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**The Impact of Competition
on Macroeconomic Performance**

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Abstract

This paper investigates the impact of the toughness of competition on the macroeconomic performance of countries. The relation between competition and innovation has been investigated intensely in industrial economics. It started with Schumpeter's hypotheses that monopoly profits were necessary for innovation, leading then to u-curve relationships where innovation was the highest for medium-range of competition, but lower for very tough competition as well as for a very lax competitive regime. Empirical studies on the growth differences between countries increasingly stress – apart from the usual suspects like investment, R&D, human capital – the role of institutions. They include indicators on regulation, government size, corruption and rule of law, but usually not the degree of competition. Conventional growth theory did not model the impact of competition, but assumed perfect competition. In New Growth Theory, economic growth depends on purposeful and maximizing innovation activities, where market structure plays an important role. But this did not result in the inclusion of competition variables into empirical growth equations.

We have attempted to bridge this gap a bit by relating thirteen indicators on the toughness of competition to macroeconomic performance. We then have added these competition indicators to an equation relating macro-performance to the standard explanatory variables for economic growth (like investment and R&D). The results indicate that competition plus innovation is a good recipe at the macro level too, probably with similar tensions and non-linearity as at the company level.

Karl Aiginger

The impact of competition on macroeconomic performance¹

1. Introduction and objective of the paper

The competition–innovation–performance triangle is investigated at the micro level from the days of *Schumpeter* to the works of *Aghion* today. This paper investigates the impact of the toughness of competition on the macroeconomic performance of countries. The relation between the degree of competition and a company's performance is at the heart of competition policy, and the relation between competition and innovation is discussed and investigated intensely in industrial economics. The impact of competition on innovation started with Schumpeter's hypotheses² that monopoly profits were necessary for innovation, leading then to u-curve relationships where innovation is largest for a medium-range degree of competition, but lower for very tough as well as for very lax competition. Empirical studies on the growth differences between countries increasingly stress the role of institutions³, but refer more often to regulation than to competition. Conventional macroeconomic growth models did not model the impact of competition, but assumed perfect competition. This changed in New Growth Theory, where growth depends on purposeful and maximizing activities for which competitive pressure plays an important role. However, this has not resulted – with very few exceptions (see *Griffith – Harrison (2004)* or *Salgado (2002)* – in the inclusion of competition variables into empirical growth equations.

We use a set of thirteen indicators on the toughness of competition. The set combines survey data from managers, but also from experts, with the data on the regulation of product markets being provided by the OECD. We have added "ex post indicators" on effective price-cost margins at the industry level and profit shares on the national level, and also added an indicator on the openness of countries to trade. As a special tribute to the work of Dennis Mueller, we also included an indicator on the persistence of profit hierarchies in about 100 three-digit industries between 1990 and 2000. For 14 EU member countries, we ranked price-cost margins at the start of the nineties, and then looked at how similar the hierarchies were one decade later. A high persistency of profit differences could be the outcome of technical factors, but high and persistent profits in a specific industry may also indicate market power, the abuse of a dominant position, low mobility or the lack of grip of the competition authorities.

¹ The author acknowledges research assistance by Dagmar Guttmann and critique of earlier versions by Michael Böheim, Martin Falk, Klaus Friesenbichler, Werner Hölzl, Michael Peneder, Andreas Reinstaller and Gunther Tichy.

² It is interesting to note that this point occurred specifically in his later papers.

³ *Rodrik (2000)* highlights five key institutions: property rights, regulatory institutions, macro stability, social insurance, and conflict management. He does not mention competition.

We then related the toughness of competition to economic performance. It is an innovation – following other papers of the author- , to define performance as a concept broader than economic growth. The performance evaluation also includes the employment rate (positively), unemployment (with negative impact), furthermore the dynamics of employment and unemployment and an indicator on the income distribution (with more equality as better performance of the socio-economic system). Measuring the impact of competition on macroeconomic performance is a rather new territory (albeit a very old question). We start from rather simple techniques (from descriptive statistics, correlations and single regressions). Due to the categorical character of many of the competition indicators (and extreme outliers in others), we prefer an ordinal ranking of countries and rely on rank correlations. This maybe a serious limitation, specifically in our final test. We estimate primitive stylized growth models in which performance depends on the starting level of income, investment ratio, human capital and innovation. Then we added the competition indicators to the best model. The surprisingly robust result is that the competition indicator by far outperforms the usual determinants of growth in our preferred model. This encouraging result could be the starting point for further research with more elaborate econometric techniques.

2. Competition: The impact in theory

The impact of regulation and innovation in empirical studies

The most elaborate literature exists on the impact of product market regulation on economic growth. This research profited heavily from the construction of indicators by OECD (*Nicoletti et al.*, 2000). The literature is developed, published and stimulated specifically in publications of the OECD (*Nicoletti – Scarpetta*, 2002, 2003) and in studies commissioned by the European Commission.

There are three channels through which product market regulation impacts growth: (i) competition, (ii) entry and exit and (iii) innovation. All three channels provide indirect links between product market regulation and growth – via the affect on the toughness of competition.

In theories, the link is established by the new growth theory and by industrial organization. The endogenous growth theory provides an increasing number of models that render endogenous the optimal level of innovation and make it dependant on structural variables. For theoretical reasons, but also because of their flexibility as a basis for empirical research, models of monopolistic competition dominate in endogenous growth theory.

The relationship between market concentration and growth stimulated by industrial organization dates back to the forties. Based on the insights gained from the theoretical model of perfect competition, it has been widely recognized that competition is an important force in achieving a better allocation of resources, providing incentives for the efficient organization of production, and pushing forward innovation activities.

Incentives for improved efficiency are provided by competition and can be divided into allocation efficiency, productive efficiency and dynamic efficiency (cf. *Armstrong, Cowan and Vickers* 1994). While the (positive) effects of product market reforms on macroeconomic

performance achieved through an increase in allocation and productive efficiency represent one-off changes to the level of output and productivity, improvements in dynamic efficiency through innovation are expected to have a much larger impact on long-term macroeconomic performance.

According to *Schumpeter* (1942), an atomistic firm operating in a perfectly competitive market may be a perfect vehicle for static resource allocation, but a large firm with substantial market power is the most powerful engine of progress and long-run expansion of total output. He identified two effects of market power on innovation. First, he argued that the expected ex-post market power, even though it would be transient, induces firms to have an incentive to innovate. If firms expected excessive rivalry after the innovation, they would have little incentive for innovation. Second, *Schumpeter* also argued that an ex-ante oligopolistic market structure and the possession of ex-ante market power are favorable to innovation. This is because it is easier for firms to predict rivals' behavior under an oligopolistic market structure and therefore there is less uncertainty of excessive rivalry. *Schumpeter* believed that profit from ex-ante market power could serve as a source of internal financial resources for innovation activity by implicitly assuming an imperfect capital market (cf. *Cohen and Levin, 1989*).

Market competition takes place as a "process of creative destruction" (*Schumpeter 1942*) and can be interpreted as a "search and discovery process" (*von Hayek 1968*). Competition as a perpetual search and discovery process ensures that producers are forced to continuously adapt their products to changing consumer preferences in order to keep their customers. Existing products and processes are challenged by innovations and will be driven out of the market if innovative products and processes fit customer needs better. In contrast to *Schumpeter's* view, a number of theoretical studies show that increased competition stimulates innovation activities. For instance, *Arrow (1962)* shows that innovating firms benefit more from innovations when competition is strong.

A series of studies in the tradition of principal-agent theory show that competition induces a firm to be more efficient by reducing its agency problems (*Hart, 1983, Nalebuff and Stiglitz, 1983, Mookerjee, 1984, Willig, 1987, Hermalin, 1992*).

Competition and innovation in new growth models

Aghion et al. (2001) demonstrate in a model with step-by-step innovation that competition has a positive effect on growth by pointing out that a technological leader in a more competitive industry earns higher profits relative to other firms in the industry. In this institutional setting, a strong motive for innovation and/or investment in R&D comes from the possibility to escape from competition with 'neck-to-neck' rivals ("escape-competition effect").

Empirical evidence for the assertion that competition forces firms to innovate and to be more efficient, thereby raising productivity and enhancing growth, is presented by *Nickell (1996)*, *Blundell et al. (1995)* and *Geroski (1990, 1995)*.

Porter (2000) found empirical evidence for both the intensity of local competition and the effectiveness of national antitrust policy⁴ having a positive relationship with the level as well as the growth rate of GDP per capita. The argument that more competition has a positive impact on growth is also confirmed by the fact that the OECD countries having started to deregulate network industries most ambitiously in the early 1990s, enjoyed the highest GDP growth per capita in the late 1990s.

By further exploring Schumpeter's basic propositions in the context of endogenous growth theory (e.g. *Aghion – Howitt* 1992, *Grossman – Helpman* 1991, *Romer* 1990), no compelling evidence for the negative trade-off between competition and growth was found. Schumpeter's results rather proved to be very sensitive to the underlying assumptions (cf. *Aghion – Howitt*, 1998).

In an attempt to "reconcile" both lines of argumentation, more recent research in the Schumpeterian tradition provides evidence that starting from a monopoly, competition enhances efficiency (only) until a certain level of market concentration is reached, while competition hampers efficiency if it is too intense. This non-monotonic relationship between competition and efficiency (or productivity and growth) is known in the literature as the 'Inverted U-Shape' hypothesis. According to *Aghion et al.* (2002), the relationship between product market competition and innovation is inverted U-shaped because at low levels of competition, the "escape-competition effect" tends to dominate, while the Schumpeterian effect tends to dominate at higher levels of competition.

Empirical evidence for the "inverted U" is presented in older literature, but also in recent studies (e.g. *Scherer*, 1967, *Scott*, 1984, *Levin et al.*, 1985, *Caves – Barton*, 1992, *Green and Mayes*, 1991, *Aghion et al.*, 2005, *Griffith – Harrison*, 2004). For less favourable evidence on the impact of product market competition on innovation see *Ahn – Hemmings* (2000), *Cohen – Levin* (1989) and *Symeonidis* (1996). *Aghion et al.* (2005) show additionally that the optimal level of competition – for maximizing the incentive for innovation – lies rather near to the position of perfect competition.

By using data for UK manufacturing industries, *Aghion et al.* (2002) found that negative "Schumpeterian" effects of competition on innovation (and growth) only materialize at very high competition intensity levels. According to this research, the *escape-competition effect* is the strongest in industries with a small technology gap ("neck-and-neck" industries) and the *appropriability effect* is the strongest in industries with a large technology gap. However, in case of really strong competition, not too many industries will remain neck-and-neck (composition effect). On the other hand, weak competition leads to many industries remaining neck-and-neck, where the escape-competition effect dominates, while strong competition unlevels them, leading to the predominance of the *appropriability effect*.

By finding confirmation on the existence of an inverted-U relationship between product market competition and R&D expenditure for both the manufacturing and the service sector by using data for twelve EU countries, recent research strengthens the hypothesis that the

⁴ Since 'intensity of local competition' and 'effectiveness of national antitrust policy' are both qualitative 'soft indicators' that have been constructed on the basis of interviews with a sample group of (national) business managers, any far-reaching conclusions derived from these indicators have to be treated with due care.

relationship between product market competition and innovation/growth is non-linear, with both very high and very low levels of competition providing lower incentives for innovation.

On the empirical relation between product market regulation and performance

Empirical research on the relation between regulation and growth had been boosted by the availability of data sets on market regulation, specifically that of the OECD (*Nicoletti et al.*, 1999). Unfortunately research on the impact of product market regulation has been less intensive than research on labor market regulation. One of the reasons is that the main set of indicators on product market regulation had originally been available only for one year in the nineties (1998), so that it could not be used for studies on regulatory change nor in panel analysis. The general finding is that product market deregulation is supportive of growth. However, this result is stronger if product market regulation is interrelated with labor market regulation and the regulation of the financial sector. For the impact of regulation on multifactor productivity see *Nicoletti, Scarpetta (2003)* and *Scarpetta et al. (2004)*.

Aiginger (2004) concentrated on the relative importance of innovation policy and regulation strategy on economic performance at the country level, specifically investigating the performance differences between European countries since the mid nineties. Economic performance is measured according to a set of indicators including growth of output, employment and productivity, which is thought to be important insofar as European countries had placed divergent emphasis on increasing competitiveness and productivity, on one hand, and to spread employment with the objective to decrease unemployment, on the other hand. Regulation is measured by indices on the product market and the labor market, innovation is measured by a set of sixteen indicators on input and output of innovation, education and information technology. The overall finding is that countries have done very well if they followed a strategy of liberalization, while at the same time boosting investment in the future (R&D, education, ICT). In univariate comparisons, the starting level of (de) regulation and the dynamics of investment in the future seem to be most important for economic performance on the country level, with the impact of innovation still being stronger.

3. Measuring the toughness of competition

Defining competition

Even at the micro level it is not easy to define competition and to measure the different aspects of competition. There are at least two approaches to define competition. Competition can be defined as a theoretical model, namely as a market in which the number of firms is indefinite, the price cost margin is zero, and firms are mechanistic price-takers. Or competition can be defined as an evolutionary search process, in which firms enter, grow, and exit, with entrepreneurs exploring chances and solving problems in a constantly changing environment (*Mueller, 1977*).

Measures for competition are often divided into structural variables and conduct variables. Structural variables are the number of firms, their size, market shares, or the size distribution of

firms. Different "rates of concentration" can be calculated, be it the share of the largest firms, Herfindahl rates, Gini-coefficients, entropy indices. Since the market delineation – i.e. the question where a market ends, how restrictive or broad it should be defined – is itself a never-ending question, and market shares and numbers of companies do not tell the whole story. Dynamic considerations in general and game theory in specific have shown that the importance of the number of companies might be overridden by behavioral or dynamic aspects. Conduct variables have always been considered important, but became even more important in game theory models. If there is one firm, this may be a boon, but the monopoly could also be "contested", quick exit and entry might prevent any behavior different from the competitive model and the monopoly firm may get lazy (*Aiginger – Pfaffermayr, 1997*). If there are two firms they may earn no profits (zero margins as in the competition model) or they may collude up to the shared monopoly profits. Collusion itself depends on conduct, but also on objective facts, specifically the length of the game. This makes the design of the game the most important issue, as acknowledged by the 2007 choice for the Nobel prize. If structure as well as conduct and the unknown design of the game are important, it pays to look at ex post indicators e.g. price-cost margins, mobility and turnover indicators, the stability of rankings in market shares and profits. Tough competition is not consistent with high margins, stable rankings, low entry and exit, whatever the true model might be.

The evasiveness of competition is aggravated if we switch from specific markets to the aggregate level of an economy. The degree of competition is different between manufacturing and services, between sectors dominated by small and those with large firms. Competition is restricted in economies where up to one-half of GDP is supplied or at least intensively influenced or regulated by public authorities, It is limited if public schools and hospitals dominate, also for sectors with a large share of government procurement or state firms. Competition is high – independent from lenient domestic competition authorities – in small open economies, where 50% of domestic consumption is supplied by foreign firms and half of production is exported.

Indicators chosen

We used competition indicators from surveys, mainly from the assessments of managers as published in the WEF Global Competitiveness Report and the IMD World Competitiveness Yearbook, but also from a rating of the Competition Authorities by an external agency. We added indicators provided by OECD on product market regulation. Finally we added statistics on the ex post outcomes on markets (profits shares, price cost margins, openness).

Survey data are available on the intensity of local competition (indicator 1), on the effectiveness of antitrust policy (indicator 2), on the extent of market dominance (indicator 3). Additionally, we used an assessment of competition legislation (indicator 5) and a rating of the National Competition Authority by the Global Competition Review (indicator 8).

As indicators of product market regulation, we used the time needed to start a business (indicator 4), the share of government subsidies as a percentage of GDP (indicator 5), the state ownership of enterprises (assessment; indicator 6), and again a survey on competition

legislation (indicator 7). Finally, we used the summary indicator on product market regulation published by the OECD (indicator 10).

As indicators of effective competition (ex post indicators,) we calculated the profit shares at the macroeconomic level (more exactly we calculated the "non-wage share" in value added, a variable usually labeled income share of workers; indicator 9). Secondly, we calculated the average price-cost margin over 99 industries (PCM 1998-2000; indicator 10). Countries in which profits in the general economy as well as the margins in manufacturing industries are high and trade is low relative to GDP will probably have less rivalry on the domestic markets than those with opposite characteristics.

Table 1: Toughness of competition and country performance

Indicator	Source	Q or C	Correlation (R) with		t-value in preferred performance model
			Performance	Growth	
1 Intensity of local competition	WEF	C	0.288	-0.177	0.12
2 Effectiveness of antitrust policy	WEF	C	0.514	-0.197	1.37
3 Extent of market dominance	WEF	C	0.479	-0.269	1.61
4 Time required to start a business ¹⁾	WEF	C	0.485	-0.100	1.32
5 Government subsidies ¹⁾	IMD	C	-0.026	0.192	0.56
6 State ownership of enterprises	IMD	C	0.586	0.068	2.82
7 Competition legislation	IMD	C	0.649	-0.133	2.79
8 Rating Competition Authority	Star Rating	C	0.351	-0.158	1.00
9 Wage share 2003-2005	Eurostat; AMECO	Q	0.440	-0.242	0.16
10 Price-cost margin (PCM), average 1998-2000 ¹⁾	OECD; STAN	Q	-0.410	0.189	-1.40
11 Persistence PCM (2000 relative to 1990) ¹⁾	Eurostat; New Cronos	Q	0.020	0.549	0.43
12 Openness 2006 (export plus import share/GDP)	Eurostat; AMECO	Q	0.073	0.540	1.13
13 Product Market Regulation 2003 ¹⁾	OECD	Q	0.561	-0.007	1.83
Composite indicator ²⁾	WIFO	C	0.603	-0.062	2.06

S: WEF The Global Competitiveness Report 2005-2006; IMD World Competitiveness Yearbook 2007; Star Rating (www.GlobalcompetitionReview.com). – ¹⁾ For these indicators the ranking had to be inverted relative to the original data published (since a high price-cost margin indicates a low degree of competition). – ²⁾ Average rank over the thirteen indicators on toughness of competition. This unweighted average is then ranked again. – Q: quantitative data, C: categorical data (rating).

Dennis Mueller has intensively investigated the persistency of profit differences. While persistently above normal profits can be the result of specific assets and of a tremendous ability to innovate and to react proactively to the changing environment at specific firms, in general, the persistence of high margins and large differences between industries may indicate some kind of slacks, barriers to competition and leniency of competition policy. We therefore ranked the price-cost margins of 99 three-digit industries in each country (EU-15 members) and compared the ranking of the margins at the beginning of the nineties and one decade later (persistency, indicator 11, for specific results see also table 5). Countries in which the correlation between the profit ranking at the beginning and at the end of the nineties was high are presumed to have less domestic and foreign competition. Countries in which the ranking between the industries changed a lot face a tougher competition regime (indicator 12). Finally, we added the general indicator on product market regulation by the OECD (indicator 13). It partly overlaps with the assessment in indicator 6, since state ownership is one of 10 indicators used to assess product market regulation.

These indicators are combined into a "composite competition indicator". This is done by ranking the countries for the 12 individual indicators and then taking average ranks over the indicator set. While there are clearly more technically advanced methods available to combine noisy indicators for the construction of a more comprehensive one, this is a first step to condense a large set of diverse information and to look at the impact of competition on performance.

To measure performance, we added the data on economic growth (average growth rate of GDP between 1996 and 2005), the employment rate and the unemployment rate of 2005, as well as changes in these two rates between 1996 and 2005. We added the level of GDP in 2005, since high GDP per capita is at least as important in the assessment of the performance of an economy as short-run growth (which tends to be higher if starting from low levels); and finally we added as an equity measure, the relation between top twenty percent income and low twenty percent. This combination of indicators – similar sets had been used in Aiginger (2004) in studies on successful macro-economic strategies – implicitly assume that the welfare of individuals as well as of an economy depends on income (growth and level), employment chances (levels and changes) and equity. Possibly, it would be nice to add indicators on the environment, or on other non-material goods (health, security etc.). Similar to the construction of the overall indicator on the toughness of competition, we combined the individual indicators by ranking and averaging them over the ranks. Implicitly, this assumes that the individual arguments in the welfare function have the same weight and are related in a similar way (e.g. same degree of redundancy).

Table 2: Indicators for macroeconomic performance (and ranking)

	Growth of GDP 1996-2005		Employment rate 2005		Employment rate change 1995-2005		Unemployment rate 2005		Unemployment change 1995-2005		GDP per capita 2005		Equity ranking Highest 20% / lowest 20%		Performance Indicator	
	%	Rank	%-points	Rank	%-points	Rank	%	Rank	%-points	Rank	1,000 €	Rank	Rank	Rank	Average ¹⁾	Rank
Scandinavian countries	2.8	17.3	73.0	7.0	3.8	13.0	7.0	16.0	-3.3	9.3	27.2	10.7	4.1	5.7	11.3	6.3
Denmark	2.1	24	77.2	2	2.6	16	4.8	8	-1.9	10	28.6	7	4.3	8	10.7	5
Finland	3.6	11	68.6	13	8.4	3	8.4	22	-7.0	3	25.9	13	3.8	3	9.7	3
Sweden	2.8	17	73.3	6	0.5	20	7.8	18	-1.0	15	26.9	12	4.0	6	13.4	11
Small open economies	2.3	21.3	68.1	13.7	3.4	11.7	6.1	13.0	-0.6	15.3	28.7	7.0	4.8	12.3	13.5	12.7
Austria	2.2	21	68.6	14	0.5	19	5.2	11	1.3	21	28.8	6	4.4	10	14.6	16
Belgium	2.1	25	62.1	22	3.7	10	8.4	22	-1.3	14	27.7	10	4.9	13	16.6	20
Netherlands	2.6	18	73.6	5	6.0	6	4.7	6	-1.9	11	29.5	5	5.1	14	9.3	2
Continental countries	1.6	26.0	64.7	18.3	4.4	11.0	9.0	22.3	-1.1	13.7	24.9	15.7	5.5	17.0	17.7	21.7
Germany	1.3	27	70.3	11	3.0	14	9.5	25	1.5	23	25.8	14	4.3	9	17.6	22
France	2.1	23	61.3	23	2.8	15	9.7	26	-1.4	13	25.4	16	5.6	18	19.1	24
Italy	1.3	28	62.4	21	7.4	4	7.7	16	-3.5	5	23.6	17	6.5	24	16.4	19
Southern countries	3.3	12.7	64.0	19.0	6.8	8.7	8.9	22.0	-2.8	12.7	19.8	20.3	6.7	23.7	17.0	19.3
Greece	3.9	8	55.5	28	2.3	17	9.8	27	0.6	19	19.7	20	6.2	22	20.1	26
Spain	3.7	10	64.3	19	13.7	1	9.2	24	-9.2	1	23.0	18	6.0	21	13.4	11
Portugal	2.4	20	72.1	10	4.5	8	7.6	15	0.3	18	16.8	23	7.9	28	17.4	21
Catching-up countries	3.7	12.3	60.3	22.0	-1.4	21.4	9.9	19.1	0.4	18.9	15.2	24.0	4.7	11.3	18.4	21.3
Czech Republic	2.6	19	66.8	15	-4.7	27	7.9	19	2.1	27	17.3	22	3.5	2	18.7	23
Estonia	6.9	2	66.5	16	-0.8	23	7.9	19	-1.8	12	14.0	25	5.5	17	16.3	18
Hungary	4.2	6	55.9	26	4.1	9	7.2	14	-2.8	7	14.7	24	3.8	4	12.9	9
Lithuania	1.3	28	62.4	21	7.4	4	7.7	16	-3.5	5	23.6	17	6.5	24	16.4	19
Poland	4.2	5	52.6	29	-5.4	28	17.7	29	4.5	29	11.7	28	5.6	19	23.9	29
Romania	2.2	22	55.5	27	-8.4	29	7.7	16	1.6	26	8.0	29	4.8	12	23.0	28
Slovak Republic	4.0	7	57.5	25	-2.6	26	16.3	28	3.1	28	13.4	26	4.0	5	20.7	27
Slovenia	3.9	9	65.2	17	-0.9	25	6.5	12	-0.4	17	19.2	21	4.1	7	15.4	17
Liberal countries	4.0	11.8	70.2	10.7	5.4	10.0	4.9	7.0	-3.5	7.3	28.8	8.7	6.8	23.8	11.3	8.0
United Kingdom	2.8	16	72.2	9	3.4	12	4.7	6	-3.8	4	27.6	11	7.2	27	12.1	8
Ireland	7.7	1	68.9	12	13.6	2	4.3	3	-8.0	2	32.6	3	5.7	20	6.1	1
USA	3.3	14	72.6	8	0.4	21	5.1	10	-0.5	16	34.7	2	8.5	29	14.3	15
Canada	3.3	13	73.8	4	4.7	7	6.8	13	-2.8	7	28.4	8	5.5	16	9.7	3
Australia	3.6	12	73.2	7	3.4	13	5.0	9	-3.1	6	28.3	9	7.0	26	11.7	7
New Zealand	3.1	15	60.6	24	7.0	5	3.7	1	-2.6	9	21.4	19	6.8	25	14.0	14

S: Eurostat (AMECO); IMD World Competitiveness Yearbook 2007. – 1) Average over the rankings of the seven individual performance indicators.

4. Tentative results on the relation between competition and the economic performance of a country

Descriptive evidence

The correlation between the individual indicators and the macroeconomic performance is surprisingly strong. The correlation is highest for the managers' evaluation of competition legislation (indicator 7; R = 0.65). The competition legislation is rated as effective by managers in several European countries (Austria, Netherlands, Luxemburg and Denmark), where economic performance is good too, and as expected in Anglo-American countries (United Kingdom, Australia, New Zealand). Competition legislation is assessed as poor in former European transition countries and in the South European economies.

Many countries with large state ownership (see indicator 6) have a lower performance ranking. Besides the transition countries, Japan and France support this relationship since they have both high state ownership and low performance. The third best correlation exists between performance and the general OECD indicator on product market regulation (indicator 13).

Table 3: Toughness of competition indicators (and ranking)

	Intensity of fiscal competition		Effectiveness of antitrust policy		Extent of market dominance		Time required to start a business 2005		Government subsidies		State ownership of enterprises		Competition legislation		Rating Competition Authority		Wage share 2003-2005		Price cost margin (1996-2000)		Persistence PCM industrial ranking		Openness 2006		Product Market Regulation 2003		Composite competition indicator	
	Rating ¹⁾	Rank	Rating ²⁾	Rank	Rating ³⁾	Rank	Rating ⁴⁾	Rank	Rating ⁵⁾	Rank	Rating ⁶⁾	Rank	Rating ⁷⁾	Rank	Rating	Authority	%	Rank	Margin	Rank	Rating	Rank	%	Rank	Rating	Rank	Average ⁸⁾	Rank
Scandinavian countries	5.6	12.7	5.7	8.3	5.4	9.3	11.3	8.0	1.8	21.3	6.8	12.0	7.0	7.0	9.3	73.8	8.0	0.152	23.0	0.313	5.0	92.5	14.0	1.2	6.7	11.1	9.7	
Denmark	5.5	14	5.7	7	5.7	7	4.0	3	2.3	25	8.1	1	7.5	2	6.0	77.6	3	0.133	21	0.199	2	100.8	12	1.1	4	8.2	2	
Finland	5.7	10	6.0	3	5.9	4	14.0	10	1.8	22	6.3	17	7.0	7	7.0	66.7	17	0.182	25	0.307	6	82.3	16	1.3	9	11.8	13	
Sweden	5.5	14	5.3	15	4.7	17	16.0	11	1.4	17	6.0	18	6.5	12	15.0	77.1	4	0.141	23	0.372	7	94.4	14	1.2	7	13.4	14	
Small open economies	5.9	6.0	5.7	8.3	5.7	6.7	24.7	14.3	2.0	20.3	7.2	6.7	7.3	5.7	16.3	68.0	13.7	0.140	17.7	0.335	10.3	141.6	7.3	1.4	12.0	11.2	9.3	
Austria	5.8	8	5.7	4	5.9	4	29.0	17	2.0	21	7.4	6	8.0	1	18.0	67.1	16	0.127	20	0.087	3	109.6	11	1.4	12	11.4	11	
Belgium	6.0	4	5.6	11	5.6	8	34.0	20	1.7	20	6.8	11	6.5	13	21.0	69.4	10	0.042	5	0.362	5	174.6	3	1.4	12	11.0	8	
Netherlands	5.9	6	5.7	7	5.6	8	11.0	6	1.3	14	7.4	3	7.5	3	10.0	67.4	15	0.250	28	0.555	25	140.6	8	1.4	12	11.2	9	
Continental countries	5.6	12.7	5.4	11.0	5.0	14.3	22.0	12.3	1.2	13.0	5.7	18.7	6.1	15.3	6.0	65.4	14.3	0.072	10.7	0.550	20.7	65.5	21.3	1.7	20.7	14.7	16.3	
Germany	6.2	2	6.3	1	6.3	1	45.0	23	1.2	12	6.8	10	6.8	10	5.0	69.1	11	-0.038	1	0.614	26	84.5	15	1.4	12	9.9	4	
France	5.6	12	5.7	7	5.3	13	8.0	5	1.4	18	5.7	20	6.6	11	4.0	70.3	9	0.218	27	0.419	9	55.6	25	1.7	23	14.1	16	
Italy	4.9	24	4.2	25	3.5	29	13.0	9	0.9	9	4.7	26	4.8	25	9.0	56.7	23	0.036	4	0.615	27	56.5	24	1.9	27	20.1	29	
Southern countries	5.2	18.7	4.8	19.0	4.4	20.3	74.7	26.0	0.9	10.3	5.2	23.7	5.3	21.7	18.7	58.9	20.3	0.148	13.3	0.386	7.3	59.9	23.0	1.7	22.7	18.8	25.0	
Greece	5.0	22	4.6	22	4.2	23	38.0	21	0.1	1	5.6	22	4.9	33	25.0	42.7	29	0.120	7	0.452	10	51.4	26	1.8	26	19.8	28	
Spain	5.5	14	4.9	18	4.7	17	108.0	29	1.0	11	4.5	27	5.2	22	14.0	65.0	19	0.204	26	0.404	8	58.4	23	1.6	21	19.2	25	
Portugal	5.1	20	5.0	17	4.3	21	78.0	28	1.6	19	5.6	22	5.6	20	17.0	68.9	13	0.120	7	0.303	4	70.0	20	1.6	21	17.6	22	
Catching-up countries	5.1	20.1	4.3	24.1	4.2	23.1	45.3	21.5	2.3	17.6	5.6	19.3	5.0	24.0	13.4	57.5	21.6	0.090	7.8	0.452	10.0	134.6	8.9	1.8	20.0	17.8	22.3	
Czech Republic	5.2	18	4.9	18	4.2	23	40.0	22	7.9	29	6.3	16	5.3	21	11.9	65.1	18	-0.037	2	0.452	10	148.9	6	1.7	23	16.8	19	
Estonia	5.6	12	4.8	20	4.0	26	72.0	27	1.0	10	7.2	9	6.0	19	11.9	64.7	20	0.120	7	0.452	10	169.3	4	1.5	16	14.8	18	
Hungary	5.5	14	4.6	22	4.2	23	50.0	24	1.4	16	7.6	2	6.1	18	11.9	68.6	27	0.135	22	0.452	10	155.1	5	2.0	28	17.1	20	
Lithuania	5.2	18	4.1	27	3.6	28	26.0	15	0.8	8	5.4	24	4.7	26	11.9	52.7	25	0.120	7	0.452	10	129.3	10	1.5	16	17.4	21	
Poland	5.0	22	4.3	24	4.5	19	31.0	18	0.5	5	4.3	28	4.4	27	24.0	51.8	26	0.120	7	0.452	10	82.0	17	2.8	29	19.7	27	
Romania	4.3	29	3.4	29	4.3	21	28.0	16	2.0	24	5.6	21	4.8	24	11.9	45.4	28	0.120	7	0.452	10	76.9	18	1.5	16	19.6	26	
Slovak Republic	4.9	24	3.9	26	4.0	26	52.0	24	1.9	23	5.0	25	4.3	28	11.9	55.8	24	0.017	3	0.452	10	176.0	2	1.5	16	18.8	24	
Slovenia	4.9	24	4.2	25	4.5	19	41.0	26	3.0	26	3.3	29	4.1	29	11.9	75.5	5	0.120	7	0.452	10	139.1	9	1.5	16	18.2	23	
Liberal countries	5.8	7.7	5.9	6.3	5.6	9.0	10.7	6.8	0.7	7.2	6.7	10.8	6.6	10.8	6.3	67.4	14.0	0.143	13.3	0.506	14.3	68.9	20.8	1.0	3.3	10.1	6.3	
United Kingdom	6.1	3	6.0	3	6.0	3	18.0	12	0.5	4	6.3	14	6.3	14	1.0	70.5	7	0.155	24	0.523	24	61.6	21	0.9	1	10.1	6	
Ireland	5.1	20	5.5	13	5.4	12	24.0	14	0.6	6	6.3	15	6.1	17	8.0	62.8	22	0.120	7	0.297	3	145.1	7	1.1	4	11.4	11	
USA	6.3	1	5.9	6	6.3	1	5.0	4	0.5	3	6.5	12	6.3	16	2.0	70.4	8	0.061	6	0.861	29	28.0	29	1.0	3	9.2	3	
Canada	5.7	10	5.6	11	5.5	10	3.0	2	1.2	13	6.5	13	6.9	9	11.0	49.0	12	0.120	7	0.452	10	70.4	19	1.2	7	10.3	7	
Australia	6.0	4	6.1	2	5.2	14	2.0	1	1.3	15	7.4	3	7.2	4	3.0	68.0	14	0.120	7	0.452	10	64.5	27	0.9	1	8.1	1	
New Zealand	5.8	8	6.0	3	5.2	14	12.0	8	0.3	2	7.2	8	7.0	5	13.0	63.6	21	0.285	29	0.452	10	40.7	22	1.1	4	11.3	10	

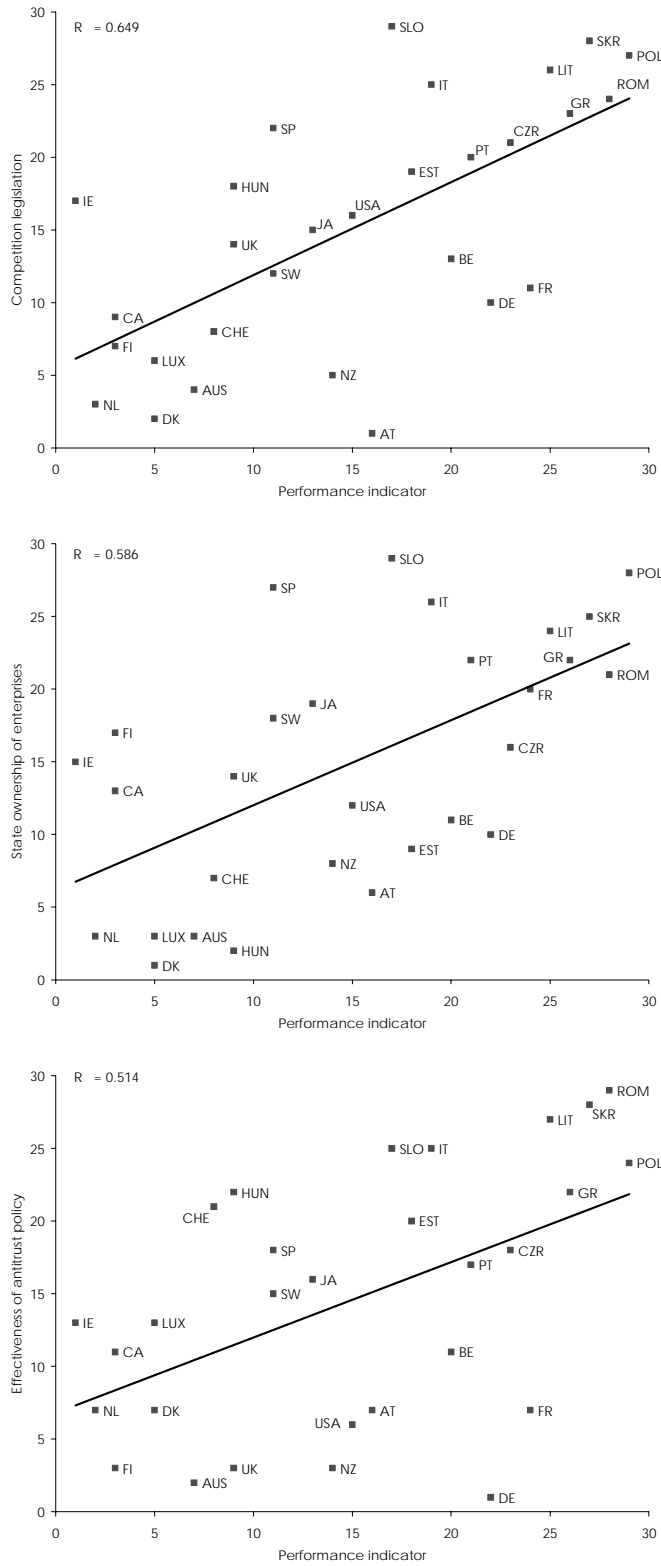
S: WEF The Global Competitiveness Report 2005-2006; IMD World Competitiveness Yearbook 2007; Star Rating (www.GlobalCompetitionReview.com); Eurostat (AMECO); OECD (STAN). –

1) 7.01: competition in the local market is (1=limited in most industries and price-cutting is rare, 7=intense in the most industries as market leadership changes over time). – 2) 7.02: Anti-monopoly policy in your country is (1=lax and not effective at promoting competition, 7=effective and promotes competition). – 3) 7.03: Corporate activity in your country is (1=dominated by a few business groups, 7=spread among many firms). – 4) 7.11: number of days required to register a business. – 5) 2.4.08 Government subsidies. – 6) 2.4.10 State ownership of enterprises: State ownership of enterprises is a threat to business activities/is not a threat to business activities. – 7) 2.4.11 Competition legislation: Competition legislation is not effective in preventing unfair competition/is efficient in preventing unfair competition. – 8) Average rank over the thirteen indicators of toughness of competition. This unweighted average is then ranked again.

This is followed by three indicators, with correlation coefficients still being around 0.50, namely, the effectiveness of antitrust policy (indicator 2), extent of market dominance by large firms (indicator 3) and the time required to establish a business (indicator 4). Thus, performance depends on the degree of competition with regard to entry – which is specifically relevant for new and small firms – as well as conditions monitoring the behavior of

large firms. The indicator on the intensity of local competition does not prove to be significant, and neither does it for government subsidies.

Figure 1a: Rating of competitiveness indicators and country performance



The ex post indicators in general fare worse probably because of feedbacks and reversal causality. Better macro performance seems to be related to a higher wage share. Denmark, Switzerland, Finland and Sweden have low macro profit ratios and good performance. All are small open economies. We could not establish a relation between the average price-cost margin across industries of a country and performance, and in fact, countries with higher profit margins show a somewhat better performance. This might indicate a reverse causality, or just the fact that both channels work and can not be disentangled: competition increases performance, but performance increases or keeps high the level of margin. Non-linearity – as stressed by competition and innovation – might play a role, since all these countries have high shares of R&D in GDP. There is no correlation between performance and openness and persistency of profit differences.

Out of all of the 13 indicators we used, eleven have the correct sign, and eight are larger than 0.4. If we combine the 13 indicators (including the insignificant ones and those with wrong sign -assuming that these nevertheless carry some useful information), we obtain a composite indicator on the toughness of competition. Its correlation with the performance ranking is 0.60, which is a very close relation. The relation is driven by the Anglo-Saxon and the Scandinavian countries (with some exception of Sweden which lies in the upper half, but is not leading in competition toughness) and Canada and Australia; US and New Zealand have tough competition, but only medium-term performance according to our performance indicator. On the other hand, the southern European countries and the new member countries of the EU jointly have low competition and low general performance. The single largest outsider is Germany with a very tough regime in competition (position 4), but low performance in the specific decade.⁵

As far as persistency is concerned, we did not find a good relation to economic performance. Some good performers have low persistency (Ireland, the Netherlands, and Denmark) but others like Australia have a high persistency of profit rankings. Correlation of persistency with economic growth, on the other hand, is rather close. The data also indicate that persistency is high in large countries and that the causality might run in both directions.

If we combine all indicators (the significant and the insignificant even including those with a negative sign), we obtain an overall composite indicator. The correlation between this composite indicator and the performance ranking is $R = 0.60$, which is highly significant. The positive relation is established by a high ranking in competition and performance in Netherlands, Denmark and Finland (three Scandinavian European countries) and Canada. With the United Kingdom, Ireland and Australia, three more countries from the Anglo-Saxon world follow. Australia and United Kingdom are placed a little bit lower in performance than in competition, and Ireland better in performance (it is only number 15 in competition). Low performance is combined with low competition in the new EU member countries of Romania, Slovakia, Lithuania and Czech Republic, and in the three southern European countries

⁵ We have intentionally not chosen economic growth alone as measure of success, since we wanted to include the starting level and the employment performance as well as equality. Furthermore countries might excel for growth easier in a short run period than in a long one. If we had taken growth in general the correlations were weaker. The exceptions are that persistence of profit ranking across industries is closely related with growth and openness is related to growth. The composite indicator does not correlate with growth rankings however.

notably Greece, but also Portugal and Italia. Outsiders which reduce the fit are Spain which enjoys a better-than-average performance in the past decade, but has the worst competition region of all 29 countries. On the other hand, Germany excels in all rankings of competition, but has had an unsuccessful decade as far as economic performance is concerned. Both countries show that while competition is important, there are overriding issues. German suffered from the costs and the attention given to the unification as well as due to its insufficient emphasis on high-tech industries⁶, education and information technology. Spain enjoyed the construction boom initiated by EU membership and liberalized labor markets (but did not promote domestic competition in product markets).

The impact of competition in a stylized model

Testing simple correlations does not prove causality. One way to tackle this problem is to start from a standard model of economic growth or performance and then add the variable of interest and test its explanatory power and its effect on the coefficients of the "standard model". We started from the presumption that a standard model explaining growth or performance (in our case we emphasize performance) should try to model the impact of at least four variables: physical investment, starting income, human capital and research expenditures.

We applied this "starting model" to our specific data set. We have 29 countries and mainly data for the nineties. As in other models, the multi-collinearity between human capital and research proved to be problem, irrespective of whether we chose life expectancy or years of schooling as an indicator for human capital. The second negative result was that we did not get the expected negative impact of the starting level of per capita GDP. As best performing model we got that performance (more exactly our country composite ranking on performance) was dependent on physical investment and on research. We added to this "preferred model" human capital, but there is the same strong multi-collinearity with research as in other papers. To this very parsimonious "preferred model" – which alone was able to explain one-fourth of the performance differences – we added the 13 competition indicators individually and then the combined indicator.

The result was rather encouraging. The individual competition indicators had the right sign in 12 out of 13 regressions. It was significant (with t values above 2) for state ownership and competition legislation and fairly significant for product market regulation and market dominance.

The result for the composite indicator was especially impressive. The coefficient is significant at the 5% level (t = 2.06). Its inclusion reduces the coefficients (in effect destroys the significance) of the other determinants. Specifically important seems to be the interrelation between competition and R&D. This confirms the complex relationship suggested in Industrial Organization literature. If we then extend the regression by the other suspects (eliminated in the course of choosing the preferred model), the result proves robust. The composite

⁶ See Aiginger (2003, 2004).

competition indicator is the single most significant explanatory variable for the performance ranking.

Table 4: Preferred model with and without competition variable

Dependent variable: Performance ranking		Investment share in GDP		R&D ratio		Human capital (life expectancy)		Dummy 1		Dummy 2		Composite competition indicator	
		Coefficient	t-value	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
perf = f (investment share, R&D ratio, dummy 1, dummy 2)	Model 1	0.35	1.54	0.69	2.76			4.83	1.27	8.70	1.66		
perf = f (investment share, R&D ratio, human capital, dummy 1, dummy 2)	Model 2	0.28	1.22	0.63	2.47	0.32	0.97	-0.03	0.00	9.78	1.83		
perf = f (investment share, R&D ratio, dummy 1, dummy 2, composite competition indicator)	Model 3	0.24	1.09	0.39	1.45			2.74	0.74	7.97	1.62	0.44	2.06
perf = f (investment share, R&D ratio, human capital, dummy 1, dummy 2, composite competition indicator)	Model 4	0.09	0.40	0.20	0.73	0.59	1.92	-6.91	-1.13	9.74	2.05	0.57	2.69

Dummy 1: New member countries; Dummy 2: Slow growing countries (Germany, Japan, and Switzerland).

Of course this result is the starting point rather than the end of research on this interesting question, calling for much more elaborated econometric work: enlarging the time period, testing for endogeneity and multi-colinearity, and a panel approach is called for. We should test whether the result depends on our performance measure; whether it holds if we combine quantitative and categorical data (we transformed all indicators into categorical variables). And we should study the different impact of competition on growth performance and on our broader performance measure as well as indirect effects of competition on growth via innovation in sub-segment research.

The relation between competition policy and socioeconomic models

The economic performance of European Countries since the mid-nineties had been disappointing. Economic growth was lower than in the past and than in the US, the productivity gap to the US- which had narrowed over the past decades (with some European countries surpassing the US in GDP per hour) widened again, the employment rate which had been higher in Europe in the seventies is now trailing the US rate by nearly 10 percentage points and unemployment rate, which used to be lower in Europe is now higher than in the US. One factor suspected behind the disappointing performance of Europe between 1995 and 2005 was the "European Socioeconomic Model" with its emphasis on social inclusion, big government and tight regulation of product and labour markets. This explanation never proved easy, since most of these conditions had been different also in periods of higher European growth. But against this argument, the importance of "interaction effects" was invoked: big government, high costs and rigid rules are more important in more turbulent times of globalization and rapid technological changes.

However, European countries are different. Literature distinguishes three to five types of European socioeconomic models. The surprising result is that of the different versions of the European socioeconomic models, the two extreme ones have enjoyed a better performance since the nineties. This holds for growth comparisons, but even more for the broader approach taken here to measure performance by income, employment, unemployment plus income distribution. The Anglo-Saxon model in Europe is applied in

Ireland and the United Kingdom and resembles most the US model, for example, because of low regulation and social costs as one extreme. The Scandinavian model, at the other end of the spectrum, has high taxes, big government and high welfare payments (e.g. replacement ratios for unemployed or retired persons).

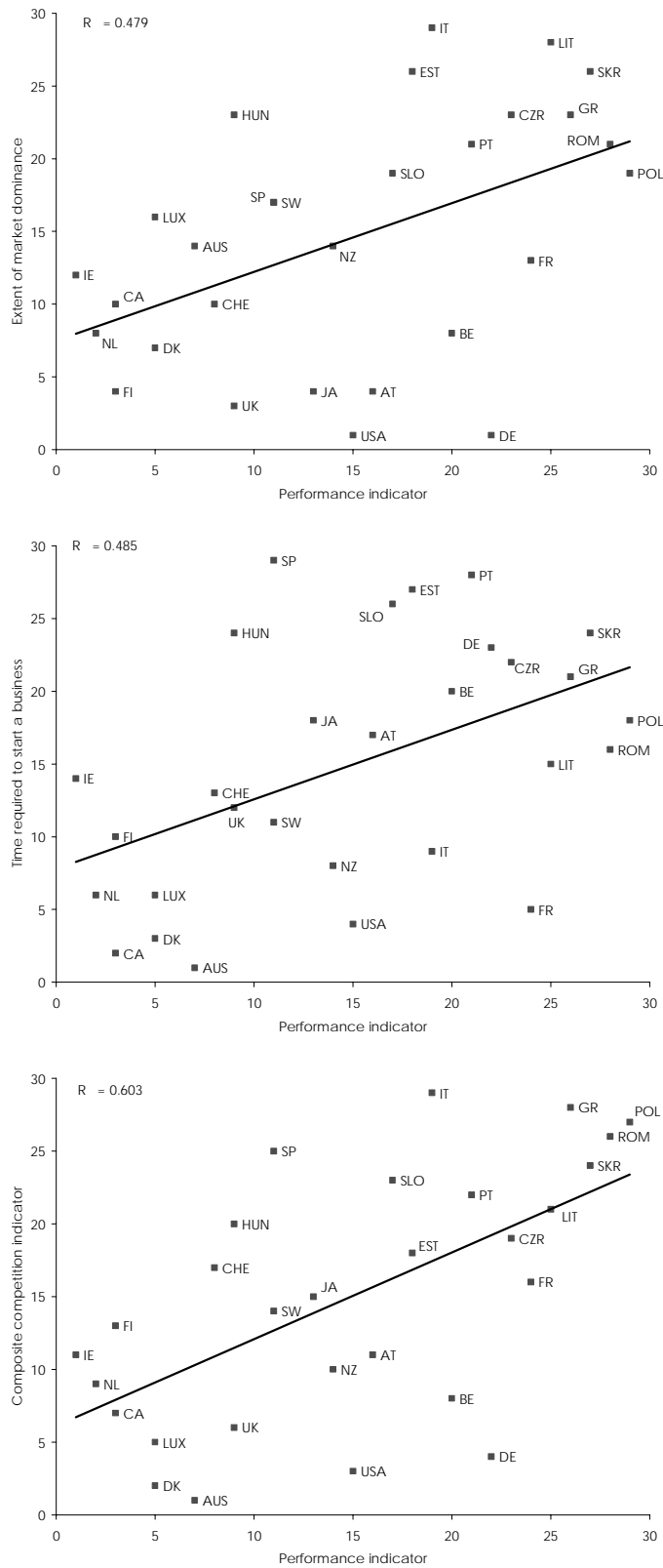
In our performance indicator, Ireland and the United Kingdom take position 1 and 8 among 29 countries and the Scandinavian countries (Denmark, Finland and Sweden) hold the position 5, 3, 11. The unweighted average across the "model members" of the overall performance rank is therefore 5 for Anglo-Saxon Europe and 6.3 for the Scandinavian model. In contrast, the big European economies (Germany, France and Italy) are ranked as 22, 24 and 19 (average rank 21.7). There are a lot of explanations of what the successful Scandinavian countries did and especially what they have done differently since the nineties (after severe crises in the late eighties or early nineties)⁷. And there are also good arguments that Ireland's catching-up was a specific case (enabled by European transfers, low taxes and inward investment by US firms), and that the United Kingdom was rebuilding infrastructure after a strong austerity period. But let us now look at the difference in toughness of competition.

Both successful countries groups are leader in the indicators on the toughness of competition. The United Kingdom is ranked as no. 6 and Ireland as no. 11. Ireland has the lowest regulation of product markets, but managers assess local competition as low and state ownership as rather high, profits are large. As for the Scandinavian countries, Denmark is ranked as country with the second-highest degree of competition (second only to Australia). Finland and Sweden are ranked as no. 13 and 14, with good rankings for competitive legislation and low product market regulation. Both are losing even better rankings due to state ownership and subsidies, which are two elements that had been reduced in the past years and where the assessment was different for these countries according to other indicators (see *Aiginger – Sieber, 2006*). It looks as if a combination of medium toughness of competition and attempts to increase the degree of competition – plus the strong emphasis on innovation (see *Aiginger, 2004A, Aiginger – Guger, 2006*), which plays an important role in these countries to achieve a good performance despite a still large government sector and high taxes.

The lowest competitive pressure of all countries is in Italy (rank 29), the competitive regime is below average in France. Germany is an outlier: in most respects it has to be considered as an economy with a high degree of competition, specifically, as regards antitrust regulation. However, it is rather long and costly to start a new business. The average ranking for the countries of the continental model is 16.3 (an average over the very different regimes in Germany and Italy). The situation is very homogenous in the southern European countries with a low degree of competition (average rank 19.3), and in the catching-up countries (new members) with an average rank of 25.3. The small European countries have an above average degree of competition.

⁷ Aiginger (2003, 2004) and *Aiginger – Guger (2006)* find that the main reforms were related to labour markets (flexicurity, carrot and sticks, deregulation of irregular contracts and part time), investments into the future (excellence in R&D, education, lifelong learning) plus prudent fiscal policy (long run surplus, output and distribution oriented budget techniques, pension reforms with long term as well as equity concerns)

Figure 1b: Rating of competitiveness indicators and country performance



S: WEF The Global Competitiveness Report 2005-2006; IMD World Competitiveness Yearbook 2007; Star Rating (www.GlobalcompetitionReview.com).

Thus, the Anglo-Saxon countries in Europe and outside add a high degree of competition to their model of low social cost and taxes. The Scandinavian countries reduced the potential burden of high taxes to competitiveness by a medium to tough regime on competition, and they seemed to have enforced competition over the past decade. In conjunction with the factors of excellence in innovation, education and life-long learning, they are now able to stay competitive in a globalizing world – despite high taxes and big government. France and Italy, on the other hand, have failed to strengthen internal competition and are laggards in performance and toughness of competition.

5. Conclusions and outlook

The importance of competition is well established in Industrial Economics; models and research results in this field have been the basis for competition policy. The relationship between rivalry and cooperation is investigated in regional analyses and impacts on regional policy in the tradition of Porter's diamond and cluster policy. And the – probably non-linear – relation between innovation and competition and its impact on performance is a perennial topic in innovation theory. The impact of competition on economic growth and overall macroeconomic performance is far less investigated. Although empirical growth models now include more institutional variables, they very seldom include indicators on the toughness of competition. And there are very few studies relating performance differences of countries and regions in the past decade to the degree of competition. The only indicators used sometimes are trade openness and – primarily in studies by OECD researchers – product market regulation.

We collected thirteen indicators on the toughness of competition for 29 countries. Some are survey indicators e.g. on the legislative regime (intensity of competition, effectiveness of antitrust etc.), other indicators on product market regulation were gathered by OECD experts (time to start a business, state ownership etc.). We added ex post indicators to the price-cost margins in industries, on aggregate profits, and finally, and as a tribute to the works of Dennis Mueller, on the persistence of profit differences between industries. The usual indicator on trade openness complements the set. Since all indicators relate on a narrow aspect of the broad notion of "toughness of competition", since they are noisy, and contain measurement errors, we combined the information delivered by the individual indicators by ranking and then averaging them, to arrive at a "composite indicator on competition".

We define economic performance of a country broader than usual, combining data on income (per capita level and macro economic growth), employment, unemployment (rates and change over ten years) and equity (relation of top 20% income to low 20%). Similar performance measures had been used in *Aiginger* (2004A), to analyze performance differences between countries and models since the mid-nineties. Combining several aspects of performance (rather than concentrating on economic growth alone), mitigated the problem that a period of ten years is influenced by many country-specific problems (from the catching-up of Ireland to German unification).

Eleven of the thirteen indicators on competition are positively related to performance in the cross-country correlation, with close relations to the assessment of the competition legislation,

the extent of state ownership and product market regulation (the latter two with a negative sign). Most importantly, the relationship between the performance ranking and the combined indicator on competition was proven to be very close.

As a stronger test, we add the competition indicators to a small parsimonious "preferred model" explaining performance differences across countries. The preferred model explains country performance over the past ten years by innovation (R&D ratio) and investment (share of physical investment in GDP). If we add the competition variables all but one have the correct sign, two are significant by the usual standards, for two the impact is marginally below significance. The overall indicator is robustly significant. Its inclusion reduced the explanatory power of innovation, thus indicating the same complex relation between innovation and competition, as modeled on the micro level. The overall impact of competition seems to be the most important and most robust indicator in explaining performance differences.

The degree of competition is the strongest in the Anglo-Saxon countries: complementing low taxes and social costs by a tough competition regime seems to be favorable for competitiveness and growth. Most of these countries (specifically Ireland, Canada and Australia) are also front runners in the performance ranking. Equally high performance was achieved in the Scandinavian countries. This has to be considered as a surprise, since these countries have high taxes and big government. It is explained by *Aiginger (2004A)* and *Aiginger – Guger (2006)* firstly, by their excellence in research and education (the countries are surpassing the Lisbon goals w.r.t. R&D ratios and are leading the Pisa education ratings), secondly, by changes in the labor market regimes (flexicurity and re-qualification, carrot-and-stick strategies) and thirdly, by prudent public finance (long-term pension reforms, budget surplus goals, concerns about equity and fairness). What may have been overlooked is that these countries are encouraging competition too (even in public services). Denmark is at the top in the rating of competition, Finland and Sweden (despite of big government) lies in the middle of the bulk, with tendencies to the upper half and to increase competition over time (encouraging entry, reducing regulation). The Scandinavian countries demonstrate that strong emphasis on innovation plus medium or strong competition is good for performance; this combination can outweigh the high costs for the social and environmental system. France and Italy are negative extremes: low competition in the domestic market and a low degree of openness, together with low investment into the future (research, education, new technologies) is bad for economic performance. Germany excels in competition policy, but this positive effect is overridden by the costs of German unification and the insufficient attention to research and education. This is an important problem for the country with the highest wages in manufacturing. Spain, on the other hand, shows that for a certain period of time, the negative effects of low competition and low innovation may be hidden by strong investment in housing and construction and high transfers by the EU. How long this will last must be monitored.

In the long run, innovation plus competition seem to be a good double strategy for improving performance and staying competitive in a globalizing world. The interrelation between competition and innovation may be as complex at the macro level as indicated in the micro models, since competition means private appropriation of inventions and patents, while innovation at the country level will profit from external effects, spillovers and synergies. The

relation between innovation and competition and their combined effect of persistence of profit differences and on country performance will remain a fascinating research topic.

Table 5: Persistence of profit differences at EU level

		1990		2000	
		Rank		Rank	
Top 10 industries					
N265	Cement, lime and plaster	0.649	1	0.718	4
N223	Reproduction of recorded media	0.698	2	0.798	1
N160	Tobacco products	0.622	3	0.748	3
N23	Coke, refined petroleum and nuclear fuel	0.673	4	0.785	2
N242	Pesticides, other agro-chemical products	0.702	5	0.602	10
N154	Vegetable and animal oils and fats	0.649	6	0.583	14
N181	Leather clothes	0.659	7	0.673	6
N156	Grain mill products and starches	0.638	8	0.594	12
N159	Beverages	0.613	9	0.646	7
N362	Jewellery and related articles	0.620	10	0.592	13
Low 10 industries					
N312	Electricity distribution and control apparatus	0.402	90	0.399	10
N342	Bodies for motor vehicles, trailers	0.382	91	0.395	9
N323	TV, radio and recording apparatus	0.401	92	0.345	3
N332	Instruments for measuring, checking, testing, navigating	0.411	93	0.435	22
N296	Weapons and ammunition	0.401	94	0.309	2
N352	Railway locomotives and rolling stock	0.375	95	0.252	1
N283	Steam generators	0.365	96	0.360	5
N363	Musical instruments	0.305	97	0.393	8
N272	Tubes	0.200	98	0.500	58
N333	Industrial process control equipment	-0.082	99	0.440	24

S: Eurostat (New Cronos).

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