Do T's create growth?

- Evaluating Richard Florida's "Three T's"

Abstract:

Richard Florida and Irene Tinagli lay out an alternate model of economic growth in the 2004 paper "Europe in the Creative Age". Their model is focused on the impact of the "Creative Class", an extended concept of human capital, as well as human capital flows, and how these phenomena are impacted by societal values.

This paper examines the empirical and theoretical underpinnings of the model developed by Florida and Tinagli: The Euro-Creativity index (ECI) and the Euro-Creativity Trend indexes. Using linear regression, several different possible relationships between the ECI and economic performance are examined. Also, the theoretical consistency of the ECI is discussed.

The ECI and ECI-Trend are found to be problematic both as a model of economic growth, as well as policy tools, because of several empirical and methodological issues. Therefore, caution is advised when interpreting and using results yielded by the ECI and ECI-Trend.

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1. Introduction

"In our view, the key determinant of global competitiveness no longer turns simply on trade in goods and services or flows of investment and capital, but rather in flows of people."
(Florida and Tinagli, 2004)

Interest in how one makes an economy grow runs high in today's world - not only in the halls of academia, but also in parliaments, city councils and think tanks around the globe.

It is therefore not surprising that Growth theory has become an extensive field, at times a dauntingly complex one. Untold regressions have been performed in the course of attempting to discover which factors correlate with economic growth. The number of journal pages dedicated to disentangling the web of causality behind those correlations is greater still.

This of course creates room for new actors in the field. One such entrant is Richard Florida, a professor at the School of Public Policy at George Mason University, and a Brookings institution fellow.

Florida has earlier focused his research on city development, where he has been an influential actor since the release of his 2002 book "Rise of the creative class". Florida's thesis is simple: In order to succeed in growing economically, cities must attract what he terms "the creative class". The term "creative class", in turn, covers the highly educated, and those without a degree in other professions deemed creative, such as painters and musicians.

Other factors he considers to be important to the economic development of a city are high-tech prowess, innovativeness as well as the level of tolerance displayed for alternative lifestyles.

The centerpieces of "Rise of the creative class" are rankings composed from the four factors described above. They show San Francisco coming in as the most creative urban area in the United States, with Austin as second-best and New York at number ten. Florida's message was well received, and "Rise of the creative class" became a national bestseller, as well as widely influential. A Google search for "creative class" today yields 160 000 hits. Florida has

recently published a new book, "Flight of the creative class", where he extends his theory in several new directions, mainly dealing with international competition for talent.

This thesis, however, will focus on a precursor to "Flight of the creative class", a 2004 paper named "Europe in the creative age", co-written with Irene Tinagli of Carnegie Mellon University. In "Europe in the creative age", Florida turns his eye towards explaining the factors behind economic growth on the national level in Europe. (The full paper can be downloaded from [http://www.demos.co.uk/catalogue/creativeeurope/])

As in Florida's city development work, his theory can be summed up by what he terms "The Three T's – Technology, Talent and Tolerance". These three concepts, in turn, measure technological, occupational, educational and creative factors as well as tolerance for difference and diversity. In the growth model developed by Florida, all of these factors are essential in building the creativity that makes economic growth happen. Linking creativity to growth, however, is not a new path in growth literature. How does Florida's approach to growth research distinguish itself from previous writings?

1.1 Background

The neoclassical theory of economic growth came into being with a classic paper by Solow (1956). In the Solow model, growth occurs as the effect of capital accumulation. Capital and homogenous labor serve as the only factor inputs, the aggregate production function displays constant returns to scale, and the rate of saving is exogenous. As a workhorse model, it has proven exceptionally useful, even though it does not attempt to account for all stylized facts and empirical regularities in observed economic development.

Subsequent papers therefore attempted to extend Solow's approach in a number of directions. One particularly influential direction has been so-called new growth theory, pioneered by Lucas (1988) and Romer (1990) who explicitly endogenize the rate of technological change. In Romer (1990) accumulation of knowledge occurs as the result of research and development in a monopolistically competitive market structure. Firms choose an optimal level of R&D spending, spurred by the possibility of 'striking gold' – i.e. making a commercially viable innovation – which can then be produced and sold at above marginal cost. Lucas, on the other hand, considers human capital accumulation through education as the main engine of growth.

Both papers suggest a plausible mechanism through which optimizing behavior endogenously generates a rate of technological progress.

Another approach to the study of growth has been institutional analysis, where the works of North (1990) and Olson (1965, 1982) deserve a mention. Although their analytical approaches only partially overlap, both authors, often drawing on detailed descriptive evidence, persuasively demonstrate how various institutional arrangements can have large impacts on aggregate outcomes.

There is a voluminous empirical literature that examines the linkages between a number of proposed explanatory variables and the growth rate, usually by employing panel techniques. As noted Levine and Zervos (1993), there are a number of statistical problems involved in such an approach, e.g. it is doubtful whether it can really be plausibly argued that different countries in the sample are really just observations drawn from a distinct population. Another influential critique of this strand of the literature comes from Levine and Renelt (1992), a paper in which the authors use extreme bound analysis to test for robustness. The result is startling: only the variables investment share of GDP and trade to GDP are robustly correlated to economic growth. The Levine and Renelt paper has subsequently been criticized for imposing too strict a definition of robustness (e.g. by Sala-i-Martin, 1997). Nevertheless there is near consensus that results in cross-country growth regression studies must be interpreted with great caution, and that there are some pertinent questions on causality and model specification that are as of yet unanswered.

1.2 Purpose

The purpose of this thesis is to examine the usefulness of Richard Florida's "Three T's" in explaining economic development. This is relevant as Florida has attained significant stature in the area of city development, and his views on national economic development are increasingly influential among policy makers. This is especially true as the theory developed by Florida, in contrast to much of the academic growth literature, is concise and accessible even to non-academics.

Florida does examine some of these relationships in his original paper, but only rather superficially. Therefore, this paper aims to provide a more extensive picture of how the Three

T's and the various components that make up the model empirically relate to economic development. It will also discuss the theoretical underpinnings of Florida's growth model.

There are two main areas with regards to Florida's work that need to be addressed in order to determine its usefulness:

Model construction: How does Florida handle standard model-building problems, such as weighting and delimitation? Of special interest in this area are '*threshold issues'.* The model employed in "Europe in the Creative Age" is to a significant degree 'transplanted' from Florida's earlier city development work. The transition between city and country level poses several interesting theoretical questions. Do assumptions that hold on city level remain valid when transferred to the national level?

Causality: How reasonable are the causality assumptions behind the model? Is it reasonable to assume that the correlations picked up by the model indicate a causal relationship?

1.3 General approach

How should these problems be dealt with when attempting to determine whether the ECI represents a useful contribution to growth theory? This paper will employ a two-pronged approach.

First, the results presented in Florida and Tinagli (henceforth F & T) will be examined empirically, principally through linear regression (OLS). The regression approach does not constitute a direct examination of the causality assumptions made in "Europe in the Creative Age", but do provide information about correlation. While correlation does not in itself prove causation, the presence (or absence) of correlation often can provide useful hints regarding causation.

A second issue is the use of OLS, rather than alternative, non-linear regression methods. As the background section makes clear, examining the causes of growth is a difficult business. Determining the exact nature of the (most likely quite dynamic) relationships between the

variables being examined is even more difficult. Nevertheless, model testing in the original F&T paper is performed using linear correlation assumptions. This decision is not discussed in the paper. For practical reasons, however, multiple alternate specifications will not be examined in this paper. It should be noted that the linearity assumption constitutes a potential weakness, in this paper, as well as in F&T's "Europe in the Creative age".

Besides the empirical approach, it is also important to scrutinize the individual assumptions underlying the theory. Again, discussing the reasonableness of causality assumptions must be an important part of any such inquiry. This is especially true for the threshold-related issues mentioned above. No generalized method will be employed in the theoretical discussion, and each issue will be discussed on an individual basis. This is simply because the mode spans such a wide range, from the provision of cultural goods to migration.

I do not aim to resolve the issues raised in the theoretical discussion section, as that would broaden the scope of this paper beyond reasonable limits. Instead, I will attempt to point out issues that are likely to have a major impact on the ECI model, and attempt to determine how F&T address these issues in "Europe in the Creative Age".

It is my hope, that when combined, the empirical and theoretical portions will provide a useful framework in which to evaluate the ECI; both as an academic contribution, and as a policy tool.

1.4 Data

Data regarding "The Three T's" is taken from Florida and Tinagli (2004). Data on GDP/Capita and economic growth is taken from the official annual national accounts statistics of the OECD.

The principal weakness of the dataset is the small number of observations. As this is due to the limited time horizon and country selection in Florida's original paper, it is difficult to ameliorate this problem, however.

2. Model overview – Technology, Talent and Tolerance

This section provides an overview of the theory employed by F&T in explaining European economic performance.

2.1 The Three T's in relation to other growth theory

There are obvious parallels between Florida's "Three T's" and standard economic growth theory. Even though F&T are less formalistic in hypothesizing about the mechanisms of economic growth, many of their ideas can certainly be found in mainstream growth theories. Florida himself conceives of the relationship as follows:

"Traditional models say that economic growth comes from companies or jobs or technology. This report argues that these models are good starting points but they are incomplete."

According to F&T, how does this incompleteness manifest itself?

- *Technology* plays a crucial role in all growth models, either simply as an exogenous process as in the augmented Solow model, or – in more realistic specifications – as the result of conscious efforts to enhance productivity by researchers (Romer, 1990).

- *Talent:* Florida's emphasis on *Talent* is also consistent with conventional wisdom, e.g. models where long run growth comes from human capital accumulation.

- *Tolerance*: The proposition that "culture", however defined, may impact economic growth is not new and is the subject of a number of studies, particularly in political science. (cf. Weber, 1904; Swank, 1996; Franke et al., 1991; Granato et al. 1996).

Where F&T's analysis does differ, however, is in the introduction of the concept of the "creative class", and its interaction with a 'culture of *Tolerance'*, and associated skilled labor mobility in generating strong economic growth. "Creative class" is a more expansive concept than common measures of human capital, and tolerance, however measured, is usually not an integral part of growth modeling.

2.2 Important concepts

All of the explanations of the Three T: s given above are purely theoretical. How does F&T go about measuring these factors? In "Europe and the creative class", three proxy variables each for Technological development, Talent and Tolerance are used. Each group of three variables is then grouped into the three main sub-indexes (Technology, Talent and Tolerance). These three indexes are finally combined into the main index, or the "Euro-creativity index", or "ECI" for short.

The table below gives an overview of the makeup of the Euro-creativity index employed by F&T:

2.2.1 The Euro-Creativity Index:

Table 1.

Index	Sub-Indexes	Description	Source
Talent	Creative Class	Employed in creative occupations as percentage of total employment	ILO (2002) [http://laborsta.ilo.org, data extracted on October 2002]
	Human Capital	Percentage of population 25-64 with a bachelor degree or above	OECD (2001)
	Scientific Talent	Number of researchers in scientific disciplines per thousand workforce	European Commission-Eurostat 2001)
Technology	Innovation Index	Patents applications to the US Patent Office per million population	USPTO as reported by the European Commission, DG Research, in: "Towards a European Research Area. Key Figures 2001".
	Technology Innovation Index	High-Tech Patents per million population (US Patent Office)	USPTO as reported by the European Commission, DG Research, in:"Towards a European Research Area. Key Figures 2001".
	R&D Index	R&D expenditure as percentage of GDP	European Commission-Eurostat (2001)
Tolerance	Attitudes Index	Percentage of population that express tolerant attitudes toward minorities	European Monitoring Centre on Racism and Xenophobia, EUMC and SORA Institute for Social Research Analysis (2001)
	Values Index	Degree to which a country is based on traditional values versus more rational/secular values	World Values Survey, University of Michigan http://wvs.isr.umich.edu]
	Self Expression Index	Degree to which a country recognizes and accepts self-expression values.	World Values Survey, University of Michigan [http://wvs.isr.umich.edu]

Excerpted from Florida and Tinagli (2004)

2.2.2 The Euro-Creativity Trend Index

In addition to the Euro-Creativity index (ECI), F&T employ a trend index (1995-) in order to measure changes in the factors underlying growth. The Euro-Creativity Trend Index (ECI-TREND) measures change instead of static variables. Also, the Trend Index consists of only two variables (Technology and Talent), reduced to two sub-components each. The Tolerance variable was omitted from the trend index due to data limitations.

2.2.3 Index creation

The index creation process is based on assigning the highest-ranking nation the score 15. Other nations are then assigned scores proportional to their position in relation to the highest scoring nation. I.e. if Sweden has 20 patents per 100 000 people and the leading nation has 40, Sweden is assigned a score of 7.5.

3. Empirical testing of the model

3.1 Model specification

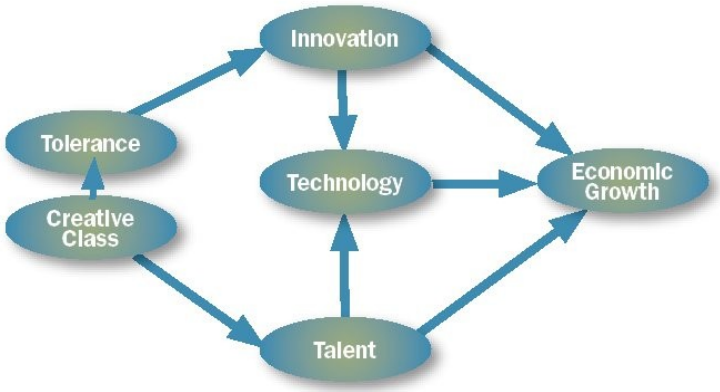
The theoretical underpinnings of the Three T's have been discussed above. The Florida-Tinagli model can be said to be a combination of "new" growth theory (endogenous technological progress through both input- and output technology- and education variables), with the addition of the "creative class" and its impact on growth, as well as a more general 'cultural' approach (I.e. the "Tolerance" variable). The tolerance variable is indirectly connected to new growth theory, as high levels of tolerance are seen as being conductive to inward flows of human capital, in addition to facilitating human capital mobilization.

3.1.1 Intended usage

When evaluating the usefulness of a model, one must take the purpose for which the model was built into account. Florida and Tinagli describe the usefulness of their model in these terms:

This report focuses on the underlying conditions which form the "ecosystem characteristics" of the creative economy that enable certain places to attract and mobilize more of these creative assets than others.

Figure 1.



Excerpted from Florida and Tinagli (2004)

As can be seen in the schematic, what the model explains is the process of economic growth, as measured by Gross Domestic Product. By presenting a theory on how economic growth is created, it allows prediction of the potential for future growth. Also, by explaining the underlying factors, the model can provide support for policy decisions intended to bolster future growth.

3.1.2 Model testing in the original paper

Three principal means of testing model usefulness are employed in Florida and Tinagli (2004). These are:

1.) Regression of the ECI / ECI-Trend against economic performance as measured by GDP levels / growth.

2.) Regression of the ECI against various measures (indices) of "competitiveness".

3.) Regression of the sub-components of the ECI against other sub-components of the ECI. (I.e. "Creative Class" against "Human Capital")

Main results of model testing in the original paper:

1.) The ECI correlates strongly with economic performance as measured by GDP levels.
2.) The ECI-Trend correlates strongly with economic performance as measured by GDP growth.
3.) The ECI correlates strongly with various other competitiveness measures.

3.1.3 Comments on model testing

While it is useful to know that the ECI correlates with GDP levels, it is unclear how useful this piece of information is in itself. If one simply wants to estimate economic performance, it is easier to observe GDP levels directly, rather than taking a detour through an aggregated index. The index has to offer something more to be useful, especially as the components are so wide in range and diverse that it is difficult to disentangle the impact of the disparate different parts.

In order to facilitate policy decisions it would rather be useful to see *which components* of the index correlate with economic performance. Also, this information is required in order to be able to begin to examine if the assumptions of causality behind the model hold. One additional mode of testing is thus to correlate each sub-component of the ECI to GDP levels.

In addition to measuring the relationship between the static ECI index and GDP levels, it could potentially be useful to examine the relationship between ECI ratings and future economic growth. A further possible extension is the creation of an alternate index, measuring "untapped" potential for growth. This is reasonably defined as the difference between level of economic development and ranking in Florida's index (such a potential ranking would be especially interesting for Sweden, that has a very high 3-T rating but only a moderately high level of GDP)

F&T find that ECI-trend correlates positively with economic growth during the period of 1995-1999. The questions regarding the ECI (such as aggregation) by nature apply to the ECI-trend as well. However, economic growth is rather volatile and sensitive to business cycles. It therefore seems important to examine different time windows in order to estimate the robustness of results.

3.1.3 Variable selection

As mentioned in section 2.1, the main departure of "The Three T's" from established growth theory lies in the inclusion of the "Euro-tolerance index" in the model. Thus, the underlying assumptions in this specific area are the ones most important to examine further.

The citation given by Florida to motivate the proposed relationship between growth and values is a paper by Ingelhart and Baker (2000). The citation for the relationship between attitudes towards immigration and growth is a paper on the development of new high-tech start-ups in the San Francisco bay area by Annalee Saxenian (1999), as well as a reference to an unspecified Canadian study.

Ingelhart and Baker do examine relationships between values ("Traditional vs. Secular/Rational" and "Survival vs. Self Expression") and GDP levels. Still, the correlation between GDP and values for a significant portion of the countries examined, what Ingelhart and Baker term "protestant Europe", is weak. The correlation between the "secular/rational" values variable and GDP for this group of countries is not statistically significant[1]. The relation between the "self-expression" variable and GDP for the same group is however significant at the 5-percent level. It should be noted that the data used in this study dates from 1980.

F&T provide rationales for including the 9 sub-components of the three main indexes. They do not attempt to rationalize their delimitation decisions, which is not surprising considering the model is essentially a 'transplant' from their earlier city development work. Similar variables used in the previous work on cities are now used to account for GDP growth.

For the technology and talent variables, non-lagged variables are used. In growth theory, it is often assumed that investments in education and research and development yield results only after a fairly significant lag. This does not pose a problem for the ECI as long as variable values are stable over time. However, the potential for abrupt changes in variable values in these categories is likely to lessen the value of these variables as predictors of economic performance.

[1] I.e., not significant at the 1,or 5-percent levels, standardized coefficient = 0.025, T-value=0.19

This issue poses a much more serious problem for the ECI-Trend. When regressing the ECI-Trend on economic growth, non-lagged annual change values in R&D investment, patents, education and occupational choice are regressed on annual change in GDP. It is highly unlikely that a short run change in for example R&D investments influence GDP growth the same year. On the other hand the annual changes in GDP certainly correlate with the business cycle in investment, which in turn is likely to have a strong effect R&D investments. In recessions GDP grows less and less is invested in R&D, which would show up in F&T's regression as a positive correlation without proving the causal relationship suggested by Florida. The same reasoning is true for other variables in the index. Overall, regressing ECT-Trend on yearly growth is not a suitable test of the model.

3.1.4 Weights

F&T do not apply any weights to the nine sub-variables, or to the three composite variables. Or rather, they have implicitly assumed that all variables have exactly the same effect on the economy. The rationale for this weighting decision is not provided in the paper.

3.2 Method

The principal method employed in this thesis is ordinary linear regression (OLS). Florida's data, in various forms, will be regressed on different measures of performance. Florida's model will also be re-specified in several ways, in order to attempt to disentangle how the different components of the model impact results, as well as to assess the robustness of his estimates. The methodology employed by F&T will also be discussed.

As noted in section 1.3, the use of OLS is not unproblematic, as the exact natures of the economic relationships examined in this paper with regards to linearity are not well known. The expected sign of the estimated coefficient is always positive, with the exception of when examining the ECI-Trend.

3.3 Explanatory power

In the following section I examine how well the Three T's are able to explain observed economic growth. The method used is OLS-regression of the index scores of the 15 countries

and various measures of economic performance. The data limitations outlined above should be kept in mind throughout all these regressions, as well as the inherent difficulty of determining causality from correlation.

All regression functions used are of the standard OLS form, i.e: $\hat{Y}_i = \hat{\beta}_0 + \hat{\beta}_1 x_1 ... \hat{\beta}_i x + \varepsilon_i$

where $\hat{\beta}_0$ is a constant.

When displaying regression results, the following format will be used:

Table 2.

Independent variable	**Name of dependent variable**	
Name of independent variable	Coefficient***	(t-value)

***=Significant at 1%, **=significant at 5%, *=significant at 10%
Adj. R^2 =

Or, when performing re-estimation of regression equations, excluding independent variables in steps, the following format is used:

Table 3.

Independent variable	**Name of dependent variable**		
Name of independent variable	Coefficient (t-value)		

Note that t-values are always displayed inside the parenthesis.

Test statistics for normality (Shapiro-Wilkes) and heteroscedasticity (White's General) tests, are displayed below the results box where appropriate. An asterisk (*) indicates that the null hypothesis has been rejected at the five percent level. The null hypothesis is:

White's Heteroscedasticity test: Homoscedasticity (I.e. no heteroscedasticity problem – if heteroscedasticity is present, this tends to make)

Shapiro-Wilkes: Normal distribution of residuals.

This provides some further input into the quality of obtained results.

3.2.1 Using the Three T's to explain GDP levels

One potential relationship between Tolerance, Technology and Talent on one hand and economic performance on the other is simply how the Euro-Creativity index and GDP level relate to each other. The theoretical justification for this potential mechanism is that high levels of tolerance, technological achievement and human capital should help build a higher level of economic achievement.

While a high correlation between a model variable and a measure of economic growth does not in itself prove the presence of a causal relationship, it can be a useful indicator in guiding future research and model development.

This first regression is the same as is used for the purpose of model testing in "Europe in the creative age". As in the original paper, the relationship between GDP level and the Euro-Creativity index is significant, despite the small number of observations. The income levels and index levels for the year 2000 are employed in this paper, as F&T used this year for comparison purposes in the original article. Results are displayed below:

Fig. 2

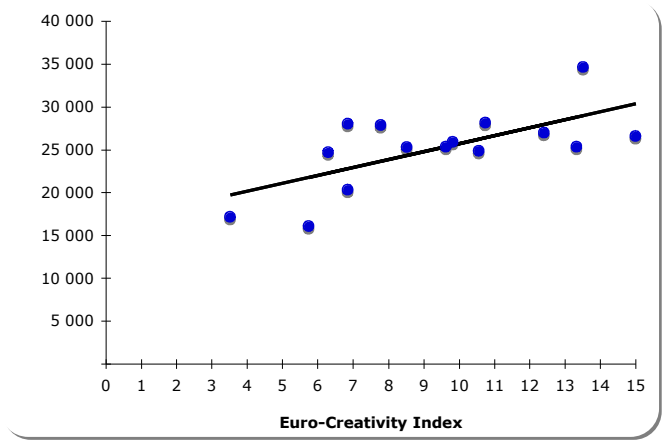


Table 4.

Independent variable	**Real GDP/Capita (2000)**	
ECI	928.29***	(3.24)

***=Significant at 1%, **=significant at 5%, *=significant at 10%
Adj. R^2=0.403, White=1.575, Shapiro-Wilkes=0.97

There is a highly significant positive relationship between per capita GDP and Euro-creativity rating. An increase in ECI by one point is associated with an increase of 928 USD in GDP per capita.

As noted in section 3.1.3, merely establishing a positive correlation between GDP and such a diverse index as the ECI is not very useful. In order to facilitate further evaluation, index sub-components need to be regressed on GDP, in order to establish exactly which real factors are associated with higher gross domestic product.

Step one in disentangling the impact of sub-components is regressing the aggregated variables, Tolerance, Talent and Tech on GDP/capita. First, each index component is regressed on Real GDP per capita separately. Results are displayed below:

Table 5.

Independent variable	**Real GDP/Capita (2000)**	
Tolerance	285.64	(0,81)
Talent	1081.87***	(3.13)
Tech	883.87***	(4.15)

***=Significant at 1%, **=significant at 5%, *=significant at 10%
Tolerance Adj. R^2=-0.025 Talent Adj. R^2=0.385 Tech Adj. R^2=0.536

Two of the variables, Talent and Tech are found to be highly significant, while Tolerance is not significant at any reasonable level. The next step is to regress all subcomponents on GDP/Capita simultaneously.

Table 6.

Independent variable	**Real GDP/Capita (2000)**	
Tolerance	-18.20	(-0.068)
Talent	238.37	(0.44)
Tech	753.53*	(1.95)

***=Significant at 1%, **=significant at 5%, *=significant at 10%
Adj. R^2=0.462, White=6.675, Shapiro-Wilkes=0.962

When examining which of the three aggregated variables correlate with growth when all are regressed simultaneously, only the Technology component is found as having a statistically significant correlation with GDP-level. While all variables have positive coefficients, both "Tolerance" and "Talent" are statistically insignificant. A 95-percent confidence interval for the coefficients of Tolerance and Talent ranges from strongly negative to strongly positive.

The lack of a statistical relation between GDP and the Tolerance variable, both when examined separately and in the context of the model is relevant, as Tolerance is one out of two index components that are original to the ECI, the other being "Creative Class". The original F&T paper does not attempt to disentangle the influence of the separate index components, and thus misses this problem. The correlation between ECI and GDP level seems to be driven by technology alone (If Technology is removed from the data Talent does become statistically significant, but not Tolerance.) This in turn indicates significant correlation between the "Talent" and "Tech" variables. Testing shows a correlation of r=0,8 between the Talent and Tech variables, confirming this high level of correlation.

In order to delve deeper into the correlation structure, the index is examined in greater detail in section 3.1.4. There, the individual sub-components will be used in place of the aggregated index.

3.2.2 Using the Three T's to explain GDP growth

Another potential relationship between the Euro-Creativity index and economic performance is the notion of high a high index score indicating, to some degree, unrealized potential for future economic growth. This is the case, for example, if there is a lag between high levels of Talent and economic growth, and if the Talent or Tolerance levels we observe have changed in recent years. In order to examine this relationship, index levels for 1998 (around when most of the data for the ECI originates) are regressed on economic growth for the period of 1998-2003.

Table 7.

Independent variable	**GDP/capita growth (ln) 1998-2004**	
Tolerance	-0.0132	(-1.30)
Talent	0.027	(1.32)
Tech	-0.0151	(-1.024)

***=Significant at 1%, **=significant at 5%, *=significant at 10%
Adj. R^2 = -0.0244, White=11.43, Shapiro-Wilkes=0.802*

As seen in the table above, results indicate that no such relationship can be found using the data at hand. None of the examined variables are correlated in any significant way with economic growth. Note however, that the time period in question is short, and that there is no obvious way to choose the parameters and time horizon of the model and regression. What we can observe is that countries with high scores in the three sub-categories of the Euro-

Creativity index did not grow at a higher rate between 1998-2004 than countries with low rankings. Two out of three components yield negative, but insignificant coefficients.

3.2.3 A closer look at economic potential

Even if no relationship between ECI level and future growth is found, this could potentially be explained by the factors measured by the ECI already having impacted GDP levels in many, if not most countries. Thus, it can be useful to disentangle the hypothesized realized impact of the ECI from potential unrealized impact.

One method of doing this is comparing GDP levels with ECI levels. If the factors measured by the Euro-creativity help determine economic growth, a gap between ECI level and GDP level could potentially be explained by a lag in the impact of the potentially growth-enhancing factors that are measured by the ECI. If this hypothesis is correct, countries with better ECI rankings than GDP rankings could be expected to grow faster than average.

In order to test this hypothesis, ECI is first allowed to predict GDP/Capita for all the examined countries. The level of GDP predicted by the ECI is then compared to actual GDP levels. Real GDP, the ECI and, the GDP level predicted by the ECI and the different between real and predicted GDP are all displayed in table 7.

The actual level of average economic prosperity (GDP 1998) is compared with what a model where GDP is explained by the ECI-index would predict. For example Austria has a relatively low ECI and "should" have a GDP of 21.535 $, but in reality achieves a higher level of 25.434 $. The difference is 3.899$. For Sweden the converse is true, despite a high ECI value Sweden achieves a low actual GDP. The difference is -4.191$ per year, a measure of potential growth if ECI has not yet had time to effect economic performance.

Table 8.

	GDP 1998	ECI	ECI-predicted GDP	GDP diff. ("potential")	Growth 1998-2004*
Austria	25 434	7.8	21 535	3 899	16.00%
Belgium	23 740	9.8	23 280	460	15.59%
Denmark	25 528	10.7	24 073	1 455	13.53%
Finland	23 240	13.3	26 293	-3 053	24.78%
France	23 436	8.5	22 169	1 267	18.33%
Germany	23 400	10.6	23 914	- 514	8.99%
Greece	14 683	5.7	19 790	-5 107	31.72%
Ireland	23 923	6.9	20 742	3 181	62.34%
Italy	23 248	6.3	20 266	2 982	10.36%
Netherlands	24 790	12.4	25 500	- 710	15.16%
Portugal	15 420	3.5	17 887	-2 467	14.44%
Spain	18 231	6.9	20 742	-2 511	25.59%
Sweden	23 530	15.0	27 721	-4 191	21.90%
United Kingdom	23 276	9.6	23 121	155	20.85%
United States	31 607	13.5	26 452	5 155	24.57%

*Due to data constraints, economic growth is measured in absolute GDP, not GDP/Capita.

Step two is regressing the size of the difference between actual and predicted GDP on economic growth. By doing this, it is possible to examine if differences between competitiveness as measured by the ECI and GDP levels are the result of a time lag in competitiveness impacting GDP growth.

In order to make the period of measurement as long as possible with good data quality, the period chosen is 1998-2004. This period yields a six-year time window, during which it will have been possible to realize at least a portion of any unrealized economic growth potential reflected by the difference between the ECI and actual GDP. The values and rankings for the variable "potential" can be now regressed on the variable "Growth 1998-2004". Results are shown in table 8.

Table 9.

Independent variable	**GDP growth**
Potential	1156.6 (0.176)
Adj. R^2	-0.074

***=Significant at 1%, **=significant at 5%, *=significant at 10%
White=1.215, Shapiro-Wilkes=0.767*

No relationship between the Potential variable and GDP growth can be found at any reasonable significance level. Countries that have low levels of GDP compared to ECI

rankings do not grow any faster than those that are already above the levels of income that is given by the European Creativity index.

3.2.4 Testing model sub-components (ECI)

Above it was shown that only one of the three Ts was correlated with growth. However each main ECI component (Tolerance, Talent, Technology) is in turn comprised of three sub-indices. It is thus relevant to examine to which extent the sub-components can explain variation in economic performance between nations.

Therefore, the nine sub-components are regressed on GDP/Capita for 2000. In step one, all sub-components are regressed separately on GDP/Capita. In step two, all variables are regressed simultaneously on GDP/Capita. Variables with the 'wrong' sign are then excluded from the regression. In step three, highly insignificant (I.e. $p > 0,5$) variables are excluded from the regression. Results are displayed in the two tables below:

Table 10.

Independent Variable	GDP/Capita 2000	
R&D	Technology	765.43** (2.80)
Values	Tolerance	4.89 (0.026)
High-tech innovation	Technology	845.86*** (3.59)
Human Capital	Talent	583.53 (1.72)
Scientific Talent	Talent	904.70** (2.74)
Creative Class	Talent	771.86* (2.02)
Attitudes	Tolerance	684.28 (1.35)
Self-Expression	Tolerance	905.77*** (3.77)
Innovation	Technology	982.81*** (4.41)

***=Significant at 1%, **=significant at 5%, *=significant at 10%

Table 11.

Independent variable	GDP/Capita 2000					
R&D	Technology	-784.5 (-0.38)				
Values	Tolerance	-155.17 (-0.75)				
High-tech innovation	Technology	-757.71 (-0.49)				
Human Capital	Talent	-321.1 (-0.36)				
Scientific Talent	Talent	461.6 (0.17)	-232.8 (-0.51)			
Creative Class	Talent	490.5 (0.47)	308.4 (0.87)	231.0 (0.75)		
Attitudes	Tolerance	412.5 (0.58)	384.9 (0.94)	292.3 (0.83)	232.7 (0.69)	
Self-Expression	Tolerance	508.7 (0.87)	386.9 (1.32)	404.4 (1.45)	448.4* (1.67)	495.4* (1.96)
Innovation	Technology	1602.5 (1.11)	660.8* (1.92)	553.6* (2.13)	615.8** (2.56)	618.8** (2.63)
Adj. R^2		**0.54**	**0.58**	**0.61**	**0.63**	**0.65**
Shapiro-Wilkes		**0.943**	**0.966**	**0.968**	**0.962**	**0.954**

***=Significant at 1%, **=significant at 5%, *=significant at 10%
No White's test was performed due to too few degrees of freedom.

While six out of nine variables examined were significant at some reasonable level when regressed separately on GDP levels, only two remain so after "culling" ("Self-Expression" from the Tolerance category and "Innovation" from the Technology category.), indicating significant correlation between regressors.

3.2.5 Using the change index to explain growth

Yet another potential relationship between growth rate and the Three T's is the relation between change in the Technology, Tolerance and Talent variables and changes in GDP. The underlying assumption would be that changes in growth-inducing factors also change levels of economic growth. The European Creativity Trend Index (ECI-TREND) is an attempt to model this potential relationship. However, data limitations have forced F&T to convert the three T's into two T's. The Tolerance variable is thus omitted from the change index. Also, the three sub-variables in Talent and Technology are reduced to two in the ECI-TREND. As the year 1995 is used as baseline by Florida & Tinagli when creating the ECI-TREND, it is also used as starting year when comparing the ECI-TREND to actual economic growth.

While the relationship between the ECI-TREND and economic growth for the period of 1995-1999 is examined in the original paper, it is still interesting to examine the impact of the individual sub-components of the ECI-TREND. The sub-components of the ECI-TREND are not ranked in the same fashion as those of the ECI. Rather, only rank order is provided in the original paper, with a rank of 1 indicating the highest level of growth. Thus, when regressing GDP growth (in percent) on index components (I.e. *difference-on-difference*), a negative coefficient indicates a positive correlation with growth. Also, as economic growth measured during a relatively short time period can be volatile, three different period lengths are examined. (1995-98, 1995-99 and 1995-2000) The regression is carried out in three stages. First, explanatory variables with the 'wrong' sign (i.e. positive) sign are dropped. Then, highly insignificant variables are dropped. Results are displayed in table 10-12 below:

Table 12:

Independent variable	**GDP/Capita growth (ln) 1995-99**		
Growth in R&D	0.0020 (0.020)		
Growth in Patents	-0.00098 (-0.12)	-0.00026 (-0.039)	
Growth in Scientific Talent	-0.018* (-2.07)	-0.017** (-2.67)	-0.017*** (-3.45)
Growth in Creative Class	-0.0095 (-1.62)	-0.0094 (-1.69)	-0.0094* (-1.85)
Adjusted R^2	0.40	0.45	0.50
Shapiro-Wilkes	0.874*	0.861*	0.862*

***=Significant at 1%, **=significant at 5%, *=significant at 10%
No White's test was performed due to too few degrees of freedom.

Table 13:

Independent variable	**GDP/Capita growth (ln) 1994-00**		
Growth in R&D	0.0020 (0.14)		
Growth in Patents	-0.00082 (-0.98)	-0.00012 (-0.012)	
Growth in Scientific Talent	-0.024** (-1.84)	-0.022** (-2,42)	-0.017*** (-3.45)
Growth in Creative Class	-0.015 (-1.74)	-0.015* (-1.82)	-0.0094* (-1.85)
Adjusted R^2	0.40	0.45	0.50
Shapiro-Wilkes	0.849*	0.839*	0.840*

***=Significant at 1%, **=significant at 5%, *=significant at 10%
No White's test was performed due to too few degrees of freedom.

Table 14:

Independent variable	**GDP/Capita growth (ln) 1996-98**		
Growth in Patents	0.00076 (0.19)		
Growth in R&D	0.00028 (-0.054)	0.00018 (0.041)	
Growth in Scientific Talent	-0.010** (-2.32)	-0.010** (-2.43)	-0.010*** (-4.01)
Growth in Creative Class	-0.0039 (-1.53)	-0.0040 (-1.43)	-0.0040 (-1.53)
Adjusted R^2	0.46	0.51	0.55
Shapiro-Wilkes	0.923	0.926	0.922

***=Significant at 1%, **=significant at 5%, *=significant at 10%
No White's test was performed due to too few degrees of freedom.

The main result from these regressions is that the rank order of the variable "growth in scientific talent" correlates highly with GDP growth. The rank orders of the other variables are never statistically significant during any of the time periods examined.

3.3 Summary of principal empirical results

This section will discuss the usefulness of the ECI and ECI-Trend in predicting economic growth and / or making policy decisions. It will be divided into three sections: The first will focus on methodology, the second on regression results, and the third section will provide a brief conclusion, combining the results of the two preceding sections.

As Milton Friedman (1953) famously noted, the impact of theoretical objections against a model is limited if the model consistently succeeds in providing useful results. Thus, before discussing the methodology employed by Florida & Tinagli, here follows a summary of the regression results obtained in section 3 of this paper. For the rationale behind using OLS in examining the relationship between growth and the ECI, see section 3.2.

3.3.1 Results in testing the ECI vs. GDP levels

While the aggregated ECI index is strongly correlated with GDP levels, only two sub-components are positively correlated with GDP: Technology and Talent. When regressed simultaneously, only Technology is significant, while Talent is found to be positively, but

insignificantly correlated with GDP. Tolerance is found to have a significant correlation to GDP levels in neither case.

When further disentangling the effects of the individual real variables that make up the Three T's, six variables are positively correlated to GDP. However, only two variables are found to have any significant statistical relation to GDP in a simultaneous regression: Innovation (moderately correlated) and self-expression (weakly correlated).

3.3.2 Results in testing the ECI vs. GDP growth

The ECI is not found to have any statistical relationship to future growth. In order to ameliorate the problem of competitiveness not impacting growth with identical lags in all countries, a measure of unrealized growth potential as measured by the difference between the ECI ranking and actual GDP was computed. No statistical relationship between this new measure of growth potential and actual GDP growth was found.

3.3.3 Results in testing the ECI-Trend vs. GDP growth

A high rank order in the Scientific Talent variable of the ECI-Trend index is found to be strongly related to economic growth. A high rank order of the creative class is weakly correlated to economic growth in two out of the three time periods examined. For all other variables, no statistically significant relationship was found.

4. Theoretical discussion

4.1 Model construction

The novel contribution of the Three T's is not the proposition that technology or high levels of human capital have a positive influence on growth, but the emphasis on Tolerance and other cultural factors as conductive to growth.

High tolerance is modeled as conductive to attracting creative people. F&T also expand their focus on human capital from academic talent to include cultural talent. They also provide a rudimentary case for why Tolerance should influence growth positively. Yet these disparate factors are brought together in a single index, which is intended to explain growth and to guide policy.

If the intention of F&T is to provide a comprehensive model, there are many other factors that we have reason to believe to be related to growth. Tax policy (cf. Jones, Manuelli & Rossi, 1993) capital accumulation (cf. Solow, 1956), trade (cf. Frankel & Romer, 1999) and governance (Porta et. al, 1999) are examples of such factors. If the idea of the authors was rather to focus on the portions of the Three T's that constitute original contributions, it would most likely have been more useful to present them as components, to in turn be "plugged" into more extensive growth models.

The 'component approach' would also have made examining the model easier. As observed in section 3.2.1, the Tolerance variable was not found to have any statistically significant relationship to growth. It is not possible to disentangle the impact of the individual components in any of the model testing performed in the original paper. Thus, there is significant risk of confusion if the model is used for policy purposes without further examination.

A short illustration of the problem posed by excessive aggregation: It is possible to conceive of an alternative index intended to predict growth that includes capital formation, share of population with college degrees and SUV-sales. It would quite likely yield strong empirical results. It is, however, doubtful if one should base policy on these aggregated results.

The factors measured in the Three T's model are not merely described as possible contributing factors in creating growth, but are instead established by F&T as the main driving forces behind modern economic development. In academic growth theory such certain claims are rare (for good reason). This in turn suggests the presence of a significant burden of evidence on those making the claim.

There are further problems present. The ECI uses three variables, each made up of three subcategories, to explain economic growth. Even if we were to accept that all nine categories have a positive impact on growth, it seems highly unlikely that the impact would be entirely equal. But the index does in fact weigh the effect of all the nine diverse factors to be exactly equal. No rationale is provided for this (note that not making a weighting decision is equivalent to making one). It should be noted however, that index creation without quantified impact assumptions is a very widespread phenomena in business and economics.

Issues relating to the arrows of causality are another important problem facing any prospective model builder. In the case of the Three T's model, transplantation issues further complicate any reasoning about causality, as the model originates in a field very different from national growth theory.

4.2 Transplantation issues

Richard Florida originally did most of his work in city development. The transferring of the Three T's model from that field to national policy produces several problems that need to be addressed in order for model usefulness to be successfully established.

The most cited portion of Florida's work relates to how a city should attract Talent, partly though providing a tolerant and vibrant atmosphere. But this is far more relevant for cities than for nations, for the simple reason that people flow much more easily between cities in the same country than between nations - see for instance Decressin and Fatas (1995). Mobility with regards to almost any variable is lower between nations with similar income levels than for cities within a country. This means that labor flows induced by both economic and social factors are usually limited in size and scope. For example, gay people are much less likely to move from southern Europe to Holland than from rural areas to larger cities, in spite of the relatively high level of tolerance on display in the Netherlands.

Furthermore, cities specialize to a much larger extent than nations. Even if Florida's theory on the importance of tolerance in attracting talent and developing technology holds, it is most likely sufficient that a few parts of a nation are tolerant. If all of Switzerland except the larger cities and university towns suddenly become intolerant the entire nation will receive a low overall tolerance raring. But they may well attract as much talent as they did before to the

tolerant areas. The "intolerant" areas can simply specialize in producing goods that are not intensive in the production factors that tolerance-sensitive talent produces, and trade the rest. See for instance Krugman (1991) on differing patterns of development in "core" and "peripheral" areas. F&T do note the limitations placed on the paper because of data not being regionalized in their conclusion, but do not attempt to address this issue further.

4.3 Causality

Perhaps more importantly, the mechanisms through which Florida's model is supposed to function are largely left unexplored. This is somewhat problematic, as the question of causality is of central importance when constructing a model of economic growth.

The main instrument through which tolerance is assumed to add to economic development is via the mobilization and / or attracting of talent. Yet, no direct attempt is made by Florida to quantify these factors. Rather than attempting to measure net flows of, say, PhD students or artists between nations, a distant proxy – attitudes to all minorities, including unskilled immigrants and refugees, is used. This results in the one nation in the world that attracts the most talent by far (Solimano, 2002), the United States, scoring low on the Tolerance index. This factor is compounded by no attempt having been made to quantify US attitudes towards minorities. Instead, the US tolerance level is determined solely by national attitudes towards social issues unrelated to minorities and immigration. This is explained by a lack of comparable data, as the EUMC does not provide statistics for the United States. Still, it is questionable if the rating being determined by wholly unrelated factors was a better option compared to using somewhat different, but roughly equivalent data.

Moving on, Tolerance is not the only force that determines the flow and / or mobilization of talent. Economic incentives, research possibilities (or creative work in general), language, taxes and wages are other determinants. And attracting talent is not enough. In order to influence growth, talent has to be utilized, through engagement in qualified work.

The situation in Sweden can be used to illustrate this factor: Educated people entering Sweden frequently face difficulties finding even menial work below their level of qualification. (Swedish Integration Board, 2004) Florida and Tinagli do not attempt to quantify this factor. Of course, when constructing a model it is not desirable to model every single factor involved

in a complex process, for reasons of parsimony. However, when one chooses to model a complex system using very indirect variables (such as modeling human capital flows via general attitudes to immigration, or unrelated social attitudes), it is reasonable to expect a more detailed treatment of the issues involved.

All these issues taken together suggest that future research into Florida's index should also attempt to examine the direct mechanisms that The Three T's are theorized to work though. To what degree does tolerance actually attract talent? To the extent research is published internationally, does academic research increase the growth rate of the country where it was conducted? How important is non-technical talent (artists, entertainers) for growth?

And of course, how does causality flow with regards to creative occupations? A simple illustration of this conundrum is provided by consumption patterns with regards to culture. A larger proportion of New Yorkers earn their living as novelists and painters than do rural Indians. It seems likely that spending on the arts and entertainment to a large degree depends on income level, rather than Indian poverty being explained by an Indian artist shortage.

When it comes to cultural production this is an obvious question. Opulent Stockholm attracts more actors and opera singers than rural Norrland. Perhaps this is partly due to tolerance, or agglomeration factors, but to a large degree it is most likely simply demand driven. These effects are entangled in Florida's model.

Cause and effect are not merely a matter of "how" and "where" – another important aspect is "when". This issue is especially important with regards to the ECI-Trend index, which attempts to capture the impact on economic growth of changes in ECI components over time.

The ECI-trend index as currently designed assumes roughly coincidental impact from changes in the ECI on GDP growth. Model testing in the original paper is based on regressing changes in the modified ECI index between 1995-99 on GDP growth between 1995-1999. This presents a potentially large methodological problem: if rates of change have not been stable for a significant period of time, it is unclear what effect rates of variable change could be said to have on coincidental growth. An increase in the number of patents, for instance is likely to yield real result only after a significant time lag.

5. Conclusion

The Florida-Tinagli indexes of economic growth potential and competitiveness correlates moderately with levels of economic development, as well as with growth. However, these correlations are usually explained by one or two variables in simultaneous regressions. The original contributions of Florida and Tinagli to growth theory, as represented by the Creative Class and Tolerance variables, do not appear to be significantly correlated with levels of economic performance. Changes in the Creative Class variable are mildly correlated with economic growth during some time windows, however. Also, differences between the level of economic performance predicted by the F&T model and actual performance do not appear to be correlated with future economic growth. These results should be interpreted with caution however, both because of the inherent problems of cross-country, regressions, as well as the limited number of observations available.

On the methodological side, the model proposed by Florida and Tinagli suffers from several problems. Variable choice appears to be mostly arbitrary, as is weighting of variables. There is no discussion present regarding the impact of lags on measuring connections between growth and other factors. Causality assumptions are hardly scrutinized and input and output variables are mixed without mentioning the problems this might bring on. Issues created by the transplantation of modeling assumptions and concepts from the city to national level are not discussed.

Because of these empirical and methodological issues, it recommended that the ECI and ECI-Trend should be interpreted and applied with great caution, especially with regards to policy decisions.

6. Appendix

ECI – aggregated makeup

	ECI	ECI (re-normed)	Tolerance	Talent	Tech
Austria	0.42	7.78	7.76	6.81	4.39
Belgium	0.53	9.81	7.35	10.95	5.35
Denmark	0.58	10.74	12.9	10.5	5.89
Finland	0.72	13.33	9.49	13.22	9.57
France	0.46	8.52	7.38	7.93	5.34
Germany	0.57	10.56	9.45	9.25	6.97
Greece	0.31	5.74	5.58	7.61	0.83
Ireland	0.37	6.85	4.22	9.48	3.09
Italy	0.34	6.30	7.17	5.86	2.4
Netherlands	0.67	12.41	11.42	12.86	5.83
Portugal	0.19	3.52	1.99	5.37	1.19
Spain	0.37	6.85	6.57	8.31	1.55
Sweden	0.81	15.00	15	10.72	10.92
UK	0.52	9.63	7.7	10.81	5.01
USA	0.73	13.52	3.07	15	15

Source: Florida and Tinagli (2005)

ECI – sub-components, part I

	Tolerance			Technology	
	Attitudes	Values	Self-Expression	Innovation	High-tech innov.
Austria	11.10	2.06	10.00	3.67	1.00
Belgium	9.35	4.50	8.11	4.19	2.28
Denmark	12.47	10.41	13.24	4.48	3.08
Finland	13.83	7.50	7.03	6.14	6.39
France	10.91	4.59	6.55	3.29	2.37
Germany	10.32	10.59	7.30	6.33	2.56
Greece	5.65	6.84	4.19	0.10	0.09
Ireland	12.66	-8.63	8.58	2.05	0.68
Italy	13.44	1.69	6.28	1.52	0.75
Netherlands	12.66	7.59	13.85	4.43	3.49
Portugal	11.10	-8.34	3.18	0.05	0.02
Spain	15.00	0.84	3.78	0.38	0.18
Sweden	14.81	15.00	15.00	9.33	5.25
United Kingdom	11.30	2.44	9.26	3.43	2.56
United States	11.76*	-4.97	11.08	15.00	15.00

Source: Florida and Tinagli (2005)
* - inferred value

ECI – sub-components, part II

	Technology	Talent		
	R&D	Creative Class	Human Capital	Scientific Talent
Austria	7.22	8.44	3.50	6.86
Belgium	8.03	14.95	6.65	8.63
Denmark	8.39	10.50	3.05	9.12
Finland	13.38	14.27	7.22	15.00
France	8.80	11.26*	5.92	8.67
Germany	9.97	9.06	7.89	8.57
Greece	2.07	11.01	6.37	3.63
Ireland	5.64	12.97	5.98	7.23
Italy	4.22	6.58	4.91	4.70
Netherlands	7.86	14.73	13.65	7.13
Portugal	3.16	6.55	3.67	4.62
Spain	3.65	9.72	7.89	5.32
Sweden	15.00	10.56	7.11	11.92
United Kingdom	7.58	13.33	8.68	7.82
United States	10.62	15.00	15.00	11.41

Source: Florida and Tinagli (2005)
* - inferred value

ECI-TREND – rank order

	Growth in Creative Class*	Growth in Scientific Talent*	Growth in Patents*	Growth in R&D*	Ranksum*	ECI-TREND
Austria	10	3	9	8	30	0.34
Belgium	5	10	7	5	27	0.35
Denmark	4	11	3	6	24	0.38
Finland	10	2	6	1	19	0.6
France	15	13	15	15	58	0.08
Germany	8	14	12	11	45	0.2
Greece	12	6	4	9	31	0.36
Ireland	1	1	2	2	6	0.89
Italy	6	15	11	13	45	0.18
Netherlands	2	8	10	12	32	0.27
Portugal	14	4	1	3	22	0.51
Spain	9	5	8	4	26	0.37
Sweden	3	9	5	10	27	0.35
United Kingdom	13	12	13	14	52	0.15
United States	7	7	14	7	35	0.33

*Rank
Source: Florida and Tinagli (2005)

Real GDP/Capita levels:

	1999	2000	2001	2002
Austria	26 504	27 865	28 373	28 872
Belgium	24 554	25 916	27 096	27 716
Denmark	27 004	28 144	29 223	29 231
Finland	23 668	25 359	26 390	26 495
France	24 235	25 293	26 552	27 217
Germany	24 029	24 851	25 456	25 917
Greece	15 220	16 073	17 020	18 439
Ireland	25 922	28 035	29 822	32 646
Italy	23 766	24 682	25 377	25 568
Netherlands	25 578	26 982	28 711	29 009
Portugal	16 368	17 150	17 886	18 434
Spain	19 477	20 317	21 347	22 406
Sweden	25 106	26 576	26 902	27 209
United Kingdom	24 014	25 322	26 627	27 948
United States	33 013	34 602	35 179	36 121

Source: OECD (2005)

GDP growth:

	Growth 95-99	Growth 94-00	Growth 96-98
Austria	14.3%	20.9%	8.2%
Belgium	12.8%	20.8%	6.8%
Denmark	14.1%	23.7%	8.2%
Finland	23.7%	35.7%	15.8%
France	12.1%	19.0%	6.6%
Germany	7.9%	14.0%	4.0%
Greece	15.8%	23.4%	9.7%
Ireland	59.0%	84.7%	30.5%
Italy	9.8%	15.8%	4.9%
Netherlands	19.6%	27.3%	11.6%
Portugal	21.9%	27.2%	12.6%
Spain	19.1%	27.3%	11.2%
Sweden	17.1%	27.3%	7.7%
United Kingdom	15.8%	25.6%	9.5%
United States	20.9%	30.3%	12.9%

Source: OECD (2005)

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