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The regional impact of EU association agreements: an event-analysis approach to the case of Central and Eastern Europe

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Abstract. Although EU association agreements are generally seen as welfare-improving, relatively little is known about their spatial-distributional consequences. Drawing on the pre-accession experience of Central and Eastern Europe (CEE), this paper estimates the regional growth effects of such agreements using an event-analysis approach. It finds a positive growth effect which is however not constant across association phases or types of regions (e.g., specialised regions gained most in the early association period and service-oriented economies gained most near accession); and it discusses the implications of this in relation to debates on regional growth in CEE and for future waves of association.

Key-Words: association agreements; event analysis; regional growth; CEE
JEL Classification: F15, R11, O43

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Abstract. Although EU association agreements are generally seen as welfare-improving, relatively little is known about their spatial-distributional consequences. Drawing on the pre-accession experience of Central and Eastern Europe (CEE), this paper estimates the regional growth effects of such agreements using an event-analysis approach. It finds a positive growth effect which is however not constant across association phases or types of regions (e.g., specialised regions gained most in the early association period and service-oriented economies gained most near accession); and it discusses the implications of this in relation to debates on regional growth in CEE and for future waves of association.

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1. Introduction

The collapse of communism in Eastern Europe brought about an unprecedented wave of trade liberalisation and economic integration agreements between the European Union and countries belonging to the so-called Eastern Bloc. The intensity of this process varied across space, with countries in Central and Eastern Europe (CEE) moving soon to deeper forms of integration, and eventually to EU membership, and countries located further east, as well as those belonging to the Euro-Mediterranean Partnership, engaging with the EU through the more recently-established framework of the European Neighbourhood Policy (ENP).

Association with the EU, and the preferential trade liberalisation that this entails, has long been considered in the literature as strictly welfare-enhancing – be it through technology importation and a more efficient allocation of capital (MONASTIRIOTIS and ALEGRIA, 2011; CRESCENZI *et al*., 2014; MONASTIRIOTIS, 2016), or through agglomeration and market access benefits (ASCANI *et al*., 2012). Indeed, a number of studies have shown that, after an initial period of stabilisation, the associated countries entered a remarkable period of fast growth, with speedy income and productivity convergence with the EU 'core' and a notable restructuring of their economic base (GÁCS, 2003; MATKOWSKI and PRÓCHNIAK, 2007; RAPACKI and PRÓCHNIAK, 2009). Despite this, evidence linking directly the process of EU association to (national) growth is rather hard to find in the literature – with only a handful of studies examining empirically this link (see, *inter alia*, HENREKSON *et al*., 1997; BADINGER, 2005), typically finding a positive but usually transitory effect on growth.

The situation is less clear-cut with regard to the impact of EU association on *regional* growth. Theoretically, trade integration can have significantly differentiated effects at the regional level, as the trade diversion and market size effects that it entails can alter significantly existing (regional) comparative advantages and create new productivity or agglomeration advantages that may be distributed unevenly across space. In the empirical literature, concerning in particular the case of the CEE countries, a large body of evidence exists showing that the process of EU approximation coincided with a significant widening of regional disparities and persistent polarisation in these countries. The literature broadly attributes these developments to the process of transition, and the resulting patterns of openness and restructuring, arguing that these favoured disproportionately those regions with closer proximity to the west and pre-existing agglomeration advantages and concentration of financial and political capital (typically, capital-city regions) (see, *inter alia*, RESMINI, 2003; KALLIORAS and PETRAKOS, 2010). But, more so than in the literature on national

growth, there is virtually no study that provides direct evidence linking these regional growth outcomes to the EU association process *per se*.

This paper makes a contribution in this direction, by devising an empirical strategy that allows to examine the impact of EU association on regional growth not only on the aggregate but also across different regions (and region types): examining, specifically, how the contribution of different regional characteristics, as drivers to regional growth, changed across phases of EU association in the process to accession. This allows to draw conclusions about the regional-distributional impact of the EU association process which, albeit specific to the CEE sample, may be relevant also to countries currently deepening their association with the EU under the ENP framework. The main hypothesis is that, if EU agreements have a (differentiated) effect on regional growth dynamics, this would most likely be represented by a shift in growth trajectories between regions of different structures or potentials as EU association deepens. To test this, the paper exploits the cross-country variation in the timing of these agreements as well as the differences in the intensity of association provisioned by different types of agreements (trade and cooperation; association; accession) to identify the distinctive effect that these had on regional (and national) growth, while controlling for national growth trajectories, which are more readily linked to the process (and pace) of transition that was taking place at the same time.

The next section discusses in more detail the empirical approach and the data. Section 3 reviews the descriptive evidence concerning the patterns of regional growth in CEE during the study period and across the phases of EU association. Section 4 develops a model of regional growth which incorporates the influence of regional structural characteristics and of the EU association agreements, while the results from the econometric analysis based on this model are presented in section 5. The analysis provides strong evidence that EU association has indeed a distinctive impact on growth, but that this is limited to the early

phases of association (Trade and Cooperation Agreements). In fact, in models that control for country-specific (national-level) growth dynamics, which are taken to be linked to the processes of transition and catch-up convergence with the EU, deeper forms of association (especially the Europe Agreements in the pre-accession period) are found to have a negative effect on regional growth. More importantly, the results show that these effects are spatially differentiated, with early association agreements favouring mainly specialised, agricultural, less developed and more peripheral regions; but deeper association (pre-/post-accession) being more advantageous for service-oriented, high-population density and more developed regions and regions with closer proximity to the EU core (Brussels). The implications of these findings are discussed in the concluding section.

2. Identifying the effect of EU association

The collapse of communism presented the EU with a significant challenge, as well as an opportunity, to integrate the former communist countries but also to secure in this way the irreversibility of the transition process. Lacking at the time a formal process to facilitate this, the EU developed in 1993 the so-called Copenhagen Criteria, which became the overarching framework guiding the process of approximation with, and eventually accession to, the EU. In that early period, a first stage of association was through bilateral Trade and Cooperation Agreements, which provided for trade liberalisation in the associated countries in exchange of financial aid by the EU and technical assistance to the transition process. Subject to progress with democratisation and market liberalisation, the associated countries were eventually invited to submit a membership application and sign "Agreements Establishing an Association" (Europe Agreements), which kick-started the pre-accession process towards EU membership – which was concluded in 2004 for eight of the CEECs and in 2007 for Bulgaria and Romania (see Table A.1 in the Online Appendix). Signing of such agreements became in

a way a kind of endorsement by the EU of the transition policies deployed in each of these countries and transmitted strong signals to markets, at home and abroad, about the position of each country in its path to post-communist transition and accession to the EU. In this sense, it had a potentially big impact on a range of factors affecting growth, from investment to export demand and from wage-setting to interest rates.

The uniqueness of this process (in that it has been gradual and prolonged but at the same time highly standardised) provides an incomparable case on which to study the effect that EU association has on economic growth and on its differentiation within countries. This is important not only for historical reasons but also because the process is to a large extent replicated today in the wider 'European Neighbourhood' (MONASTIRIOTIS and BORRELL, 2012). It is of course very difficult, in the absence of very detailed data and a suitable general equilibrium model, to evaluate *ex post* all these channels and mechanisms (investments, exports, wage-setting, etc.) that may have influenced regional growth in the process of EU accession.[1] Instead, to estimate the effect of EU association on (regional) growth this paper follows a different approach, inspired in part from the trade literature on the effects of Preferential Trade Agreements (see, *inter alia*, BAIER and BERGSTRAND, 2007; EGGER *et al*., 2011) which typically incorporates a shift (dummy) variable for the timing/existence of such agreements in a gravity equation of bilateral trade flows. Although the gravity model setting does not lend itself for the analysis of (regional) growth, the similarity here is that the various EU association agreements are treated as unique events which can act as shifts in a regional growth equation (as demonstrated in section 4). In this sense, this approach is akin to that found in 'event analysis' studies (see, *inter alia*, KARAFIATH, 1988 and LEEDS and LEEDS, 2012 for methodological expositions; and DARBY *et al*., 2006 and JASMAND and MAENNIG, 2008 for empirical applications in an urban or regional context).

In estimating this effect, there is of course a potential problem of endogeneity. Arguably, the signing of EU agreements cannot be taken to be exogenous to national performance, including national growth: good performance reflects in part successful transition policies, which in turn are a pre-requisite for the signing of such agreements. Thus, in an econometric context, regressing growth on indicators capturing the progression of contractual relations with the EU could produce inflated[2] estimates of the true effect of the latter on the former.

To overcome this problem, the empirical strategy adopted here relies on regional-level data and specifies a regional growth model which incorporates, besides the classical factors of production (capital and labour), also a set of regional-level variables, capturing regional structures and geographical characteristics, which are assumed to influence regional total factor productivity (TFP). To capture the progression of EU association, from minimal contractual relations in 1991 to full membership in 2004/07, three shift effects (taking the value of 0 prior to the shift and the value of 1 from there until the next shift) are subsequently introduced through the TFP equation, corresponding to the three milestones in the EU association process (signing of a Trade and Cooperation agreement; signing of a Europe agreement; and enactment of EU membership). As these milestones vary in time across the 10 CEE countries, their effect cannot be taken to represent sample-wide (fixed across countries/regions) time effects unrelated to the signing of these agreements. Exploiting the two-level structure of the data (regions within countries observed across years), the model includes additionally country-specific quadratic time-trends, which control for – exogenous to the signing of these agreements – national-level growth trajectories.[3] Finally, to estimate the *differentiated* impact of EU association at the regional level the model is extended to include interaction terms between the shift effects and some of the key determinants of regional growth (regional characteristics). The estimates on these interaction terms can be thought of as showing how the impact of EU association varied across different region types (when the regional characteristics are defined as dichotomous

variables) or, alternatively, how the contribution to regional growth of different regional growth drivers changed across the four periods (when the regional characteristics are defined as continuous variables).

The empirical analysis utilizes data from the Cambridge Econometrics database at the NUTS3 level covering the 10 post-communist countries that acceded to the EU in 2004/2007, over the period from the early transition phase (1991) until the eruption of the crisis (2008). This data is used to derive measures of the annual growth rate of regional GDP (in log-differences), specialisation (Herfindahl index based on sectoral employment shares), the investment rate (used as a proxy for capital growth, as explained later), employment growth, and population density. This is complemented with GIS information on the Euclidean distance between each region and its corresponding national capital ('peripherality') or Brussels ('distance from the EU').[4]

3. Patterns of regional growth in the process of EU accession

The three milestones of EU association split naturally the sample into four periods: early transition (the period prior to the Trade and Cooperation agreements); interim period (from the Trade and Cooperation agreement to signing a Europe agreement); pre-accession period (from the Europe agreement to EU accession); and post-accession period (from EU membership to 2008). A first look, then, into the question of the relationship between EU association and growth is by examining the descriptive patterns of growth across these four periods. Figure 1 presents this analysis for two period definitions: one in relation to EU agreements, as described above (Panel A); and a comparable one using *ad hoc* 5-year intervals (Panel B).

[INSERT FIGURE 1 HERE]

As can be seen, there seems to be a significant effect coming from the interim agreements, as growth in the second period in Panel A is significantly different from that of the 'early transition' period. This contrasts to what is seen in Panel B, where the acceleration of growth rates over time (between the two 5-year intervals in the 1990s) was positive but much less dramatic. By implication, it appears that the signing of the first contractual agreements with the EU is a significant milestone in separating between weak and much improved growth performance. Still, it is not possible to make a causal inference from this observation: although one could argue that these agreements may had a causal impact on growth rates, it is equally plausible that interim agreements were offered to countries (and regions) that were showing robust signals of strong prospective growth performance.

Either way, quite interestingly, the period of Europe Agreements seems to be characterised by non-accelerating growth and much higher variability in terms of regional growth performance. This is unexpected, as the Europe Agreements represented the kick-starting of the pre-accession process and thus were the ultimate signal that the associated countries were certain to become at some later date full members of the EU. The result is even more notable given that the second part of this period (corresponding to the 'early 2000s' in Panel B) was a period of yet accelerating growth and declining disparities in regional growth rates.[5] If a causal claim can be made, it would appear that – counterintuitively – the signing of Europe Agreements had a negative effect for the associated countries, decelerating their rates of growth – while for some regions at the bottom of the distribution the effect may have been negative even in absolute terms. In contrast, the last period (post-accession and late 2000s in Panels A and B, respectively) signifies a return to faster growth and, importantly, an impressive convergence in regional growth rates. Again, it is difficult to ascertain from the data whether this implies a causal link between EU association (in this case, accession) and (regional) growth.

To look more closely at the regional differentiation of growth performances across the different EU association periods, Table 1 presents the average annual growth rates for sub-groups of regions (specialised – non-specialised, peripheral – central, western – eastern, agricultural – non-agricultural, and with high or low population density, service employment shares, export orientation, or income levels), defined using the national median values within each period as the threshold criterion. With this, the hypothesis that the impact of the association agreements has been different for different types of regions can be formally examined – even if descriptively at this stage.

As can be seen, growth performance has varied sometimes significantly across the various groups and across the four periods of the analysis. In the early transition period all region types experienced significantly negative growth rates (at around -4.5%, as is also indicated in Figure 1). The shock was notably higher in regions that were relatively more specialised, were located further afield from Brussels and had more export-oriented economies[6], but it was rather uniformly distributed across regions of different levels of development (GDP per capita), degree of urbanisation (population density), proximity (distance from the national capital), and production structures (share of agriculture and share of services). The period following immediately after the signing of the first Trade and Cooperation Agreements ('interim agreements') saw a significant shift in average annual growth rates, which is statistically significant for each and every regional group (see the asterisks between the means of each pair of periods, showing the statistical significance of their differences). Interestingly, in the 'interim' period growth rates appear to have converged significantly between groups and types of regions, with the only remaining statistically significant differences being between specialised and non-specialised regions (now at the 5%), between east and west regions (also at 5%) and between high and low service-sector share regions (only at the 10%) – with specialised, service-oriented and western regions showing faster recovery than their counterparts.

[INSERT TABLE 1 HERE]

The situation concerning specialised and non-specialised regions reversed in the next period (after the signing of the Europe Agreements and before accession to the EU). Consistent with the evidence of Figure 1, growth rates in this period declined significantly (in a statistical sense) for many region types, but specifically for regions that were of closer relative proximity to Brussels, high specialisation and population density, and low export orientation and levels of development. Overall, in this period growth rates appear particularly slow (relative to their counterparts) in agricultural, specialised, non-service-oriented, non-export-oriented, eastern and less developed regions. In turn, the post-accession period shows a significant revival of growth rates, for all region types. This time, however, the differences between region types are amplified and become significant for virtually every type of grouping (except for export orientation). This is in sharp contrast to what was observed in Figure 1, where growth disparities appeared to have declined significantly. By implication, this shows that while in the post-accession period regional *growth rates became more convergent*, at the same time regional *growth differentials became more systematic* – with regions clearly being sorted between high and low growth regimes on the basis of their structural characteristics. In particular, central, urbanised, western, diversified and non-agricultural regions significantly outperformed their counterparts post-accession.

This is a particularly powerful – and novel – finding. It shows that, if interpreted in causal terms, EU association has economic effects that are significantly and systematically differentiated across space. Not only that, but also that this systematic differentiation may be masked at the aggregate level (e.g., when looking at developments in terms of regional disparities at large). This calls for a more careful analysis in trying to identify the winners and losers of EU association and, in policy terms, for more careful and targeted interventions

that would seek to support and compensate these losers. This offers a strong motivation to the econometric analysis that follows.

4. Econometric analysis – model specification

The econometric analysis uses as a base a production-function specification with two main factors of production (capital and labour). Specifically, regional output is modelled as a Cobb-Douglas production technology of the form:

$$Y_{rtn} = A_{rtn} K_{rtn}^{\beta_1} L_{rtn}^{\beta_2} \quad (1)$$

where ***Y*** is output; ***K*** and ***L*** stand for (physical) capital and labour, respectively; $\boldsymbol{\beta_1}$ and $\boldsymbol{\beta_2}$ are the output elasticities of capital and labour; ***r***, ***t***, an ***n*** index regions, years and countries; and ***A*** is a technology parameter showing total factor productivity (TFP).

Taking logarithmic first-differences, eq.1 becomes:

$$\Delta y_{rtn} = \Delta \ln(A)_{rtn} + \beta_1 \Delta k_{rtn} + \beta_2 \Delta l_{rtn} \quad (2)$$

where small letters show logarithms and ***Δ*** is the lag operator. The first term of this expression (TFP growth) is assumed to follow a country-specific quadratic trend[7] and to be additionally affected by a series of region-specific characteristics and the signing of association agreements with the EU (which are assumed to shift technological growth quasi-permanently, i.e until the next agreement becomes effective). Specifically:

$$\Delta \ln(A_{rtn}) = c_0 + \sum_{1}^{\kappa} (c_1^{\kappa} X_{rtn}^{\kappa}) + \sum_{1}^{\varphi} (c_2^{\varphi} EU_{tn}^{\varphi}) + \sum_{1}^{n} (d_{3,n} * t) + \sum_{1}^{n} (d_{4,n} * t^2) \quad (3)$$

where $\boldsymbol{X}$ is a vector of $\boldsymbol{\kappa}$ region-specific variables (population density, share of agriculture, share of services, specialisation, distance from the capital and from Brussels); $\boldsymbol{EU}$ is a vector of shift dummies for the duration of each type $\boldsymbol{\varphi}$ of association agreement ($\boldsymbol{\varphi}$ = 1 for the early transition period, $\boldsymbol{\varphi}$ = 2 for Interim Agreements, $\boldsymbol{\varphi}$ = 3 for Association Agreements and $\boldsymbol{\varphi}$ = 4 for Accession); $\boldsymbol{t}$ is time (sample years) so that $\boldsymbol{d_n t}$ represents a set of country-specific time-trends; and $\boldsymbol{d_{1,n}}$, $\boldsymbol{d_{2,n}}$ ($\boldsymbol{n}$ = 1,…10) and $\boldsymbol{c_i}$ ($\boldsymbol{i}$ = 0,…,2) are parameters to be estimated.

Substituting eq.3 into eq.2, replacing capital growth with the investment ratio[8] and adding a stochastic term capturing unobserved regional heterogeneity, gives the estimating growth equation:

$$\Delta y_{rtn} = c_0 + \sum_{1}^{\kappa}(c_1^{\kappa} X_{rtn}^{\kappa}) + \sum_{1}^{\varphi}(c_2^{\varphi} EU_{tn}^{\varphi}) + \sum_{1}^{n}(d_{3,n} * t) + \sum_{1}^{n}(d_{4,n} * t^2) + \beta_1 \left(I/Y\right)_{rtn} + \beta_2 \Delta l_{rtn} + \varepsilon_{rtn} \qquad (4)$$

Given the interest in the effects of regional-level structural variables, most of which vary more across space than over time, as well as the controls for countries and time (as captured by the country-specific trends) region-specific fixed effects are not included in the estimations and instead eq.4 is estimated using OLS. As is shown in the Online Appendix, the OLS results are consistent and qualitatively similar to those obtained with other methods.

In eq.4 the estimates on coefficients $\boldsymbol{c_2}$ capture the aggregate (average across regions) growth effects of the association agreements within each country. To examine in turn the *differentiated regional growth impact* of the association agreements, the technology equation (eq.3) is modified to include also an interaction term between each characteristic of interest ($\boldsymbol{X^{\kappa}}$) and the European association dummies ($\boldsymbol{EU^{\varphi}}$). Thus, the estimating model becomes:

$$\Delta y_{rtn} = c_0 + \sum_{1}^{\kappa}(c_1^{\kappa} X_{rtn}^{\kappa}) + \sum_{1}^{\varphi}(c_2^{\varphi} EU_{tn}^{\varphi}) + \sum_{1}^{n}(d_{3,n} * t) + \sum_{1}^{n}(d_{4,n} * t^2)$$

$$+ \sum_{1}^{\varphi}\left(c_3^{\varphi} X_{rtn}^{a} EU_{tn}^{\varphi}\right) + \beta_1 \left(I/Y\right)_{rtn} + \beta_2 \Delta l_{rtn} + \varepsilon_{rtn}$$

(4')

where $\boldsymbol{a} \in (1,\ldots,\boldsymbol{\kappa})$ is one of the $\boldsymbol{X^{\kappa}}$ regional characteristics. In the empirical analysis the regional characteristics ***X*** are used alternatively as continuous measures or as dichotomous dummies (assigning the value of one for regions with above-median values, as used in the descriptive analysis of Table 1).

5. Empirical results

For exposition, the analysis starts with a simple version of eq.4 where the technology parameter ***A*** is assumed to be influenced only by the country-specific time-trends (i.e., $\boldsymbol{c_1^{\kappa}} = \boldsymbol{c_2^{\varphi}} = 0\ \forall \boldsymbol{\kappa,\varphi}$). This simple model (Table 2, col.1) performs well as a baseline, with both coefficients significant at the 1% level. Extending this model to include the various regional characteristics (col.2), maintains the signs and significance of these coefficients and adds explanatory power to the model. As can be seen, specialisation is found to be negatively related to growth (consistently across specifications). The share of agriculture is also inversely related to growth, although the effect is insignificant in the regressions shown, which control simultaneously for the regional employment share of services – which enters with a positive coefficient (significant at 10%). Population density also enters with a positive coefficient but lacks statistical significance. Among the geography variables (col.3), peripherality (distance from the national capital) returns a negative and statistically significant effect (at 1%), showing that proximity to the main urban agglomeration is a

significant contributor to growth. Distance from Brussels also returns a negative effect, which is however not significant statistically.

These results remain consistent when adding the shift effects linked to EU association agreements (col.4). The shift effects are statistically significant for the first three periods and, moreover, statistically different from one another (with the exception of the pre-post-accession pair).[9] This shows that average regional growth has been, indeed, distinctively different across phases of EU association.[10] Consistent with what was shown in Figure 1, the early transition period saw growth rates well below the average (an estimated deviation of 3.05 percentage points of growth), while growth dynamics reversed significantly after the signing of the interim agreements (with a positive deviation of 3.8 percentage points). In contrast, the pre-accession period was characterised by a deceleration of growth (in *ceteris paribus* terms), falling 0.7 percentage points below the central sample-wide estimate ('grand mean'); while the post-accession period was also a period of below-average growth, although with a slight improvement – albeit marginally, given the statistical insignificance of this coefficient – compared to the pre-accession period.

[INSERT TABLE 2 HERE]

Col.5 reproduces the results of col.4, this time replacing the continuous measures associated to regional characteristics with the dichotomous (dummy) variables used earlier in Table 1. As can be seen, the results remain consistent[11] with the coefficients of the EU association dummies virtually unchanged. It should be noted that these results are very robust also across specifications.[12] To ascertain that, besides their robustness, these results capture really the effect of the association agreements and not just a period effect, col.6 performs a 'placebo' regression, substituting the EU association shift dummies with a set of dummies corresponding to four sequential 5-year intervals (as used in the right panel of Figure 1). The results in this case are very different both quantitatively (e.g., the period 3 coefficient is

three times larger than the estimated pre-accession effect) and qualitatively (e.g., in the first two periods the estimated signs are reversed). Although this is a rather crude test, it nevertheless gives confidence that the obtained results are indeed substantively linked to the process of EU association.

Naturally, the question that emerges is how these period-related variations played out for regions of different structures and types. This is explored in Table 3, where, in each column, one of each regional characteristic is interacted with each of the period shift effects, to obtain period-specific estimates of the impact of these characteristics on regional growth.[13] As can be seen, both the shift effects and the estimates for the production function variables remain broadly consistent with those reported earlier. Reading horizontally the average slope effects across models ('grand mean' estimates for each of the regional characteristics), it can be seen that, globally (i.e., irrespective of EU association period), growth is negatively associated with sectoral specialisation, agricultural employment and distance from the capital (peripherality) and from Brussels; while it is positively associated to employment in services, population density (agglomeration) and relative development. This is fully consistent with the findings reported in previous studies on growth in CEECs as well as with economic intuition: growth is harnessed by industrial diversity, agglomeration, proximity to markets (national or European), and specialisation in sectors with increasing returns and high productivity (services).

The novelty of the analysis comes with the results concerning the interaction terms, which examine how these 'global' relationships have differed across the four phases of EU association. Reading again horizontally and starting from the early transition period, it appears that at this period most of the negative global effects were intensified (additional recessionary effects from specialisation, agricultural employment and remoteness); while a positive growth advantage is only found for the wealthier regions. The situation changed

drastically in the period of interim EU agreements. In that period, sectoral specialisation, agricultural employment and even distance from the economic centres, seem to contribute to above average regional economic performance; while specialisation in services, population density and levels of development seem to have slowed regional growth down. Clearly, this shows that this period created conditions of increasing spatial equity in the CEE countries – consistent with the results found in the descriptive analysis depicted in Table 1. Instead, in the pre-accession and post-accession periods the interaction effects are in most cases statistically insignificant, suggesting that growth drivers in these periods operated very much in line with the global effects. The two exceptions in the pre-accession period (an additional growth advantage for service-oriented regions and an additional growth disadvantage for eastern regions) and the two additional exceptions in the post-accession period (a growth disadvantage for agricultural regions and a growth advantage for more developed regions), are in line with expectations in the literature about the spatially inequitable effects of economic integration (ASCANI *et al*., 2012; MONASTIRIOTIS, 2014 and 2016).

[INSERT TABLE 3 HERE]

Summing up, the results suggest that EU association has indeed a differentiated impact on regions of different types. Following a large early transition shock, the interim period saw a dynamic of relative convergence, with the characteristics mostly attributable to the early transition shock now contributing to a faster recovery. Entering pre-accession has instead restored the previous order of affairs, with growth becoming slower in regions with higher agricultural shares, more specialisation, lower population densities and levels of development and lower proximity to national and European markets. The same pattern remained post-accession, but in this period the sorting capacity of some regional characteristics – in particular, sectoral employment shares, relative levels of development

and distance from Brussels – became stronger. This is consistent with arguments in the literature suggesting that EU membership strengthens forces of agglomeration that favour regions with high market potential, concentration, and specialisations in increasing returns sectors. The analysis shows that this effect is uniquely related to the EU association process and it is not simply coincidental to other contemporaneous forces that may exert an influence on national and regional growth.

6. Conclusions

The analysis presented in this paper offers a useful account of the regional growth trajectories followed by the transition countries that acceded to the EU in the 2004/07 enlargement. Although the literature has already shown that regional disparities in these countries widened significantly in the process of transition, market openness and EU accession, evidence of a direct link between the process of EU association and national and regional growth is hard to find in the literature. In some respects, the reason for this is that the dynamics unleashed by the EU association process can easily be convoluted with, and is difficult to separate from, influences linked to the concurrent processes of transition and economic restructuring.

The analysis in this paper overcame this problem by approximating the temporal dynamics linked to transition through non-linear country-specific time-trends and modelling explicitly the factors driving regional growth through a TFP equation. The results show that the EU association process did indeed accelerate growth in the countries and regions of CEE – although this happened almost exclusively in the first phase of association (interim period) and, against conventional wisdom, the growth impact of the pre-accession period was

negative. These estimates are distinctively linked to the phases of EU association, as indicated by their difference to those obtained for the 5-year intervals in the 'placebo' test.

More importantly, the evidence shows that these growth effects have not been evenly distributed across space. While in the early association phase less advantaged regions seemed to benefit more, later phases of association and integration (pre-/post-accession) seem to have favoured regions with pre-existing growth advantages more. This result is consistent across estimation methods and ways of modelling the time dynamics (cf. Table 3 and Tables A.4 and A.5 in the Online Appendix). Of course, the study does not reveal the underlying forces that account for these EU association effects. But the patterns unveiled are indicative of the underlying processes that trigger growth – processes related to the exploitation of sectoral advantages, market size, urbanisation effects and industrial diversity. In line with arguments in the existing literature, deeper EU association and integration seems to create advantages for more developed, service-based and diversified regions and regions with high population density (agglomeration) and access to markets. But unlike what is often assumed in the literature, early association agreements actually contribute to narrowing spatial disparities by benefiting more regions of less advantageous characteristics. Perhaps concurrent processes of transition (industrial restructuring, political-economic reform) may be more detrimental for such regions and this may be a reason why the literature often finds a widening of disparities also in the early phases of EU association. As the results here show, any such developments should not be seen as directly linked to the EU association process.

The analysis presented here thus provides unique evidence on the relationship between EU association and regional growth in CEE, which is informative both for the growth dynamics in the region *per se* and for the assessment of the 'regional footprint' of EU association for countries outside the EU. Generalising on the CEE-derived estimates, deeper association

with the EU after a period of initial cooperation agreements may be associated with decelerating growth nationally and the re-emergence of old cleavages in terms of growth trajectories (e.g., between agricultural and non-agricultural regions) and pressures that shift growth towards regions with conducive characteristics – such as high rates of population density, per capita income and industrial diversity – at the relative expense of less competitive (agricultural, peripheral, narrowly specialised) regions. It is interesting to note that this general pattern may have a parallel in the countries belonging to the wider 'EU neighbourhood', which are today in a phase of EU association similar to the 'interim agreements' category.[14] Recent evidence on these countries has shown that regional disparities have not been increasing particularly rapidly during the last 10 years or so since the launch of the ENP framework (see KALLIORAS *et al*., 2016 and PETRAKOS *et al*., 2016 for evidence on this), while national growth has been rather strong (at least prior to the crisis). This is consistent with the patterns found in the CEE sample during the 'interim period'. It would thus be interesting to examine in future research whether the prospective deepening of institutional and economic relations of some ENP countries with the EU will produce outcomes similar to those identified here for the CEE countries in the 'pre-accession' period. Notwithstanding its potential salience for the EU and the countries in the 'European neighbourhood' alike, the investigation of this question should be a task for future research.

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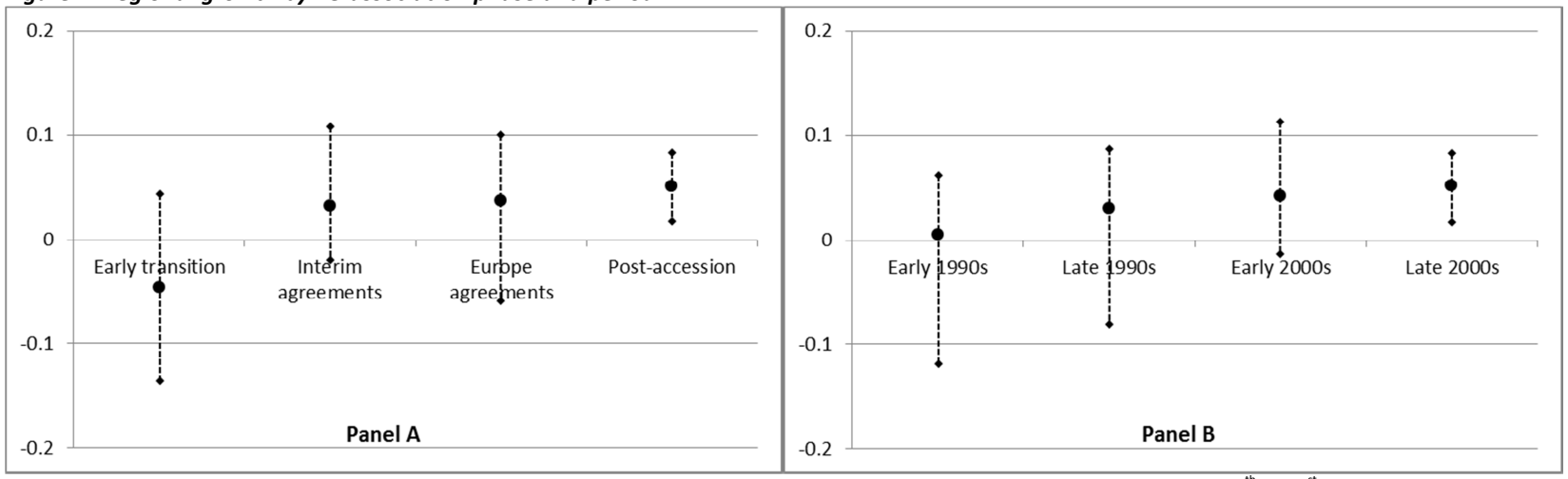
Tables and Figures – MAIN TEXT

Paper: "The regional impact of EU association agreements: an event-analysis approach to the case of Central and Eastern Europe"

List of Tables and Figures – main text

Figure* 1. *Regional growth by EU association phase and period



Notes: Large dots show median values (median regional growth across all regions during the period), while the dotted lines show the values for the 9th and 1st deciles of the corresponding distributions. See the text for information on the definition of periods.

Table 1. Average annual growth rates by period and type of region

Categories	***Early transition***	Significance b/w periods	***Interim Agreements***	Significance b/w periods	***Europe Agreements***	Significance b/w periods	***Post-accession***
Peripheral	-4.44%	***	3.92%	*	2.94%	***	4.99%
Central	-4.59%	***	4.45%	**	3.18%	***	5.42%
Significance of group difference							**
Close to Brussels	-3.69%	***	4.85%	***	3.41%	***	5.49%
Remote from Brussels	-5.36%	***	3.51%	*	2.71%	***	4.93%
Significance of group difference	**		**		**		***
Specialised	-6.31%	***	4.92%	***	2.51%	***	4.88%
Non-specialised	-2.69%	***	3.55%		3.64%	***	5.51%
Significance of group difference	***		**		***		***
Agricultural	-4.90%	***	3.71%	*	2.69%	***	4.90%
Non-agricultural	-4.11%	***	4.68%	**	3.44%	***	5.52%
Significance of group difference					**		***
Service-oriented	-4.77%	***	4.73%	*	3.91%	***	5.44%
Non service-oriented	-4.23%	***	3.65%	**	2.21%	***	4.98%
Significance of group difference			*		***		**
Dense	-4.46%	***	4.59%	***	3.08%	***	5.61%
Sparse	-4.57%	***	3.79%		3.04%	***	4.82%
Significance of group difference							***
Export-oriented	-5.03%	***	3.84%		3.37%	***	5.39%
Closed	-2.54%	***	4.50%	***	2.72%	***	5.05%
Significance of group difference	***				**		
Developed	-4.35%	***	4.57%		4.10%	***	5.75%
Less developed	-4.65%	***	3.81%	***	2.02%	***	4.68%
Significance of group difference					***		***

Notes: *, **, *** show significance at 0.1, 0.05 and 0.01, respectively. Asterisks below each pair of cells indicate the statistical significance of the difference of the two mean values of the corresponding groups (e.g., specialised vs non-specialised). Asterisks to the right of each mean value indicate the statistical significance of the difference between this value and the corresponding value for the same group in the next period (e.g., interim vs early transition). All measures are defined in 'relative' terms, i.e., in relation to the relevant country-period median. For the definition of groups and periods see the discussion in the text.

Table 2. Drivers of regional growth in CEE and the EU association effects

	(1) Production function	(2) Regional structures	(3) Geography	(4) EU association	(5) Dichotomous RHS variables	(6) 'Placebo': 5-year intervals
Production inputs						
Employment growth	0.276***	0.275***	0.274***	0.248***	0.238***	0.255***
	(0.0246)	(0.0256)	(0.0256)	(0.0248)	(0.0238)	(0.0248)
Investment to GDP ratio	0.0665***	0.0373**	0.0354**	0.0523***	0.0720***	0.0616***
	(0.0167)	(0.0175)	(0.0176)	(0.0169)	(0.0164)	(0.0169)
Regional characteristics						
Specialisation index		-0.197***	-0.196***	-0.175***	-0.00539**	-0.00841***
		(0.0437)	(0.0449)	(0.0432)	(0.00217)	(0.00225)
Population density (log)		0.00143	0.000588	0.00132	0.00359*	0.00408*
		(0.00156)	(0.00162)	(0.00156)	(0.00205)	(0.00212)
Agriculture (employment share)		-0.0112	-0.0105	-0.0166	0.000174	-0.000681
		(0.0179)	(0.0182)	(0.0174)	(0.00241)	(0.00249)
Services (employment share)		0.0327*	0.0347*	0.0107	0.00468**	0.00283
		(0.0198)	(0.0198)	(0.0191)	(0.00233)	(0.00239)
Geography						
Distance from Capital (log)			-0.00551***	-0.00538***	-0.00320	-0.00333
			(0.00197)	(0.00190)	(0.00201)	(0.00208)
Distance from Brussels (log)			-0.00667	-0.0127	-0.00613***	-0.00515**
			(0.0111)	(0.0107)	(0.00211)	(0.00218)
EU association						
Early transition				-0.0305***	-0.0322***	0.0349***
				(0.00417)	(0.00416)	(0.00611)
Interim period (TCA)				0.0382***	0.0390***	-0.00905***
				(0.00311)	(0.00312)	(0.00316)
Pre-accession (EA)				-0.00696**	-0.00609**	-0.0167***
				(0.00305)	(0.00303)	(0.00320)
Post-accession				-0.000737	-0.000701	-0.00923
				(0.00429)	(0.00437)	(0.00606)
Constant	-0.0504***	-0.0232*	-0.0135	0.00170	-0.0445***	-0.0988***
	(0.00534)	(0.0137)	(0.0167)	(0.0168)	(0.00719)	(0.0106)
Observations	3,314	3,199	3,199	3,199	3,314	3,314
R-squared	0.207	0.226	0.228	0.288	0.277	0.228

Notes: Standard errors in parentheses. *, **, *** show significance at 0.1, 0.05 and 0.01, respectively. The reported EU association effects are transformed coefficients (individual contrasts) using the Deviation Contrast transformation, which expresses the derived coefficients as deviations from the 'grand mean' (sample-wide average effect, which is given by the constant). These individual contrasts have been derived in

Stata 14 using the -devcon- command, but they can also be derived using the -margins- and -contrast- commands. All regressions include country-specific quadratic time-trends and have been estimated with OLS. All regional variables are continuous measures in cols.1-4 and dichotomous (1 if regional value is above the country-period specific median) in cols.5-6. In col.6 the EU association periods have been replaced with shift dummies for four year-intervals (1991-1994, 1995-1999, 2000-2004, 2005-2008).

Table* 3. *The effect of regional growth drivers across phases of EU association

VARIABLES	(1) Specialisation (Herfindahl index)	(2) Agriculture empl. share	(3) Services empl. share	(4) Population density (log)	(5) Relative level of development	(6) Relative distance from the Capital	(7) Relative distance from Brussels
Production inputs							
Employment growth	0.249***	0.241***	0.232***	0.237***	0.237***	0.253***	0.211***
	(0.0241)	(0.0242)	(0.0239)	(0.0240)	(0.0235)	(0.0237)	(0.0234)
Investment to GDP ratio	0.0570***	0.0650***	0.0707***	0.0683***	0.0804***	0.0760***	0.0960***
	(0.0166)	(0.0160)	(0.0161)	(0.0162)	(0.0158)	(0.0162)	(0.0159)
Regional characteristics							
Average slope effect	-0.231***	-0.0540***	0.0337***	0.00357***	0.0121***	-0.00468**	-0.0349***
	(0.0417)	(0.0103)	(0.0121)	(0.00134)	(0.00243)	(0.00188)	(0.00814)
… (x) Early transition	-0.242***	-0.0566***	0.0158	-0.000543	0.0189***	-0.0131***	-0.0301***
	(0.0665)	(0.0179)	(0.0207)	(0.00268)	(0.00322)	(0.00325)	(0.0106)
… (x) Interim period	0.237***	0.104***	-0.0917***	-0.00347**	-0.0292***	0.0109***	0.131***
	(0.0696)	(0.0180)	(0.0221)	(0.00148)	(0.00375)	(0.00355)	(0.00996)
… (x) Pre-accession	0.0175	-0.00795	0.0388***	0.00219	0.00159	0.00365	-0.0382***
	(0.0423)	(0.0109)	(0.0136)	(0.00161)	(0.00223)	(0.00231)	(0.00713)
… (x) Post-accession	-0.0123	-0.0391**	0.0371*	0.00182	0.00870**	-0.00150	-0.0627***
	(0.0801)	(0.0171)	(0.0192)	(0.00204)	(0.00377)	(0.00311)	(0.0110)
EU association							
Early transition	0.00287	-0.0154**	-0.0389***	-0.0332***	-0.0593***	-0.0172***	-0.0117
	(0.0107)	(0.00628)	(0.00907)	(0.00764)	(0.00559)	(0.00555)	(0.0114)
Interim period (TCA)	0.00469	0.0163***	0.0793***	0.0315***	0.0731***	0.0276***	-0.0941***
	(0.0103)	(0.00507)	(0.0102)	(0.00657)	(0.00545)	(0.00497)	(0.0107)
Pre-accession (EA)	-0.00877	-0.00589	-0.0229***	-0.000529	-0.00925**	-0.00983***	0.0314***
	(0.00680)	(0.00400)	(0.00663)	(0.00503)	(0.00407)	(0.00377)	(0.00764)
Post-accession	0.00122	0.00494	-0.0175*	0.00227	-0.00453	-0.000594	0.0744***
	(0.0124)	(0.00582)	(0.00987)	(0.00647)	(0.00578)	(0.00565)	(0.0132)
Constant	-0.0106	-0.0340***	-0.0597***	-0.0380***	-0.0602***	-0.0416***	-0.00762
	(0.00946)	(0.00716)	(0.00839)	(0.00740)	(0.00699)	(0.00735)	(0.00999)
Observations	3,234	3,280	3,310	3,314	3,314	3,314	3,314
R-squared	0.286	0.289	0.281	0.275	0.299	0.276	0.313

Notes: Standard errors in parentheses. *, **, *** show significance at 0.1, 0.05 and 0.01, respectively. The reported EU association effects (direct and interactive slopes) are transformed coefficients (individual contrasts) using the Deviation Contrast transformation. The slope and interaction effects reported in each column refer to the variable indicated at the top of each column (all measured as continuous variables). Measures indicated as relative are expressed as deviations from the sample mean. All regressions include country-specific quadratic time-trends and have been estimated with OLS. **Tables and Figures – ONLINE APPENDIX**

Paper: "The regional impact of EU association agreements: an event-analysis approach to the case of Central and Eastern Europe"

List of Tables and Figures – online appendix

Table* A.1. *EU association milestones for the CEE countries

Country	*Cooperation Agreement*	*Europe Agreement*	*Accession to EU*
BG	1993	1995	2007
CZ	1992	1995	2004
EE	1995	1998	2004
HU	1992	1994	2004
LT	1995	1998	2004
LV	1995	1998	2004
PL	1992	1994	2004
RO	1994	1995	2007
SI	1997	1999	2004
SK	1992	1995	2004

Source: DG Enlargement and External Action Service; processed by the authors.

Table* A.2. *Alternative econometric specifications and estimation methods

VARIABLES	(1) Country-specific trends (Table 2 col.5)	(2) Country-effects and common trend	(3) Country-effects and year dummies	(4) Year and regional fixed effects (2-way FE)	(5) Regional fixed effects only (FE 'within')	(6) Interactive country-year (C/Y) fixed effects[#]
Regional dummies						
Employment growth	0.238***	0.239***	0.212***	0.188***	0.230***	0.228***
	(0.0238)	(0.0239)	(0.0238)	(0.0248)	(0.0251)	(0.0250)
Investment to GDP ratio	0.0720***	0.0768***	0.0950***	0.0950***	0.0869***	0.0390**
	(0.0164)	(0.0155)	(0.0154)	(0.0191)	(0.0187)	(0.0161)
Specialisation (Herfindahl)	-0.00539**	-0.00615***	-0.00356*	-0.00125	-0.00400	-0.00568***
	(0.00217)	(0.00216)	(0.00214)	(0.00275)	(0.00277)	(0.00193)
Population density	0.00359*	0.00367*	0.00354*	-0.000471	-0.00775	0.00420***
	(0.00205)	(0.00206)	(0.00200)	(0.00668)	(0.00696)	(0.00157)
Agriculture (empl share)	0.000174	0.000601	-0.00106	0.00711*	0.00852**	-0.000761
	(0.00241)	(0.00242)	(0.00235)	(0.00371)	(0.00387)	(0.00186)
Services (empl share)	0.00468**	0.00526**	0.00298	-0.000378	0.0113***	0.00400**
	(0.00233)	(0.00235)	(0.00228)	(0.00322)	(0.00321)	(0.00180)
Distance from capital	-0.00320	-0.00320	-0.00260			-0.00342**
	(0.00201)	(0.00202)	(0.00196)			(0.00153)
Distance from Brussels	-0.00613***	-0.00592***	-0.00657***			-0.00571***
	(0.00211)	(0.00212)	(0.00206)			(0.00162)
EU association periods						
Early transition	-0.0322***	-0.0348***	-0.0207***	-0.0198***	-0.0636***	-0.0689***
	(0.00416)	(0.00408)	(0.00488)	(0.00488)	(0.00261)	(0.00988)
Interim agreements	0.0390***	0.0396***	0.0360***	0.0373***	0.0254***	0.0241*
	(0.00312)	(0.00300)	(0.00335)	(0.00335)	(0.00256)	(0.0129)
Pre-accession	-0.00609**	-0.000691	0.000495	0.000713	0.0131***	0.00801
	(0.00303)	(0.00287)	(0.00317)	(0.00316)	(0.00162)	(0.0129)
Post-accession	-0.000701	-0.00411	-0.0158***	-0.0182***	0.0251***	0.0368***
	(0.00437)	(0.00409)	(0.00494)	(0.00500)	(0.00212)	(0.0129)
Time-trend		0.00858***				
		(0.00153)				
Trend squared		-0.000254***				
		(7.52e-05)				

Constant	-0.0445***	-0.0493***	-0.0754***	-0.0719***	-0.00690	0.0216**
	(0.00719)	(0.00741)	(0.00844)	(0.00963)	(0.00657)	(0.00927)
Observations	3,314	3,314	3,314	3,314	3,314	3,314
R-squared	0.277	0.267	0.316	0.298	0.222	0.604
Tests for significance of differences						
Periods 1 – 2	221.83***	238.17***	106.46***	109.07***	403.48***	26.40***
Periods 1 – 3	16.14***	29.60***	8.56***	8.09***	487.17***	17.91***
Periods 1 – 4	16.76***	17.19***	0.29	0.03	489.37***	34.19***
Periods 2 – 3	83.70***	72.29***	44.45***	47.69***	12.86***	0.56
Periods 2 – 4	33.65***	46.53***	47.99***	53.90***	0.01	0.35
Periods 3 – 4	1.15	0.54	9.14***	12.00***	20.05***	1.79
Hausman test for RE v FE				85.76***	70.65***	
Breusch-Pagan test for common variance (GLS-RE model)				53.68***	35.78***	

Notes: Standard errors in parentheses. *, **, *** show significance at 0.1, 0.05 and 0.01, respectively. The reported EU association effects (direct and interactive slopes) are transformed coefficients (individual contrasts) using the Deviation Contrast transformation. All models have been estimated with OLS, except for models 4 and 5 which have been estimated using the 'within' estimator. The Breusch-Pagan and Hausman tests are in relation to the alternative of a random effects model (estimated with GLS).

[#]: The estimated period effects in the interactive country-year dummies model are not independent of the reference category used to identify them and are thus reported solely for illustrative purposes.

Table* A.3. *The effect of EU association across region types

VARIABLES	(1) Specialisation (Herfindahl index)	(2) Agriculture empl. share	(3) Services empl. share	(4) Population density (log)	(5) Relative level of development	(6) Relative distance from the Capital	(7) Relative distance from Brussels
Production inputs							
Employment growth	0.242***	0.248***	0.251***	0.250***	0.247***	0.252***	0.248***
	(0.0237)	(0.0238)	(0.0238)	(0.0238)	(0.0237)	(0.0238)	(0.0237)
Investment to GDP ratio	0.0703***	0.0780***	0.0783***	0.0787***	0.0801***	0.0793***	0.0844***
	(0.0162)	(0.0161)	(0.0160)	(0.0161)	(0.0160)	(0.0161)	(0.0161)
Regional characteristic							
Average slope effect	-0.00526**	-0.00592**	0.00258	0.00339	0.00858***	-0.00112	-0.00951***
	(0.00251)	(0.00247)	(0.00248)	(0.00247)	(0.00249)	(0.00247)	(0.00247)
… (x) Early transition	-0.0177***	-0.00109	-0.0127***	-0.00531	-0.00778	0.00469	-0.00541
	(0.00496)	(0.00491)	(0.00491)	(0.00490)	(0.00493)	(0.00490)	(0.00490)
… (x) Interim period	0.0197***	-0.00129	0.00494	0.00145	-0.00154	-0.00108	-0.00215
	(0.00499)	(0.00496)	(0.00496)	(0.00496)	(0.00495)	(0.00496)	(0.00495)
… (x) Pre-accession	-0.00392	0.00106	0.00710**	-0.00158	0.00558*	-0.000360	0.00325
	(0.00311)	(0.00310)	(0.00313)	(0.00310)	(0.00312)	(0.00310)	(0.00309)
… (x) Post-accession	0.00197	0.00133	0.000657	0.00545	0.00374	-0.00324	0.00431
	(0.00387)	(0.00386)	(0.00386)	(0.00386)	(0.00390)	(0.00386)	(0.00386)
EU association							
Early transition	-0.0224***	-0.0314***	-0.0273***	-0.0291***	-0.0312***	-0.0341***	-0.0293***
	(0.00479)	(0.00490)	(0.00486)	(0.00480)	(0.00471)	(0.00478)	(0.00477)
Interim period (TCA)	0.0302***	0.0400***	0.0356***	0.0390***	0.0373***	0.0402***	0.0407***
	(0.00390)	(0.00401)	(0.00396)	(0.00398)	(0.00394)	(0.00395)	(0.00394)
Pre-accession (EA)	-0.00441	-0.00656*	-0.00918***	-0.00498	-0.00898***	-0.00566*	-0.00740**
	(0.00336)	(0.00346)	(0.00339)	(0.00341)	(0.00333)	(0.00340)	(0.00339)
Post-accession	-0.00340	-0.00206	0.000883	-0.00494	0.00281	-0.000438	-0.00404
	(0.00466)	(0.00476)	(0.00482)	(0.00472)	(0.00474)	(0.00471)	(0.00469)
Constant	-0.0449***	-0.0456***	-0.0475***	-0.0503***	-0.0505***	-0.0482***	-0.0452***
	(0.00690)	(0.00686)	(0.00688)	(0.00685)	(0.00690)	(0.00690)	(0.00683)
Observations	3,314	3,314	3,314	3,314	3,314	3,314	3,314
R-squared	0.277	0.272	0.274	0.272	0.278	0.271	0.274

Notes: Standard errors in parentheses. *, **, *** show significance at 0.1, 0.05 and 0.01, respectively. The reported EU association effects (direct and interactive slopes) are transformed coefficients (individual contrasts) using the Deviation Contrast transformation. The slope and interaction effects reported in each column refer to the variable indicated at the top of each column. All of these variables are expressed

relative to their national (country-period) median, and are specified as dichotomous dummies (taking the value of 1 for values above the country-period median). All regressions include country-specific quadratic time-trends and have been estimated with OLS.

Table A.4. The effect of regional growth drivers across phases of EU association – FE models ('within' estimator)

VARIABLES	(1) Specialisation (Herfindahl index)	(2) Agriculture empl. share	(3) Services empl. share	(4) Population density (log)	(5) Relative level of development	(6) Relative distance from the Capital	(7) Relative distance from Brussels
Production inputs							
Employment growth	0.256***	0.261***	0.245***	0.256***	0.256***	0.262***	0.244***
	(0.0245)	(0.0246)	(0.0243)	(0.0243)	(0.0237)	(0.0241)	(0.0238)
Investment to GDP ratio	0.0668***	0.0692***	0.0658***	0.0777***	0.0782***	0.0815***	0.0957***
	(0.0150)	(0.0150)	(0.0149)	(0.0149)	(0.0138)	(0.0148)	(0.0146)
Regional characteristic							
Average slope effect	-0.152***	-0.0300***	0.0235**	0.00135	0.00942***	-0.00636***	0.00303
	(0.0392)	(0.00972)	(0.0117)	(0.00145)	(0.00171)	(0.00195)	(0.00498)
… (x) Early transition	-0.346***	-0.0884***	0.0329	-0.000387	0.0265***	-0.0179***	-0.0770***
	(0.0649)	(0.0178)	(0.0208)	(0.00274)	(0.00305)	(0.00326)	(0.00981)
… (x) Interim period	0.180***	0.0867***	-0.0841***	-0.00465*	-0.0247***	0.00818**	0.112***
	(0.0691)	(0.0179)	(0.0221)	(0.00250)	(0.00362)	(0.00356)	(0.00931)
… (x) Pre-accession	0.0239	-0.00735	0.0448***	0.00418**	0.00218	0.00601***	-0.0304***
	(0.0415)	(0.0106)	(0.0131)	(0.00163)	(0.00217)	(0.00232)	(0.00591)
… (x) Post-accession	0.141**	0.00910	0.00634	0.000858	-0.00403	0.00369	-0.00453
	(0.0684)	(0.0140)	(0.0169)	(0.00196)	(0.00283)	(0.00278)	(0.00706)
EU association							
Early transition	-0.0111	-0.0376***	-0.0731***	-0.0617***	-0.0946***	-0.0403***	0.0146
	(0.00975)	(0.00518)	(0.00869)	(0.00701)	(0.00460)	(0.00446)	(0.00991)
Interim period (TCA)	-0.00173	0.00530	0.0619***	0.0142**	0.0553***	0.0160***	-0.0861***
	(0.0100)	(0.00466)	(0.0101)	(0.00635)	(0.00510)	(0.00464)	(0.00960)
Pre-accession (EA)	0.00869	0.0119***	-0.00896	0.0206***	0.00882***	0.00386	0.0418***
	(0.00623)	(0.00300)	(0.00594)	(0.00413)	(0.00302)	(0.00298)	(0.00613)
Post-accession	0.00409	0.0204***	0.0202**	0.0269***	0.0305***	0.0205***	0.0298***
	(0.00967)	(0.00341)	(0.00846)	(0.00497)	(0.00392)	(0.00369)	(0.00751)
Constant	0.0262***	0.0111**	-0.00638	0.00382	-0.0109***	0.00705	-0.00684
	(0.00727)	(0.00467)	(0.00596)	(0.00517)	(0.00400)	(0.00457)	(0.00613)
Observations	3,234	3,280	3,310	3,314	3,314	3,314	3,314
Number of regions	190	190	190	190	190	190	190

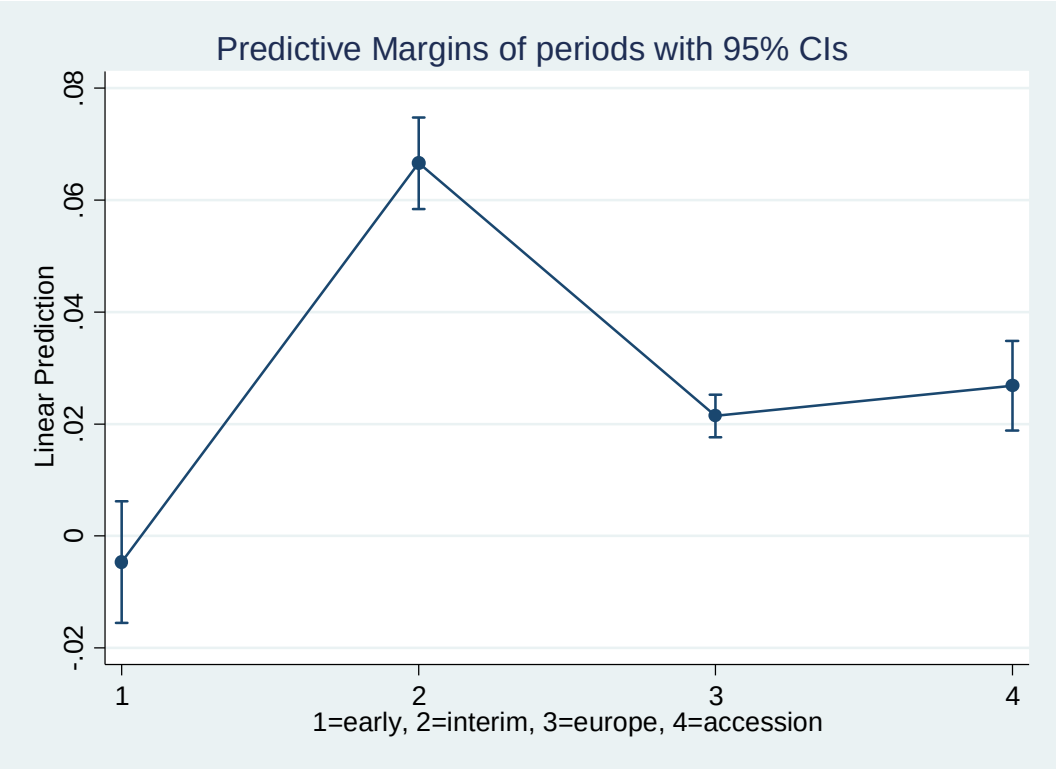
Notes: Standard errors in parentheses. *, **, *** show significance at 0.1, 0.05 and 0.01, respectively. The reported EU association effects (direct and interactive slopes) are transformed coefficients (individual contrasts) using the Deviation Contrast transformation. The slope and interaction effects reported in each column refer to the variable indicated at the top of each column (all measured as continuous variables). Measures indicated as relative are expressed as deviations from the sample mean. All regressions include region-specific fixed effects and have been estimated with the fixed-effects 'within' estimator.

Table* A.5. *The effect of regional growth drivers across phases of EU association – models with year-specific fixed effects

VARIABLES	(1) Specialisation (Herfindahl index)	(2) Agriculture empl. share	(3) Services empl. share	(4) Population density (log)	(5) Relative level of development	(6) Relative distance from the Capital	(7) Relative distance from Brussels
Production inputs							
Employment growth	0.234***	0.228***	0.215***	0.211***	0.218***	0.229***	0.204***
	(0.0240)	(0.0240)	(0.0237)	(0.0238)	(0.0234)	(0.0236)	(0.0233)
Investment to GDP ratio	0.0789***	0.0852***	0.0888***	0.0867***	0.0943***	0.0925***	0.121***
	(0.0166)	(0.0159)	(0.0160)	(0.0161)	(0.0158)	(0.0161)	(0.0161)
Regional characteristic							
Average slope effect	-0.223***	-0.0593***	0.0398***	0.00494***	0.0148***	-0.00375**	-0.0398***
	(0.0411)	(0.0100)	(0.0118)	(0.00131)	(0.00239)	(0.00184)	(0.00808)
… (x) Early transition	-0.177***	-0.0491***	-0.00975	0.00213	0.0135***	-0.00767**	-0.0349***
	(0.0667)	(0.0180)	(0.0209)	(0.00264)	(0.00322)	(0.00320)	(0.0110)
… (x) Interim period	0.0662	0.0655***	-0.0306	-0.00242	-0.0186***	0.00714**	0.110***
	(0.0699)	(0.0181)	(0.0227)	(0.00247)	(0.00379)	(0.00350)	(0.0114)
… (x) Pre-accession	0.0492	0.00343	0.0227*	1.13e-05	0.000836	0.00197	-0.0339***
	(0.0419)	(0.0109)	(0.0136)	(0.00159)	(0.00224)	(0.00228)	(0.00766)
… (x) Post-accession	0.0611	-0.0198	0.0176	0.000282	0.00420	-0.00145	-0.0411***
	(0.0804)	(0.0173)	(0.0192)	(0.00199)	(0.00376)	(0.00304)	(0.0128)
EU association							
Early transition	0.00708	-0.00184	-0.0144	-0.0131	-0.0414***	-0.0108*	0.00254
	(0.0110)	(0.00690)	(0.00960)	(0.00818)	(0.00653)	(0.00609)	(0.0120)
Interim period (TCA)	0.0257**	0.0206***	0.0499***	0.0306***	0.0564***	0.0291***	-0.0788***
	(0.0106)	(0.00549)	(0.0105)	(0.00706)	(0.00580)	(0.00505)	(0.0127)
Pre-accession (EA)	-0.0128*	-0.00912**	-0.0159**	-0.00561	-0.00701	-0.00789**	0.0298***
	(0.00701)	(0.00436)	(0.00676)	(0.00543)	(0.00445)	(0.00400)	(0.00876)
Post-accession	-0.0200	-0.00964	-0.0196*	-0.0119	-0.00803	-0.0104	0.0465***
	(0.0131)	(0.00689)	(0.0102)	(0.00729)	(0.00646)	(0.00649)	(0.0161)
Constant	-0.0353***	-0.0600***	-0.0864***	-0.0580***	-0.0819***	-0.0630***	-0.0305***
	(0.0105)	(0.00838)	(0.00969)	(0.00859)	(0.00838)	(0.00877)	(0.0107)
Observations	3,234	3,280	3,310	3,314	3,314	3,314	3,314
Number of regions	0.329	0.335	0.324	0.324	0.339	0.322	0.347

Notes: Standard errors in parentheses. *, **, *** show significance at 0.1, 0.05 and 0.01, respectively. The reported EU association effects (direct and interactive slopes) are transformed coefficients (individual contrasts) using the Deviation Contrast transformation. The slope and interaction effects reported in each column refer to the variable indicated at the top of each column (all measured as continuous variables). Measures indicated as relative are expressed as deviations from the sample mean. All regressions include year-specific fixed effects and have been estimated with OLS.

Figure* A.1. *Marginal effects of EU association periods



Notes: Marginal effects corresponding to the results of col.3 in Table 3, estimated using the -margins- command in Stata 14.

Notes

[1] For *ex ante* evaluations of EU integration on regional growth under a general equilibrium framework see, *inter alia*, D' ARTIS (2001); BRADLEY (2006); VARGA and BAYPINAR (2016).

[2] Assuming that 'selection' into an association agreement is positively related to a country's growth performance.

[3] The inclusion of these country-specific trends essentially expresses regional growth (the dependent variable) as a deviation from each region's national (country-specific) growth trajectory. As the signing of EU agreements can safely be assumed to be exogenous to such deviations, the shift coefficients arguably capture the *causal* effect that these.

[4] In the descriptive analysis a regional-level measure of export-orientation is also used (calculated using Eurostat data on national-level exports by manufacturing sector and data on each region's contribution to national employment in each sector). The method of construction of this measure does not allow its use in the econometric analysis.

[5] Note the distinction between disparities in regional growth rates, which are discussed here, and disparities in levels of regional incomes, which as the literature has shown, kept increasing.

[6] Distance from Brussels, defined here relative to the national median distance from Brussels, captures the east-west dichotomy within countries. For most variables, the difference is more accentuated when using the global median (across countries within the same period) as the benchmark. In that case, the shock appears to have been bigger also in more agricultural, larger and less developed economies – suggesting that national economies with such characteristics have performed much worse during that period.

[7] For related approaches to the modelling of TFP growth see, *inter alia*, LOKO and DIOUF (2009) and DANQUAH *et al*. (2014).

[8] In the absence of data on capital stock, the standard approach in the literature (BARRO, 2001; AGIOMIRGIANAKIS *et al*., 2002; GENNAIOLI *et al*., 2014) is to proxy capital growth by the investment-to-GDP ratio. The two variables are econometrically indistinguishable when the capital-output ratio (and depreciation rate) is constant across the sample (PRITCHETT, 1996). In this analysis differences in capital-output ratios are partly controlled for through the use of country-specific time-trends. The remaining within-country cross-regional variance is likely to bias the 'capital growth' estimates downwards (because they will tend to overestimate capital growth in the more capital-abundant regions) but is unlikely to influence the estimates on the other variables.

[9] The F-tests for the difference in the derived coefficients between pairs of periods are as follows (p-values in parentheses): $F[c_2^1=c_2^2]$=202.92 (0.000); $F[c_2^1=c_2^3]$=12.86 (0.0003); $F[c_2^1=c_2^4]$=15.20 (0.0001); $F[c_2^2=c_2^3]$=83.35 (0.000); $F[c_2^2=c_2^4]$=33.16 (0.000); $F[c_2^3=c_2^4]$=1.57 (0.2096).

[10] For a visual depiction of this see Figure A.1 in the Online Appendix, where the four EU association effects are expressed as marginal effects and not as deviations from the 'grand mean'.

[11] Population density, the services share and distance from Brussels now become statistically significant but the distance from the capital variable loses its significance.

[12] As shown in the Online Appendix (Table A.2), in alternative specifications the estimates for the early transition and interim periods have the right sign in all models and are always significant. The results for the pre- and post-accession estimates show more variability: in models that include year-specific fixed effects the pre-accession effect becomes indistinguishable from the sample mean (but still showing a deterioration compared to the interim agreements period) and, partly as a result, the post-accession effect becomes now

statistically significant; while in the fixed-effects model ('within' estimator) both of these effects turn positive and statistically significant.

[13] As a corollary, Table A.3 in the Online Appendix presents a similar analysis using the categorical variables associated to regional characteristics – thus obtaining region-type specific estimates of the impact of these shifts on regional growth. The interaction coefficients in these models are almost always in line with those obtained using the continuous measures, but almost invariably they are estimated less precisely (larger standard errors). This seems to suggest the absence of significant non-linear or threshold effects, at least at the region around the medians of the corresponding distributions.

[14] Today most ENP countries have active trade/cooperation agreements with the EU ('Partnership and Cooperation Agreements') and some already move to deeper forms of association ('Deep and Comprehensive Free Trade Agreements'), which could be paralleled to the Europe Agreements that initialled the pre-accession phase in the CEE case.