but not Turkey)
3. Asia (others) includes all Asian countries except Japan and South Korea
4. NAFTA includes US, Canada and Mexico
5. Others include Africa, Oceania and other small world wide regions not mentioned in any of the regions above stated

CSM GLOBAL PRODUCTION SUMMARY
BY COUNTRY (000) UNITS

Manufacturer	2001	2002	2003	2004	2005	2006	2007
North American Light Vehicle Production							
Canada	2,494	2,560	2,527	2,632	2,719	2,685	2,574
Mexico	1,810	1,762	1,625	1,642	1,837	2,315	2,437
United States	11,225	12,057	11,942	11,974	12,114	12,039	12,068
Total North American Production (Nov 2002)	***15,529***	***16,379***	***16,095***	***16,247***	***16,670***	***17,040***	***17,080***
European Light Vehicle Production							
Austria	131	112	106	205	214	231	233
Belgium	1,147	1,009	943	896	1,003	1,116	1,163
Czech Republic	452	427	428	409	613	695	767
Finland	42	33	23	27	28	29	30
France	3,564	3,637	3,606	3,609	3,636	3,444	3,462
Germany	5,061	4,822	4,864	5,071	5,163	5,310	5,226
Hungary	138	153	166	189	187	179	169
Italy	1,537	1,369	1,332	1,313	1,275	1,428	1,493
Netherlands	189	184	169	176	260	250	233
Norway	1	1	0	0	0	0	0
Poland	344	250	296	374	480	593	608
Portugal	177	184	186	161	105	200	203
Romania	66	56	53	95	105	105	92
Russia	1,045	1,029	1,082	1,097	1,165	1,204	1,240
Slovakia	193	242	251	266	260	261	258
Slovenia	116	109	92	89	117	175	161
Spain	2,778	2,618	2,800	2,906	2,880	2,787	2,868
Sweden	251	232	277	334	324	323	382
Turkey	247	285	349	525	631	631	708
UK	1,669	1,839	1,981	2,003	2,023	2,028	2,094
Ukraine	15	16	18	20	21	21	21
Yugoslavia	4	4	4	5	5	5	5
Total European Production (4Q 2002)	***19,167***	***18,610***	***19,027***	***19,771***	***20,495***	***21,016***	***21,414***
Total West Europe	*16,546*	*16,039*	*16,286*	*16,701*	*16,911*	*17,148*	*17,386*
Total East/Central Europe	*2,621*	*2,570*	*2,741*	*3,070*	*3,584*	*3,869*	*4,028*

CSM GLOBAL PRODUCTION SUMMARY
BY COUNTRY (000) UNITS

Manufacturer	2001	2002	2003	2004	2005	2006	2007
Japan/Korea Light Vehicle Production							
Japan	9,134	9,508	9,356	9,070	9,236	9,323	9,356
Korea	2,867	3,001	3,144	3,328	3,346	3,404	3,441
Total Japan/Korea Production (4Q 2002)	***12,001***	***12,509***	***12,501***	***12,398***	***12,582***	***12,728***	***12,796***
South America Light Vehicle Production							
Argentina	233	136	151	159	180	200	225
Brazil	1,707	1,703	1,866	2,015	2,169	2,310	2,412
Chile	6	6	7	10	6	5	5
Colombia	28	32	31	40	35	34	36
Uruguay	9	10	10	10	10	10	10
Venezuela	105	93	101	80	81	87	91
Total South America Production (4Q 2002)	***2,088***	***1,980***	***2,166***	***2,314***	***2,480***	***2,646***	***2,780***
Emerging Markets Light Vehicle Production							
Australia	362	359	378	411	426	436	438
China	1,901	2,442	2,768	3,090	3,425	3,705	3,975
India	728	765	812	848	898	956	1,005
Indonesia	230	253	247	262	298	318	324
Malaysia	416	465	399	445	479	497	517
Philippines	65	82	102	116	121	129	138
South Africa	369	380	392	411	423	458	496
Taiwan	260	306	309	307	342	362	363
Thailand	449	521	569	691	834	873	898
Total Emerging Markets Production (4Q 2002)	***4,780***	***5,574***	***5,977***	***6,582***	***7,247***	***7,733***	***8,153***
Total	***53,565***	***55,051***	***55,765***	***57,312***	***59,476***	***61,163***	***62,223***