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**Creative Class as a Determinant of Economic Development
Empirical Considerations
for North Rhine-Westphalian Regions
Based on Time Series Analysis**

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Rüdiger Hamm

0 Introduction

With his publications on the creative class Richard Florida gained a wide but controversial attention: Theoretical oriented regional scientists have discussed and to a certain extent criticized his ideas, some of the more empirically oriented regional economist tried to test his approach with statistical data for different countries using a broad variety of more or less sophisticated methods. Finally, people working in local and regional business development agencies and politicians are thinking about the consequences Florida's ideas might have on regional economic policy and on strategies in business development.

The research described in this paper¹ analyzes whether and to which extent the region's share or number of creative people determines regional economic development. It can be seen as an extension of empirical analysis on the role of the creative class for German regions, inasmuch as it concentrates on a certain part of Germany – namely North Rhine-Westphalia – and as it uses first and foremost methods of time series analyses. Starting with a description of the most relevant theoretical relationships for the research questions of this paper (chapter 1), Chapter 2 will bring into focus the results of these (time series) regressions. These results suggest that there is a positive influence of a region's creative class employment on other employment in that region. But that relationship can only be observed in one part of the North Rhine-Westphalian regions and it does not apply to others. As this result is underpinned by some additional considerations based on cross section regressions the paper finally (chapter 3) deals with the question whether some additional conditions must be fulfilled by the regions to get the relationship work well. The paper ends with a summary.

1 Some Basic Theoretical Considerations

Meanwhile Richard Florida himself has written some books² and many papers dealing with his ideas on the creative class. A number of other authors have described, adapted, discussed, criticized and

¹ This research has been done at Niederrhein Institute for Regional and Structural Research (NIERS) financed by the Northrhine-Westphalian Ministry for Economics, Energy, Construction, Housing and Transport and the European Union. Cf. Gottschalk, Ch., Hamm, R. und Imöhl, I. (2010), Die Bedeutung der Kreativen Klasse für die wirtschaftliche Entwicklung der nordrhein-westfälischen Regionen. Unpublished Final Report. Mönchengladbach 2010.

² Cf. R. Florida (2002), The rise the creative class and how its transforming work, leisure, community and everyday life. New York 2002; R. Florida (2005), The Flight of the Creative Class: The New Global Competition for Talent. New York 2005; R. Florida (2005), Cities and the Creative Class. New York 2005.

refined Florida's ideas. As the aim of this paper cannot be to give a survey on the creative class literature it must concentrate on some theses which are basic for the empirical research done here.

Florida's "creative capital theory" combines elements of human capital theory and cluster theory. His first central thesis is explained by himself in the following way: "Essentially my theory says that regional economic growth is driven by the location choices of creative people – the holders of creative ideas."³ So in his first central thesis Florida stresses the importance of talented people for regions' and cities' economic development. Further on Florida says: "It (*Florida's theory*) thus differs from the human capital theory in two respects: (1) It identifies a type of human capital, creative people as being key to economic growth; and (2) it identifies the underlying factors that shape the location decision of these people, instead of merely saying that regions are blessed with certain endowments of them."⁴ But while the formal level of skills is the decisive factor in traditional human capital theory, creativity needed for an occupation plays this role in Florida's theory.

But who belongs to the group of people in occupations with high creative requirements? "The Creative Class consists of people who add economic value through their creativity."⁵ Florida differentiates three types of creativity, which influence and strengthen each other and finally foster regional development: Technical creativity or ability to innovate, economic creativity in the sense of entrepreneurship and cultural creativity. Based on this definition he distinguishes three groups of creative people:

- The creative core generates new knowledge with engineers and all kind of scientists being members of this group.
- The creative professionals support economic development by applying knowledge in new combinations. Lawyers, managers and technicians are examples for group members.
- The bohemians are the artistic part of the creative class. They offer a high level of attractiveness for the creative core and for creative professionals with musicians, writers and designers as examples.

Florida's second central thesis says that creative people do not follow jobs, but that jobs follow creative people; therefore entrepreneurial location decisions are more and more determined by the living conditions preferred by creative people,⁶ with the consequence that „*Access to talented and creative people is to modern business what access to coal and iron ore was to steelmaking. It determines where companies will choose to locate and grow, and this in turn changes the way cities must compete.*“⁷ Hence location choice of creative people becomes relevant for entrepreneurial decisions.

But Florida's considerations are highly relevant from the regions' point of view, too. In his opinion only those countries, regions and cities will grow which are successful in attracting a sufficient number of creative people. For this regions must cope with the specific needs of the creative class: "*The physical attractions that most cities focus on – building, sports stadiums, freeways, urban malls and tourism- and entertainment districts that resemble theme parks – are irrelevant, insufficient, or actu-*

³ Florida, R. (2002), p. 223.

⁴ Florida, R. (2002), p. 223.

⁵ Cf. Florida, R. (2002), p. 68.

⁶ Cf. Fritsch, M.; Stützer, M. (2007), Die Geographie der kreativen Klasse in Deutschland; In: Raumforschung und Raumordnung, 65,1; p. 16.

⁷ Cf. Florida, R. (2002), p. 6.

ally unattractive to many Creative Class people.⁸ Instead of that the creative class is highly attracted by a climate of tolerance, openness and cultural diversity because such an environment gives the possibility to be integrated without losing the own identity and to gather new experiences and impressions that can be stipulating and inspiring for innovative processes. This makes the core of Florida's third central thesis⁹ in which the „3 T's“ – talents, technology and tolerance – play an outstanding role: „*The key to understanding the new economic geography of creativity and its effects on economic outcomes lies in what I call the 3T's of economic development: Technology, Talent and Tolerance.*“¹⁰

- Technology: Intensive use of modern technologies always is a condition and an implication of a creative milieu.
- Talents not only mean the number of qualified people but rather their ability for innovative and creative action.
- Tolerance: A milieu of openness and diversity increases the attractiveness of regions; this aspect plays a key role in Florida's concept.

In Florida's opinion not only one of these 3T's but their combination is decisive for a region's economic success: „*Each is a necessary but by itself insufficient condition: To attract creative people, generate innovation and stimulate economic growth, a place must have all three.*“¹¹

It should be also mentioned that Florida's ideas have been the aim of considerable criticism. One of the most critical points is his definition of the creative class. His critics – Glaeser might be the best known of them – say that Florida's creative core highly resembles the highly skilled workforce. So Florida is in fact analyzing the influences of human capital on regional development¹² and by this is reinventing the widely accepted human capital theory.¹³ Florida of course contradicts to that by stressing that innovations are not the result of a certain level of education but of the creative potentials. Empirical studies from different countries (Sweden, Netherlands, and France) suggest that the creative class is more capable in explaining regional developments than “traditional” human capital.¹⁴

⁸ Cf. Florida, R. (2005), *Cities and the Creative Class*. New York, S. 36.

⁹ Cf. Merx, A. (2005), Standortfaktor Toleranz. Review of “The Rise of the Creative Class”, p. 4.

¹⁰ Florida, R. (2002), p. 249.

¹¹ Florida, R. (2002), p. 249.

¹² Cf. Fritsch, M.; Stützer, M. (2007), Die Geographie der kreativen Klasse in Deutschland. *Raumforschung und Raumordnung*, 65,1; S. 17.

¹³ Cf. Glaeser, E.L. (2004), Review of Richard Florida's “The rise of the creative class”. *Regional Science and Urban Economics*, Vol. 35 pp. 593-596.

¹⁴ Cf. Mellander, C. (2007), The Creative Class or Human Capital? Explaining Regional Development in Sweden. CESIS Electronic Working Paper Series, Paper No. 79. Marlet, G.; van Woerkens, C. (2004), Skills and Creativity in a Cross Section of Dutch Cities. Utrecht School of Economics, Tjalling C. Koopmans Research Institute, Discussion Paper, Series 04-29. Chantelot, S. (2008), French Cities and the Creative Class. Université des Sciences Sociales de Toulouse.

2 Regional Economic Development and Creative Class in North-rhine-Westphalian Regions

The following empirical part of the paper focuses on the influences of creative class and human capital respectively on regional economic development. Meanwhile these relationships have been subject to numerous analyses¹⁵ which have used a broad range of especially cross section methods. In contrast to most of the existing research this paper concentrates on relatively simple time series approaches, though the starting point for doing this have been the results of cross section regressions done for German "Landkreise and kreisfreien Städte" (counties). The database used stems from the German social insurance's employment statistics¹⁶ for all counties from 1999 to 2008.¹⁷ The classification of professions used in this paper is based on ISCO 88 following Florida's definition of the creative class¹⁸ and its differentiation into creative core, creative professionals and bohemians¹⁹.

Like some other empirical studies dealing with the regional effects of the creative class, the research project done by NIERs started by testing whether the shares of creative people (creative class, creative core, creative professionals, bohemians) in total employment or the share of human capital in total employment respectively influence ...

- ... regional labor productivity (GDP per employee). One can expect that regional labor productivity increases if the regional share of creative employment increases. This can happen for two reasons: Firstly, the productivity of creative workers should be higher than that of "normal" workers; so a higher share of creative employees means higher average labor productivity (arithmetic effect). Secondly it might happen that creativity and innovativeness of creative people increase the productivity of "normal" workers, too (creativity effect).
- ... regional per capita income (GDP per capita). One can expect that regional per capita income increases if the regional share of creative employment increases. The above mentioned explanations for higher labor productivity give an explanation for higher incomes, too, because incomes normally depend on productivity.

Using data for 2007 these analyses were made by calculating cross section regressions based on

- all German counties,
- all West-German and all East-German counties, respectively, and

¹⁵ Cf. for instance Clifton, N., Cooke, Ph. (2007), *The Creative Class in the UK*. Regional Industrial Research Report 46. Cardiff; Fritsch, M., Boschma, R. (2007); M. Fritsch, *The Geography and the Effect of Creative People in Germany*. Jena Economic Research Papers, 001-2007, Jena; Falck, O., Fritsch, M., Heblich, H., *Bohemians, Human Capital, and Regional Economic Growth*. Jena Economic Research Papers, 2009 – 049, Jena; Andersen, K.V., Lorenzen, M. (2005), *The Geography of the Danish Creative Class – A Mapping Analysis*. Kopenhagen; Quian, H. (2010), *Talent, Creativity and Regional Performance: The Case of China*. *Annals of Regional Science*, 2010, Vol. 45, pp. 133-156; Audretsch, D., Dohse, D., Niebuhr, A. (2010), *Cultural diversity and entrepreneurship: A regional analysis for Germany*. *Annals of Regional Science*, Vol. 45, pp. 45-85.

¹⁶ This database has been provided by the German Bundesagentur für Arbeit. One disadvantage of employment figures stemming from the social insurance system is that they do not include freelancers and public servants.

¹⁷ As the method of data collection has changed in 1998 and 2008 the databases before 1999 and after 2008 cannot be compared with the set of data used here.

¹⁸ Cf. Florida, R.; Tignali, I. (2004), *Technologie, Talente und Toleranz - Europa im kreativen Zeitalter*. (German Translation), *Perspektive21*, Heft 31, July 2006.

¹⁹ This orientates on a similar study done by the Technische Universität Bergakademie Freiberg. Cf. Fritsch, M.; Stützer, M. (2007), p. 18.

- all counties from groups of German federal states.²⁰

The results of these cross section regressions²¹ give some clear hints that the regional share of the creative class in total employment positively influences the regional labor productivity as well as regional per capita income. But these results also show that the intensity of these influences significantly differs between groups of federal states. The same holds true for human capital: It has a significant influence on regional productivity and income, the influences differ by groups of states and in all cases the human capital approaches provide better explanations than the “creative-capital” approaches.

These intermediate results raised the question whether the differences by groups of federal states can be observed on a more disaggregated regional level, e.g. for the German counties, too. But to empirically investigate this question is no longer possible by means of cross section analysis. So time series approaches have been used to analyze whether the regional development of creative employment can help to explain total regional development or the employment of “non-creative” employees; these analyses have been limited to the 54 Northrhine-Westphalian counties.

As the construction of causal bottom-up-explanations for all cases is very laborious a simple estimation procedure²² has been used. It avoids a detailed specification of regional economic development’s single determinants, but tries to integrate regional specifics by the type of „top-down“ estimation approach²³. Such estimation approaches²⁴ assume that national and regional economic developments are in general determined by the same factors, so that regional development can be explained by the analogous national development. Different reactions of single regions to the really determining factors will probably occur because of different regional structures by industry or different location specifics. This, then, will result in different estimation coefficients. Furthermore regional economic development perhaps will depend on additional regional specifics, too. These determinants can be integrated into the estimation approach in a more general way or as additional single variables²⁵.

$$(1a) \quad \tilde{B}_i = a_1 + a_2 \tilde{B}$$

with: \tilde{B}_i : relative change of employment in region i
 \tilde{B} : relative change of nationwide employment

²⁰ For this the following federal states have been aggregated: Baden-Württemberg and Bayern (South), Hessen, Saarland and Rheinland-Pfalz (Middle-West), Mecklenburg-Vorpommern, Brandenburg and Berlin (North-East), Niedersachsen, Schleswig-Holstein, Bremen and Hamburg (North), Sachsen, Sachsen-Anhalt and Thüringen (Middle-East). Nordrhein-Westfalen remained a unit of its own.

²¹ For details cf. Gottschalk, Ch., Hamm, R., Imöhl, I., *Kreative Klasse und regionalwirtschaftliche Entwicklung – Ansätze zur empirischen Prüfung der Hypothesen von Richard Florida*. List Forum, forthcoming.

²² Cf. Tassinopoulos, A. (2000), *Die Prognose der regionalen Beschäftigungsentwicklung – Wissenschaftliche Methoden und empirische Ergebnisse*. Beiträge zur Arbeitsmarkt- und Berufsforschung, BeitrAB 239, Nürnberg, pp. 9ff for a detailed discussion of advantages and disadvantages of bottom-up and top-down approaches.

²³ For details cf. Hamm, R. Wienert, H.- (1989), *Ein Verfahren zur Regionalisierung gesamträumlicher Wirtschaftsentwicklungen – dargestellt am Beispiel der Produktion in den Regionen des Ruhrgebiets*. RWI-Mitteilungen, Jg. 40, pp. 204ff.; Hamm, R. Wienert, H. (1991), *Simulation von regionalen Binnenmarkt- und Vereinigungseffekten mit Hilfe eines einfachen Top-Down-Modells für Westdeutschland*. RUFIS-Beiträge, Nr. 2/1991, Bochum, pp. 4ff.; Eckey, H.-F. (1988), *Methoden und Prognosen von Arbeitsplätzen in Regionen*. In: Akademie für Raumforschung und Landesplanung (Hrsg.), *Regionalprognosen: Methoden und ihre Anwendung*. (Forschungs- und Sitzungsberichte der Akademie für Raumforschung und Landesplanung, Bd. 175.) Hannover 1988, p. 206.

²⁴ A comparison of such approaches can be found in Tassinopoulos, A. (2000), pp. 32ff.

²⁵ Cf. for an example Dreger, Ch. Kholodilin, K. (2007), *Prognose der regionalen Konjunktorentwicklung*. Vierteljahrshefte zur Wirtschaftsforschung. Jg76 (2007), Heft 4, pp. 49f.

Equation (1a)²⁶ is an example of such an approach; it assumes a constant partial regional elasticity ($a_2 = d\beta_i/d\beta$), while average regional elasticity (β_i/β) varies with the nationwide rate of change. If e.g. partial regional elasticity would be 1 regional rates of change would differ from national rates of change by a constant factor (a_1); then this difference is the sole expression of regional specifics. If – in addition to this – partial regional elasticity differs from 1 a further multiplicative element increases or decreases the additive component – this could be interpreted in the way that the same determinants lead to different reaction intensities nationwide and in the region.

2.1 Creative Class and Total Regional Employment (Model 1)

A transformed, but equivalent²⁷ version of equation (1a)

$$(1) \ln B_i = a_0 + a_1 t + a_2 \ln B + u_i$$

with: B_i : Employment in Region i
 B : Nationwide employment
 u_i : Error term

was used as the starting point of a stepwise analysis based on time series regressions:

- In the first step equation (1) was estimated for all Northrhine-Westphalian counties to see whether regional economic development can be sufficiently explained by this type of a combination of general and regionally specific factors (standard approach). The results show that in nearly all cases the standard approach produces economically plausible and statistically significant results. So regional development of employment can be explained by nationwide factors that have specific regional impacts ($a_2 > 0$ but $a_2 \neq 1$); regional specifics operating in an additive way ($a_1 \neq 0$) are often but not always significant.
- In the second step the influence of the creative class was examined by integrating creative employment into the estimation equation (1), i.e.

$$(2) \ln B_i = a_0 + a_1 t + a_2 \ln B + a_3 \ln B_{ki} + u_i$$

with: B_{ki} : Employment in creative class professions in region i

In this estimation equation a_3 is the elasticity of total regional employment with regard to creative employment. a_3 is expected to be positive. The results of this second step show for the vast majority of Northrhine-Westphalian regions a significant (at the 10% level) influence of creative class employment on total regional employment. Only for two regions it was impossible to find plausible and significant estimations based on the approach of equations (1) and (2) (Erftkreis, Stadt Münster); the other cases can be summarized as follows:

- For 31 of 54 Northrhine-Westphalian counties the standard approach extended by the creative class employment (2) provided the best results; i.e. regional development can be explained by the interaction of (additive) regional specifics ($a_1 \neq 0$), of nationwide factors with

²⁶ Cf. Hamm, R. Wienert, H. (1989), pp. 206ff. for a detailed explanation of this approach and cf. Hamm, R., Kampmann, R. (1992) Zur Bedeutung der Dienstleistungen für den Raum Düsseldorf. RWI-Papiere, Nr. 32, Essen, p. 34 for an example.

²⁷ For a discussion of this transformation cf. Hamm, R., Wienert, H. (1989), pp. 211ff.

specific regional impacts ($a_2 > 0$) and of the regional development of creative class employment ($a_3 > 0$). In only six cases the creative class coefficient is not significant at the 10%-level. In all cases the coefficients of determination (R^2) lie above the R^2 of the standard approach without the creative class.

- In 13 other cases estimations with specific regional impacts of nationwide factors ($a_2 > 0$) and with the regional development of creative class employment as a further determinant ($a_3 > 0$) provided the best results. For the majority of these 13 cases (9) the following holds: The originally significant autonomous linear trend (a_2), which expresses additive effects caused by regional specifics, loses its significance and the value of the partial regional elasticity changes its value; instead a significant influence of creative class on total employment can be observed. It should be mentioned that the estimation equations' quality – measured by the coefficient of determination – has changed to the worse in most cases (seven of nine). A high correlation between creative class employment and trend-variable (multi-collinearity) might give an explanation for this result.
- In eight cases national factors with specific regional impacts have not been significant ($a_2 = 0$); instead a combination of an autonomous linear trend ($a_1 \neq 0$) and regions' specific development of creative class employment ($a_3 > 0$) provide the best explanation.

These results clearly suggest that the development of the creative class employment positively influences the development of total employment in the Northrhine-Westphalian regions.

- In the third step additional regressions have been calculated to examine the influences of the creative class' segments – i.e. creative core, creative professionals and bohemians respectively. The following description of results of these voluminous calculations must concentrate on some most important points:
 - In general one can say that creative class and creative professionals are to a certain extent substitutive explaining variables; if the first variable is significant in explaining regional development of employment then the second one is significant, too. The reason for that is quite simple: Creative professionals are by far the most important part of the creative class so that they are highly correlated.
 - Only in very few exceptional cases the creative core or the bohemians provide economically plausible and statistically significant estimation results. Integrating all three segments of the creative class in one estimation equation is – because of the small number of degrees of freedom – on the one hand side problematic from a methodological point of view. On the other hand side there is no example where the regression coefficients of all three variables are economically plausible and at the same time statistically significant. As all three explaining variables are highly correlated in this case multi-collinearity might prevent the identification of the single influences – even if the coefficient of determination signals a common dependency – and thus give an explanation for these poor results.

2.2 Creative Class and “Non-Creative” Employment (Model 2)

The main criticism concerning the estimation procedure and the results presented until now (model 1) will be, that total regional employment is explained by a part of itself, namely the regional creative employment. That is the reason why the following part describes a solution that generally prevents this problem.

Table 1: Influences of Creative Class on Regional Economic Development of Northrhine-Westphalian Regions (Explanation of “Non-creative” Employment).

Standard	significant influences		No significant influences	
	without trend	Without national variable	Not significant	Others
Krefeld	Düsseldorf	Essen	Duisburg	Erftkreis
Mülheim	Aachen	Oberhausen	Mönchengladbach	Münster
Kleve	Coesfeld	Solingen	Remscheid	
Viersen	Steinfurt	Gelsenkirchen	Wuppertal	
Köln	Gütersloh	Recklinghausen	Mettmann	
Leverkusen	Paderborn	Herne	Neuss	
Kreis Aachen	Olpe		Wesel	
Heinsberg	Unna		Bonn	
Rheinisch-Bergischer Kreis			Düren	
Rhein-Sieg-Kreis			Euskirchen	
Bottrop			Oberberischer Kreis	
Dortmund			Borken	
Ennepetal			Warendorf	
Soest			Bielefeld	
			Herford	
			Höxter	
			Lippe-Detmold	
			Minden-Lübbecke	
			Bochum	
			Hagen	
			Hamm	
			Hochsauerlandkreis	
			Märkischer Kreis	
			Siegen	
14	8	6	24	2
Legend:				
Creative Class coefficient of model 1 not significantly higher than share of creative class				
Explanation in model 1 without national variable (only linear autonomous trend).				

Source: Own estimations.

Based on the considerations of the last chapter, employment in “non-creative” professions (that is the difference of total employment and creative class) is now used as the variable to be explained. If

Florida is right employment of creative class should have a positive influence on the development of employment in other „non-creative“ fields of the regional economy. For this reason equation (1a) was slightly modified to

$$(1b) \quad \ln B_{NK,i} = a_0 + a_1 t + a_2 \ln B + a_3 \ln B_{Ki} + u_i$$

with $B_{NK,i}$: Employment in “non-creative” class professions in region i

Equation (1b) was used to again run regressions for all Northrhine-Westphalian counties (model 2). Thereby the regression coefficients a_1 and a_2 can be interpreted in an analogous way as before; a_3 shows the percentage change of “non-creative” employment to a percentage change of employment in the creative class²⁸. The generalized results of this approach are summarized in table 1; five cases can be distinguished:

- In two cases it was impossible to find plausible and significant estimation results. This is identical to model 1.
- For 14 counties the modified approach provides economically plausible and statistically significant results.
- In eight additional cases it was possible to use equation (1b); but in these cases there was no significant additive effect ($a_1 = 0$).
- There are six counties for which a significant influence of the creative class can be observed, but where the influence of the national variable is not significant.
- For all other cases – which are the majority (24) – it was not possible to identify a positive influence of the creative class on the development of the rest of the regional economy by the use of the modified equation (1b).

2.3 Compatibility of Results

Until so far the results of model 1 and model 2 do not give a quite clear picture: While model 1 (2.1.1) suggests that the regional creative class positively influences total regional employment in the overwhelming number of Northrhine-Westphalian counties, the results of model 2 seem to put a question mark behind this, because these influences can only be identified in about half of all cases. This contradiction finds an explanation if one examines for model 1 whether the regression coefficients of the creative class are significantly higher than the regional share of the creative class in total employment, because otherwise the creative class’ impact would be below its own effects. In table 1 all counties have been marked in dark blue, if this is not the case.²⁹ One then can realize that those regions where significant influences of creative class employment on “non-creative” employment cannot be observed are nearly identical with those regions, where the creative class’ effect on total employment is not significantly higher than its own share, i.e. the effect is lower than normal arith-

²⁸ a_3 is the elasticity of “non-creative” employment with respect to the creative class.

²⁹ In all counties not marked by color the regression coefficients are higher than the share of the creative class at the 5%-level.

metic suggest. And vice versa significant influences of the creative class can be observed in model 2 mainly for those regions that show an effect of the creative class significantly above its own share.

So until now one can summarize that time series regressions for Northrhine-Westphalian counties provide clear hints that the creative class positively influences regional economic development (based on employment). An increase of creative employment gives a positive impact to “non-creative” employment in the same region. But this result does not hold for all Northrhine-Westphalian regions, but only for about half of them.

Based on these results one can suppose that cross section regressions for separated groups of counties might lead to more differentiated results. One could expect higher coefficients and better explanations in cross section analysis for those counties with significant influences of the creative class in time series analysis. Using regional labor productivity and per capita income as variables to be explained this hypothesis has been examined in a stepwise procedure: Starting with all 54 counties the cross section regressions have been repeated for ...

- those regions without significant influences in time series analysis (24 and 26 respectively),
- those regions with significant influences in time series analysis no matter which estimation equation has been used (28),
- those regions with significant influences in time series analysis and significant effect of the national variable (22),
- those regions with significant influences in time series analysis by use of the standard estimation equation (1b) in its original form (14).

Table 2 shows the results of this examination. In fact the results are as expected if GDP per employee, i.e. labor productivity, is the variable to be explained: The change from 54 to 28 or 22 regions respectively results in a considerable increase of the regression coefficient; in other words: The influence of creative class on labor productivity has increased. In addition the coefficients of determination are higher than in the case of all Northrhine-Westphalian regions. These effects become even more apparent if ...

- ... only 14 regions are considered in the cross section regression. The corrected coefficient of determination (R^2) is 0,61 in comparison to 0,24 for the original model. With a (significant) value of 0,86 the regression coefficient is double of the original value.
- ... if one considers only those 24 or 26 regions without significant influences in the time series analysis. Now the corrected R^2 (0,10 or 0,12 respectively) lies considerably below the original value; the same holds for the regression coefficients, i.e. the influence of creative class on productivity is only low; finally these coefficients are only significant on a lower level.
- But table 2 also shows that the results as to GDP per capita vary to a much smaller extend depending on the number of regions considered for the estimation. For 54, 28 and 22 regions the results are nearly identical. For those regions (24 or 26 respectively) without significant effects of the creative class in the time series analysis the regression coefficients and the explanatory contribution are a bit smaller – nevertheless there are not such remarkable differences like in the case of labor productivity. A higher share of creative class is apparently always connected to higher regional per capita incomes. A possible explanation for that could be, that creative class employees normally earn more than average incomes – and logically this holds true for all kind of regions. The only notable result in that context is that wealth effects of the creative class and the

explanatory contribution ($R^2 = 0,78$) are highest for the group of those 14 regions with stable results for the standard time series approach.

Table 2: Influences of Creative Class and Human Capital (Cross Section Regressions)

	Regressors	54 Regions	R ²	28 Regions	R ²	22 Regions	R ²
GDP per Employee	Creative class	0,41^{***}	0,24	0,51^{***}	0,32	0,47^{***}	0,28
	Human Capital	0,19 ^{***}	0,26	0,25 ^{***}	0,34	0,24 ^{***}	0,31
GDP per capita	Creative Class	1,14^{***}	0,42	1,29^{***}	0,44	1,25^{***}	0,44
	Human Capital	0,56 ^{***}	0,48	0,66 ^{***}	0,49	0,64 ^{***}	0,49
		14 Regions	R ²	26 Regions	R ²	24 Regions	R ²
GDP per Employee	Creative Class	0,86^{***}	0,61	0,27[*]	0,10	0,31[*]	0,12
	Human Capital	0,38 ^{***}	0,56	0,12 [*]	0,12	0,13 [*]	0,13
BIP per capita	Creative Class	1,84^{***}	0,78	1,00^{***}	0,47	0,83^{***}	0,33
	Human Capital	0,79 ^{***}	0,66	0,45 ^{***}	0,53	0,38 ^{***}	0,45

Cross section estimations based on results of table 1.

2.4 Human or Creative Capital?

A procedure analogous to that described in chapters 2.1 to 2.3 has been used to examine the human capital approach.

Human Capital and Total Regional Employment (Model 1): The first step dealt with the question whether a region's human capital³⁰ is a determinant of regional employment. The results are quite similar to the case of the creative class: For the vast majority of Northrhine-Westphalian counties development of high qualified workforce significantly influences the development of total employment; only for four counties this relationship could not be confirmed.

Human Capital and "Less-Qualified" Employment (Model 2): The second step was the examination whether regional employment of human capital influences the regions' other employment – the rest of employment or all non graduated workforce. If the human capital approach is right an increase in the number of high qualified employees should result in a positive impact on employment in other groups of qualification. Three groups of regions can be distinguished on basis of the results:

- In one single case it was not possible to set up a plausible estimation equation.
- For 37 Northrhine-Westphalian counties significant influences of human capital on regional development could be identified. In six of these cases autonomous influences have not been significant; in four other cases the national variable was not significant.
- For the remaining cases it was not possible to find an estimation equation with statistically significant and economically plausible influences of human capital on "less-qualified" labor force.

Compatibility of Results: Very similar to the analysis of the creative class, model 1 seems to indicate that a regions' human capital positively influences total regional employment in the Northrhine-Westphalian counties. Again the results of model 2 partly put a question mark behind these results,

³⁰ Number of employees graduated at universities or universities of applied sciences registered in the social insurance system.

because a positive effect of human capital on remaining employment could be found only for some of all cases. Again the contradiction can be dissolved, if one examines whether regression coefficients in model 1 are significantly higher than the share of a region's high-qualified employees in total regional employment. One then realizes that those regions where significant influences of human capital on "less-qualified" workforce cannot be observed are nearly identical with those regions, where human capital's effect on total employment is not significantly higher than its own share. And vice versa significant influences of human capital can be observed in model 2 mainly for those regions that show an effect of human capital significantly above its own share.

So, time series analyses dealing with the human capital approach for Northrhine-Westphalian regions reach quite similar conclusions like examining the creative capital approach: There are clear hints that human capital positively influences employment of "less qualified" persons. But again this does not hold true for all counties in Northrhine-Westphalia, but only for two third of them.

Again these results have been controlled by cross section analyses. The expectation was that for the group of regions with significant influences of human capital in time series analysis influence of human capital should be higher, more significant and provide a higher coefficient of determination than for the group of all other regions. The results of these cross section regressions are also presented in table 2.

In fact the results fulfill the expectations if GDP per employee is the variable to be explained: The estimated regression coefficients and thus the effects of human capital on labor productivity stepwise increase while concentrating more and more on the regions with significant human capital impacts in time series regressions; in all these cases the coefficients also are significant. The same happens to the coefficient of determination; for the last group of regions it is double as high as for all Northrhine-Westphalian regions. Furthermore considering only those regions without significant effects in time series regressions results in values of corrected R^2 of only 0,03 or 0,01 respectively and considerably lower insignificant regression coefficients than in the original case (see table 2). As to GDP per capita results are similar to the creative capital approach.

2.5 Some Critical Remarks

Existing empirical research on Florida's theories concentrates on cross section regressions while time series regressions seem to be the exception. The reason for this might be some concerns of economists and econometricians as well against the approach used here. In what follows these arguments shall be discussed briefly:

- Economists might object that the approach used here is not or only partially based on causal explanations. To counter the argument of a weak theoretical fundament by the hint that most of the cross section based research also is missing a theoretical foundation, would not be very helpful. Of course causally based „bottom-up-approaches“ have to be preferred to the „top-down-approach“ used here where a big part of explanation results from using „catch-all-variables“. But these causally based approaches have some disadvantages, too: They need much more data input, their handling is much more complex and they cannot be expected to produce results which allow interregional comparisons by simple considerations on regression coefficients' plausibility.
- Econometricians will criticize that the underlying time series only cover ten observations with an according small number of degrees of freedom for the estimations. They also will criticize that

the small number of observations does not allow for tests on stability of regression coefficients by the use of e.g. „moving regressions“. But there has not been another choice because there is no other stable database and it will not come into existence because of frequent changes of data classification. The third critical point might be that some of the approaches used here explain total employment by a part of itself; but this kind of dependencies only have been used as the starting point of a much broader analysis. And finally econometricians familiar with regional problems might intervene that the question analyzed here calls for approaches using „spatial econometrics“. To test the results presented in this paper by the use of more sophisticated methods of „spatial econometrics“ might indeed be an interesting idea for continuing this research. But because of the restrictions of the research project behind this paper a concentration on efforts to test the relevant hypotheses was more important than a high degree of methodological finesse.

3 Attributes of „Creative-Class-Regions“

Until now the results indicate that creative class (human capital) positively influences employment of other segments of the regional economy, but with the restriction that the impacts considerably differ by region. Apparently there also are some Northrhine-Westphalian regions where this relationship cannot be proved. These results nearly automatically raise the question which conditions must be fulfilled by a region, for this effect to come into operation. Or are there common attributes of these – let us call them – „creative-class-regions“?

3.1 Location in Economic-Geographic Space and Degree of Agglomeration

As to economic-geographic space and degree of agglomeration one could expect, that the relationships postulated by Florida are of more relevance for the highly agglomerated regions than for the periphery. On closer examination it can indeed be realized that at least some of the regions with no „creative-class-effect“ are neighboring regions (Ostwestfalen, Sauerland/Siegerland, Westmünsterland/nordöstlicher Niederrhein, foothills of the Eifel) all of them showing a low or less than average degree of agglomeration compared to Northrhine-Westphalian conditions. This meets the expectations on the one hand. But on the other hand it is noticeable that there are some higher agglomerated regions, too, where an impact of creative or human capital on regional economic development cannot be observed. The regions belonging to this second group are no neighborhood regions and most of them have in common that they can be called „old industrial regions“ (examples are Oberhausen, Bochum and Hagen).

3.2 Economic Performance

To ascertain whether „creative-class-regions“ possibly have common characteristics in economic performance indicators, like development of regional GDP, of regional employment and/or of labor productivity the fragmentation of economic growth into an employment and a productivity component has been analyzed in detail.³¹ The results show that most of the regions without significant ef-

³¹ For this data from 1999 to 2007 have been used.

fects of creative class on regional development have at least some similarities, but finally can be assigned to two different groups: Regions of the first group are characterized by a weak economic growth in comparison to Northrhine-Westphalian average; in these cases economic growth is mainly stemming from productivity increases. Regions of the other group are characterized by more than average growth rates and a favorable development of employment. To shed some more light on these ambiguous results additional cluster analyses have been carried out; the results of these cluster analyses confirm that economic performance attributes exclusively can hardly provide an explanation for significance or non-significance of creative-class-effects.

3.3 Structural and Endowment Attributes

To check whether “creative-class-regions“ show common structural and endowment attributes, which increase or decrease the probability for a successful transmission of the creative class’ impact to the rest of the economy, a multitude of indicators has been established and investigated. These examinations gave some hints that ...

- ... an influence of creative class on remaining regional employment is the more probable the higher the share of creative people in total employment.
- ... a significant influence of creative capital on remaining regional employment cannot be identified especially in regions that can be characterized as „agglomerated, formerly industrial dominated locations with endowment deficiencies and average creative potentials“. This type of regions are „old industrial urban areas“, which – despite its creative potentials – apparently do not or only partially succeed in exploiting the possible impulses of creative class for their general regional development. This result is in agreement with considerations of Hospers³² who analyses the role of creativity for the economic success of cities. Hospers clearly emphasizes that some urban areas will fail in the cities’ “race for creativity” in becoming a creative city even though they have the necessary profile³³: “... cities ... that are stigmatized by history, such as places in the German Ruhr Area (e.g. Essen, Oberhausen and Bochum) ... have a negative image, though all the ingredients necessary for creativity in fact may be present here.”³⁴ It cannot happen by accident that Hospers using a totally deductive approach has the same outcome (as to the concrete cities mentioned) like the inductive approach used here.
- ... a significant influence of creative capital on remaining regional employment cannot be identified in „less agglomerated, industry dominated locations with endowment deficiencies and low creative potentials“, too.

Starting with these intermediate results a cluster analysis has been carried out. A cluster analysis³⁵ aims at dividing a number of objects with the help of certain variables into groups (clusters) in a way that each group is as homogenous as possible while the groups among each other are as heterogeneous as possible. In our case the Northrhine-Westphalian counties are the objects to be clustered by attributes so that each cluster can be described by typical combinations of these attributes. This might help to identify whether “creative-class-regions“ or “non-creative-class-regions“ respectively

³² Cf. Hospers, G.-J. (2003), Creative Cities: Breeding Places in the Knowledge Economy. In. Knowledge, Technology and Policy. Fall 2003, Vol. 16, No. 3, pp. 143-162.

³³ Cf. Hospers (2003), p. 151.

³⁴ Hospers (2003), p. 152.

³⁵ Cf. Backhaus, K., Erichson, B., Plinke, W., Weiber, R. (2011), Multivariate Analysemethoden. Eine anwendungsorientierte Einführung. 13. Überarbeitete Auflage, Berlin, Heidelberg, p. 397.

are characterized by typical combinations of attributes. The cluster analysis was carried out using the Ward-Algorithm³⁶. The variables used have been selected from the described indicator based analysis; but in addition correlation between these variables should be low to make sure that they stand for different attributes:

- Share of service industries' employment in total employment (2007) as complement of industry's share;
- Net migration per 1000 inhabitants (2007) as indicator for population's reaction on regional differences in quality of living and endowment;
- Share of employees qualified in information and communication technologies in total employment (2007) as indicator for the level of regional labor force qualification;
- Net foundation of new enterprises per 100000 inhabitants (2007) and
- Development of employment (1999 to 2007) as performance indicator.

The cluster analysis suggests grouping the Northrhine-Westphalian counties to seven clusters. Three of these clusters show differences as to the average values of the variables but not as to their general tendency. Main attributes of these three clusters are: A less than average share of services – which is equivalent with a more than average share of industry, a less than average level of qualification, net emigration, a less than average or even negative balance of newly founded and closed down enterprises and a less than average development of employment. 20 of 22 Northrhine-Westphalian counties for which significant influences of creative class on regional development could not be identified belong to these groups. So the results of the cluster analysis give some further confirmation that especially a certain type of regions has problems to profit from impulses stemming from the creative class – namely industrial oriented regions and old industrial regions with qualification deficits, the structural adjustment problems of which result in high net emigration and low rates of new firm formation.

4 Summary

The theoretical ideas of Richard Florida have received worldwide attention. To examine part of these ideas empirically with special focus on Northrhine-Westphalian regions has been the aim of a research project done by the Niederrhein Institute of Regional and Structural Research. The paper describes some results of this research project.

The relationship between creative class and regional economic development is usually analyzed by means of cross section analysis using per capita income or labor productivity as variables to be explained. For Germany the cross section studies give some hints that the intensity of these relationships significantly differ by groups of federal states. This result was the reason to examine the relationship between creative class and regional economic development by means of time series analysis despite some economic and econometric objections.

The results of the combination of time series and cross section regressions used here show that creative class positively influences economic development of Northrhine-Westphalian counties in many, but not in all cases and that the intensity of reaction differs by counties. Apparently there are some

³⁶ Cf. Backhaus, K., Erichson, B., Plinke, W., Weiber, R., pp. 426ff.

regions where an increase of creative employment leads to a more than proportionate increase of total employment. An explanation might be that growth of creative employment induces additional growth of complementary non- or less-creative employment. In the same regions an increase of the share of creative employment results in a higher increase of labor productivity than elsewhere.

The examination of the human capital approach shows generally similar results but it is remarkable that the explanations based on human capital often provide higher coefficients of determination³⁷. Nevertheless it must be doubted that this result is sufficient to decide the discussions between creative and human capital theorists concerning the question whose approach provides the better explanation.

Having these results in mind the following question to be dealt with in the paper was, which conditions a region must fulfill to become a „creative class region“ and to bring the effects of creative class on general economic development into work. The paper tries to find answers to this question, too, by using a combination of intuitive, indicator-based and multivariate methods. This analysis shows that some of the regions without a significant positive impact of creative class on regional economic development are neighboring regions and geographically concentrated. In addition it can be stated that especially a certain type of region has problems to profit from impulses stemming from the creative class – namely industrial oriented regions and old industrial regions with qualification deficits, structural adjustment problems and less than average developments.

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³⁷ Other empirical studies seem to show the contrary. Vgl. Mellander (2007); Marlet G.; van Woerkens C. (2004); Chantelot, S. (2008).

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