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Planung Forschung (PRAC)

17 September 2010

Online at <https://mpra.ub.uni-muenchen.de/25413/>
MPRA Paper No. 25413, posted 24 Sep 2010 15:56 UTC

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JEL-Classification: F15, O10

Keywords: Cross-border co-operation, Economic Integration, Cohesion Policy

Abstract

This paper is part of the results of the ex-post evaluation of INTERREG III which was carried out on behalf of the European Commission during 2008 to 2010. One of the tasks was to assess the impact of INTERREG III on a harmonious regional development and integration throughout Europe. This paper is focussed on INTERREG-Strand A (cross-border co-operation). The empirical analysis, based on factor with subsequent regression analysis, suggests that predominantly experimental project types and history of co-operation matter for EU cross-border economic integration, while the strength of co-operation in the cross-border regional development programmes seems not to matter at all.

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2010

Cross-border Co-operation and European Economic Integration: An Empirical Analysis

Rolf Bergs¹

Introduction

This paper is part of the results of the ex-post evaluation of INTERREG III which was carried out by the consortium of Panteia² on behalf of the European Commission during 2008 to 2010. One of the tasks was to assess the impact of INTERREG III on a harmonious regional development and integration throughout Europe. Although the impact was to be estimated for all three strands of INTERREG, this paper is focussed on strand A (cross-border co-operation).

The aim of INTERREG has been the enhancement of trans-European co-operation across borders and to contribute to further socio-economic integration of the EU area. Economic integration has been a major purpose of the Union since the Treaty of Rome in 1957. This integration process has so far been driven by major forces, many of them institutional milestones like the Common Market, the abolishment of border controls (Schengen) or the European Monetary Union. All those institutional decisions have been taken in the course of the European political and economic evolution because the level of development and integration has advanced to a high degree and because of the expectation that those institutional decisions will further foster this economic integration process. This integration process is visible by increasing trade volumes among the countries and regions, more aligned business cycles and higher levels and intensities of intra-industry trade (reducing adverse shocks in a monetary union). Still, national borders matter, as they represent impediments to trade.³ Furthermore, those major institutional forces have also contributed to growth in border regions, but not equally⁴. Geography and spatial path dependencies are important factors to be considered. The question to be addressed in this paper is: Does INTERREG also play a role in those long-run integration processes?

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³ Chen (2004), pp. 114 f.

⁴ In an interesting empirical study on the French-Spanish border region, M. Lafourcade and E. Paluzie (2005) show that '... as for the impact of trade liberalization on this trade outperformance, [we show that], whereas the north-eastern French border regions located close to European market potentials succeeded in triggering new extra trade, more peripheral border regions, unfortunately, did not. Although temporary gains were drawn from integration shocks such as the Single European Act, the Schengen Agreement and the Maastricht Treaty, they were not sufficient to counteract the drastic long-term decline suffered by the southern French regions bordering Spain and Italy. ...' (p.28)

The problem: A minor EU policy initiative with a major goal

The immediate impact of INTERREG with Europe-wide expenditure of around 7.6 billion Euro is – to say the least - highly extensive. Per capita⁵, just Euro 16.70 was spent by INTERREG activities for all three strands during the 2000-2006 period (ERDF, national public and private). Hence, to assume that investment of those funds will have a perceptible immediate impact on economic growth and cohesion in supporting the supply side of the economies in the longer run and to trigger shorter-run demand side effects (like those of Objective 1) would be rather misleading⁶. If at all, the purpose of INTERREG must be therefore more focused on the indirect effects. Indirect effects, in many cases very incidental ones, are those effects that are generated by the existence of the programme itself or by its projects. It can also be the success of a programme or specific projects to reduce mutual prejudice, to enhance cross-cultural understanding and thus to improve market transparency across borders. Indirect effects cannot be *a priori* defined and are thus not observable (“trade fair effects” from events or networking). It is possible to record such effects by sample surveys, but most such effects are not generated by INTERREG alone, but only in an overall context, in which also other incidental factors may play a role. E.g. a social or business event, supported by INTERREG, can initiate the establishment of some business cooperation or a network, simply because people with similar interest find together in a conducive atmosphere. In some cases, this may have medium or longer-term impacts on local growth and employment.

Such impacts resulting from indirect INTERREG effects may thus further depend on different overall economic or administrative frame conditions. These are either related to institutional milestones of European evolution (e.g. the Schengen border or the EMU), location factors or economic trends (trade, business cycles, structural change). Hence, there is some theoretical justification to assume that INTERREG matters for economic integration but the empirical evidence for that is much harder to establish. One problem is how economic integration, especially that evolving in European border regions, should be defined. This will be discussed further below. The second, more important, problem is related to the adequacy of data available.

Within the ex-post evaluation of INTERREG III a survey among managing authorities of more than 80% of the programmes was carried out. This survey aimed to establish some kind of a composite performance indicator to cluster the programmes (facilitating the selection of case studies for in-depth evaluation) and to examine the influence of co-operation history. This analysis could generate some interesting results, also relevant for our empirical analysis, especially with respect to numerous different sub-variables of the composite

⁵ Assuming a population of 455,299,000 million EU inhabitants in 2006 (EUROSTAT)

⁶ There are only few examples of INTERREG strand A programmes with substantial physical investment, where demand side effects may materialise in the local economies. One example is co-operation between Portugal and Spain.

indicator. Those sub-variables are related to the strength of partnership, institutional strength, nature of projects and others⁷. Based on the results of the programme survey of the ex-post evaluation, our expectation would be that more experience in co-operation would have a stronger developmental impact than a rather newly started co-operation. An important *a priori* hypothesis of the evaluation was the assumption, that history matters. Furthermore, the complexity and innovativeness of projects might differ revealing a certain level of development of a region. A sound joint analysis of needs for a border region could also have a positive effect as this might have led to better coordinated programme strategies and their implementation.

Now one could try to use these survey data to estimate the impact of the sub-variables on economic integration. However, a direct econometric estimation of the impact on integration across borders is hardly possible⁸. It is also necessary to consider the important major forces governing cross-border integration outside INTERREG. These are the European Economic and Monetary Union (EMU), Schengen, language, business cycles, level of bi-lateral market integration and perhaps further ones. However, many of those forces superimpose the INTERREG-specific results and are closely interrelated with them. Multicollinearity is a problem if just merging all those variables in a regression analysis. The idea to get closer to an insight into the relevance of INTERREG for economic integration is to consider all those INTERREG and non-INTERREG influences as co-variates and to run a factor analysis incorporating the survey-related indicators and further indicators determining economic integration across borders. Hence, the factor analysis will be used to specify the right-hand side of the regression equation, while economic integration will be the left-hand term.

A simple index of cross-border economic integration

Economic integration can be regarded from the viewpoint of trade (e.g. volumes and similarity) or income (GDP) or both. Empirically, geographical distance and income levels determine trade volume between two countries (gravity). While the gravity model has a strong empirical relevance for trade across borders at national level⁹, geographical distance plays only a minor role in local cross-border trade between two countries at district level. Another prominent indicator measuring market integration is the Grubel-Lloyd-Index for intra-industry trade. But the lack of sub-national trade data across the EU does not allow working with neither the gravity model nor the Grubel-Lloyd-Index at the level of border regions. However, the level of intra-industry trade of adjacent countries may have itself an influence on integration in border regions, therefore this variable can be conceived as one of the variables entering the factor analysis.

⁷ Cf. Panteia and Partners (2009), pp.251 ff.

⁸ A regression with the sub-variables of the survey did not yield significant results.

⁹ E.g. Chen (2004) for cross-border trade in the EU or McCallum (1995) for US-Canadian trade

A feasible way to view economic integration in border regions could be a respective definition that is more related to economic cohesion¹⁰. As INTERREG is anyway part of EU Cohesion Policy, aimed at increasing and balancing regional income levels, it is suggested to base the analysis on GDP per capita (PPS). This indicator is anyway the core context criterion for eligibility of cohesion funding; harmonised data are available at regional levels. However, raw GDP per capita data as such do not reveal anything about integration; rather, an adequate variable must indicate a spatial relationship of income (between the regions themselves and between the regions and a reference). So far, for cross-border regional development there is no ready-made variable that has been applied and empirically tested. Therefore we had to explore other ways to define a suitable and simple solution. In our model, the final dependent variable aims to simultaneously capture the inter-regional disparity and the disparity between the regions and the EU average. The variable DI (degree of integration) is defined as a simple index:

$$DI = \left(1 + \frac{|\Delta y_{ij}|}{y_{EU}}\right) \cdot \left(1 + \frac{y_{EU} - y_i}{y_{EU}}\right) \cdot \left(1 + \frac{y_{EU} - y_j}{y_{EU}}\right), \text{ for } y_i < y_{EU} \text{ and } y_j < y_{EU}$$

$$DI = \left(1 + \frac{y_{EU} - y_i}{y_{EU}}\right)^2, \text{ for } y_i < y_{EU} \text{ and } y_j \geq y_{EU}$$

$$DI = \left(1 + \frac{y_{EU} - y_j}{y_{EU}}\right)^2, \text{ for } y_j < y_{EU} \text{ and } y_i \geq y_{EU}$$

$$DI = 1, \text{ for } y_i \geq y_{EU} \text{ and } y_j \geq y_{EU}$$

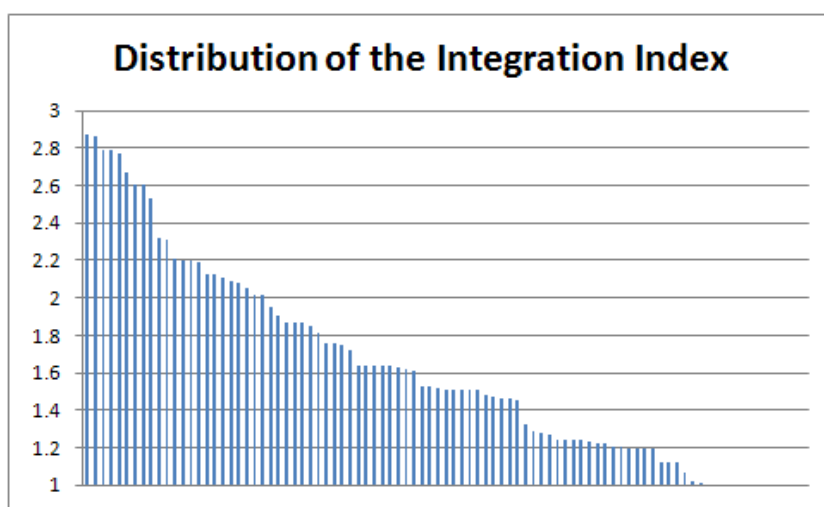
(y means GDP per capita [PPS], while i and j are the regions).

The data are to be obtained from the regional statistics of Eurostat (at NUTS 2 level). Only member states are covered. Integration of non-member states with the EU cannot be observed at the NUTS 2 level. It is to be noted that regional GDP levels above or equal the EU average are cut-off and set equal to the EU average assuming that integration at this level is already achieved. The multiplicand of the first index measures the inter-regional difference, while the other two multipliers show the difference between the regions and the EU average. If in the first index the first factor is 1, both regions have the same income per capita. Then the more important weight is on the difference with respect to the EU average. This special case would be $DI = \left(1 + \frac{y_{EU} - \frac{1}{2}(y_i + y_j)}{y_{EU}}\right)^2$ (for $y_i = y_j$).

¹⁰ Spatial proximity (as a constant in local cross-border trade) and income levels determine bi-lateral local trade volumes. Therefore cohesion and trade are directly linked to each other via the gravity function.

The second (and third) index only emphasises the disparity between the poorer region and the EU (while the richer region is already equal or better-off than the EU average). The fourth index is set 1 for both regions already equal or above the EU level, thus having already achieved full integration. Any deviations from that theoretical optimum are at values > 1 . Those deviations reflect inter-regional disparities and/or disparities between regions and the EU average.¹¹

The database was elaborated by calculating the index for all combinations of NUTS 2 borders. Thus, not the programmes, but the different border sectors are viewed. Hence within one programme different index values can appear. The following figure shows the slope of the distribution of the index results (ranked).



The model, the assumptions and the data

For the factor analysis 35 “Strand A” programmes from all six clusters were taken¹². Altogether 98 border sectors are represented. The set of variables comprises the survey variables, originally calculated for the typology of

¹¹ It could be subject to further discussion which EU average should be selected. We propose the EU15 average because for the EU27 average still bigger disparities (due to the lower living standards of the new member countries) are reflected.

¹² Twelve programmes out of the 35 were pre-selected from the clusters by the European Commission (for the purpose of programme case studies in the context of the ex-post evaluation INTERREG III), the additional 23 were selected randomly from the clusters. Bi-lateral programmes with external borders were excluded, because of the missing GDP data. Furthermore, the problem that the programme survey failed to generate data on programmes with Greek managing authorities may have induced some minor bias. Thus, the results are to be interpreted for the European Union without Greece.

INTERREG programmes (HIST, JOINTN, PART, LOC, JOINTP, IMPACT)¹³ plus different dichotomous (dummy) or interval-scaled non-INTERREG variables like Schengen (0;1), EMU (0;1)¹⁴, language (0;1), business cycle synchronisation (correlation of NUTS 2 growth rates), market integration of the national states (i.e. the Grubel-Lloyd index on intra-industry trade). Schengen and EMU reflect a high level of economic and social integration between member states. Both have been the outcome of an integration process but they also further reinforce that process, thus being both, cause as well as effect. As already mentioned, intra-industry trade is an important economic indicator of market integration, a major criterion of real convergence and thus also of importance for a functioning monetary union. We therefore also expect a high correlation between IIT and EMU. Different business cycles of countries with common borders may also have at least short-term impacts on economic integration, because these might influence the relative purchasing powers on both sides of the border. Finally different languages are certainly an important barrier of co-operation. It might thus also influence the cross-border local markets to some extent.

We deliberately excluded programme budgets as we do not expect them to be decisive in wider economic impacts materialised by EMU, Schengen, IIT etc.

In a first step, the correlation of all variables will be calculated. Eigenvalues and related Eigenvectors of the correlation matrix will then determine factors capturing the a.m. variables¹⁵. A Kaiser-Meyer-Olkin sample adequacy test will help to decide whether the matrix is statistically adequate for a factor analysis (threshold minimum: 0.5). If yes, the process will consequently lead to a condensation of information by reducing the number of variables. Within those factors, variables will have different loadings (i.e. the correlation between the variable and the factor). In order to clearly interpret the factor matrix, a rotation (e.g. an orthogonal *varimax* rotation) is necessary. The factor loadings of the rotated factor matrix may then allow comparing the relationship of sub-

¹³ HIST denotes the extent of co-operation tradition prior to the commencement of INTERREG III, JOINTN denotes in how far needs for a programme were examined jointly, PART denotes the scope and depth of strategic partnership, LOC denotes the depth and nature of co-operation, i.e. the lead partnership activity, location advantages and complexity of co-operation, JOINTP denotes the extent to which projects are truly joint and IMPACT denotes the level of a wider policy related institutional impact. The data are based on either factual quantitative results (e.g. historical duration of cross-border co-operation) or qualitative scoring (e.g. 0-20-40-60-80-100). Of course, qualitative scoring is not strictly based on empirical facts, but rather on self-reported assessment and assumption. There is always emphasis on personal interest (what is important for "me" if "I" view the programme?) and an emotional bias in such statements. However, we can assume that because of the large number of observations among programmes the level of objectiveness can be regarded as acceptable. All variables are described in the first interim report of the ex-post evaluation, cf. Panteia and Partners (2009).

¹⁴ The value 0 means the existence of an exchange rate, 1 means Eurozone. As regards the exchange rate regimes there are still major differences among the member states and participating non-member states (from a currency board, quasi-equivalent to EMU, to a floating regime, e.g. between Ireland and the United Kingdom). A further differentiation of the variable would stipulate a more elaborated economic model, and is hardly possible within the scope of that task. Border economics as a section of economics is still at an early stage. Modelling so far is more or less confined on currency market fluctuation impact on cross-border regional retail segments. It is to be referred to Thomas M. Fullerton Jr. 2003; Furthermore: Ardair et al. 2006

¹⁵ Factor determination by the principal components analysis

indicators of the overall composite indicator with the other major variables within one factor. Hence, also a ranking of importance of the sub-indicators can be determined. In a final regression analysis (second step), the influence of the determined factors on the dependent variable (see above) will be estimated. The regression coefficients may then suggest statistical evidence whether factors hamper or foster integration.

Results of the multivariate analysis: First step: Factor analysis

The principal component analysis with Varimax rotation comprised the INTERREG variables HIST, JOINTN, PART, LOC, JOINTP and IMPACT merged with EMU (1;0), SCHENGEN (1;0), CYCLE (Business cycle synchronisation: correlation of national growth rates)¹⁶, LANGU (common language: 1;0) and IIT (national Grubel-Lloyd index)¹⁷. The Kaiser-Meyer-Olkin sample adequacy test value is at 0.797 and thus clearly confirms adequacy of the factor model. Out of the eleven vectors four Eigenvalues > 1 were extracted, leading to four factors as the following table shows.

Eigenvalues extracted

Variables/factors	Eigenvalues
F1	4.658
F2	1.356
F3	1.197
F4	1.055
F5	0.709
F6	0.538
F7	0.500
F8	0.433
F9	0.254
F10	0.160
F11	0.141

In those four factors the rotated factor loadings are of major interest. These show the correlation between the different eleven variables and the condensed information captured by the four extracted factors. In the following table we see that in factor 4 only the synchronisation of business cycles is loading high (> 0.5). In factor 3, only three INTERREG variables (JOINTN, PART and LOC) show high loadings. This factor can be thus described as the intensity and level of project co-operation. Factor 2 includes language and IMPACT as variables with

¹⁶ Database for growth correlations from Rheinisch-Westfälisches Institut für Wirtschaftsforschung 2006; Heston, A., et. al (2002),

¹⁷ Data from Caetano and Galego (2007)

higher loadings, combining some emphasis on the socio-cultural factor (IMPACT indicates the mutual impact on institutional learning and adaptation). Finally factor 1 with the highest percentage of variation in the rotated factors predominantly includes high-loading variables defining the historically grown level of development of a region. These are EMU (the Monetary Union), the level of market integration (IIT), the existence of a Schengen border, the history of co-operation and LOC, showing the level of complexity of the INTERREG interventions. Interestingly, in factors 3 and 4, the INTERREG variables are clearly separated from the non-INTERREG variables. Only in factor 1 we identify a combination of major weight of INTERREG and non-INTERREG variables. We see that history (experience in co-operation), the level of institutional integration, revealed by Schengen and EMU (derived from a historical process of development and integration) and confirmed by the level of intra-industry trade, are closely interrelated. In addition to that, we see that the INTERREG variable LOC also seems to matter in this context. The level of innovativeness and the pattern of complexity of projects are reflected by this variable. We can definitely not say that this variable has an important influence or whether LOC describes causes or rather effects¹⁸. In fact we strongly assume that it rather reflects an effect due to a high association between the historical grown level of development and the resulting pattern of co-operation projects. Nevertheless, we can at least say, that LOC matters within the economic context of INTERREG strand A.

Table 2: Varimax Rotated Loadings¹⁹

	Factor1	Factor2	Factor3	Factor 4
HIST	0.807	0.088	0.087	0.100
JOINTN	0.320	-0.220	0.702	0.133
PART	-0.177	0.340	0.776	0.064
LOC	0.576	0.102	0.553	0.042
JOINTP	0.500	0.470	0.429	-0.153
IMPACT	0.252	0.719	0.213	-0.175
EMU	0.895	0.096	-0.020	0.278
SCHENG	0.700	0.262	0.317	0.417
CYCLE	0.165	0.010	0.120	0.933
LANGU	0.155	0.745	-0.115	0.366
IIT	0.852	0.306	0.089	-0.078

¹⁸ If we established that causal relationship, we would assume *cum hoc ergo propter hoc*, a major logical error in interpreting correlation compared to regression.

¹⁹ Percent of Variation in Rotated Factors

Factor 1: 31.799

Factor 2: 14.970

Factor 3: 16.113

Factor 4: 12.260

Second step: Regression analysis

The factor analysis alone cannot establish an estimate how the factors above (incorporating INTERREG intervention) influence the economic integration of the European Union. To shed more light on the weight of the different factors in their impact on integration, we can use the factor matrix (factors as latent independent variables). Our linear regression model is hence:

$Integration = a + b_1 \cdot z_1 + b_2 \cdot z_2 + b_3 \cdot z_3 + b_4 \cdot z_4 + u$, whereby $z_1 \dots z_4$ represent the matrix of factor scores.

The estimates are the following:

Table 3: Regression results (Dependent variable: Integration)

Variable	Beta	b	s.e.	t	HC-t ²⁰
Factor 1 (z_1)	-0.488	-0.293	0.054	-5.449*** ²¹	-4.898***
Factor 2 (z_2)	-0.163	-0.104	0.056	-1.854*	-1.850*
Factor 3 (z_3)	-0.072	-0.047	0.057	-0.820 n.s.	-0.713 n.s.
Factor 4 (z_4)	-0.183	-0.085	0.042	-2.042**	-2.601**
Intercept	0.000	1.684	0.048	35.322***	30.703***

F = 11.17 ***

R² = 0.34

Adjusted R² = 0.31

Signs of the coefficients are as expected (the higher the index values the lower the level of integration). The highly significant determination coefficient suggests with 0.34 a sufficiently strong relationship. Interestingly, factor 3 is not significant at all, factor 1, however, is strong and highly significant, showing that actually only the level of economic development is an explanatory factor (variable) for integration across borders. The factor with the majority of the INTERREG variables (co-operation factor) does not matter for economic integration. Business cycles and socio-cultural factors matter to some minor extent. Two conclusions can be derived from that. The first one is that INTERREG does not appear to play an important role in economic integration of the EU. Basically there is little relationship. The second conclusion is however that we cannot claim that INTERREG does not matter at all with a view to economic integration.

Since in factor 1 the INTERREG variables ‘history of co-operation’ and LOC load higher, our conclusion would be that for INTERREG to further pursue economic integration across borders, patience may play a role (as history matters), and furthermore projects with experimental and innovative character should be

²⁰ Heteroscedasticity-consistent t-values, based on White’s heteroscedasticity-consistent variance matrix.

²¹ ***/**/* means significant at the 0.01/0.05/0.1 level; n.s.: not significant

supported. Even though there is the strong assumption that LOC is much more effect than cause within factor 1, we can always assume some circular causation, and thus the possibility that indirect impacts from experimentation in cross-border co-operation play also some minor role in integration processes²².

LOC has certainly no influence on institutional variables like EMU or Schengen. But it may have an influence on history, namely to accelerate development processes in border regions and to mature faster.

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²² Testing the causal relationship between the higher loading variables of factor 1 by path analysis failed because of the high absolute differences between the observed and reproduced correlation coefficients.