Regional growth in Hungary: The impact of European economic integration*

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Abstract: During the 1990s, the economic integration of Hungary to the European economic area was widely implemented. At the same time, Hungary experienced considerable regional disparities in economic growth. Motivated by endogenous growth theory and new economic geography, in the present paper I investigate the impact of FDI intensity, export orientation, and regional specialisation on regional growth in Hungary. With panel data of the 20 Hungarian regions covering the years 1994-2001, I perform growth regressions with OLS, after finding regional fixed effects insignificant. I check for the robustness of the results to the omission of the capital region and to the correction for contemporaneous correlation across regions. I find that the share of agricultural employment and the change in export orientation of the regions are the paramount determinants of regional growth. Investment per capita, the change in the employment rate, FDI density and the change in regional specialisation are found to enhance regional growth in some but not all specifications.

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1 Introduction

At the enlargement of the European Union (EU) in May 2004, the economic integration of the Central European EU applicant countries to the European economic area had already been widely implemented. Specifically, trade reorientation from the East to the West since the collapse of the Council for Mutual Economic Assistance and the opening of the Central and Eastern European economies for the inflow of capital (in particular Foreign Direct Investment, FDI) have generated intensive economic linkages between the old and the new EU members. Transformation and economic integration have further resulted in changing patterns of regional specialization (Traistaru et al., 2003). After an initial drop in output, the Central European economies have experienced considerable economic growth (European Bank for Reconstruction and Development 2003: 56). Annual growth rates above the EU average allowed them to embark upon the path of catching up. With transition and European integration however, these economies have also witnessed the surge of social and, in particular, regional inequality. An increase of socio-economic disparities across space in the 1990s is widely documented for the Central Europe (Petrakos et al., 2004). In Hungary too, sizeable regional disparities opened up in the 1990s. Not only in levels, also in the rate of change does Hungary display differences of regional income. From a policy perspective, the identification of determinants of regional growth is a prerequisite of preventing the further increase of income differentials, in order to avert social disruption.

In the present analysis, I address this concern by studying the determinants of regional growth in Hungary 1994-2001 and, in particular, the effect of some factors of European economic integration on regional growth at NUTS III level. Specifically, I investigate to what extent regional growth differentials can be traced back to differences in FDI density, orientation to foreign markets, and the composition of manufacturing activity among the regions. Spatial patterns of these factors have been shaped by European economic integration.

Neoclassical theory predicts the convergence of income levels across economic units. For Hungary, Iara and Traistaru (2003) have found that in the 1990s, convergence among the NUTS III regions of Hungary has not even taken place conditional on the regions' economic characteristics. This suggests looking for explanations of regional growth in Hungary beyond the neoclassical framework. Recent economic theories have shed light on the potential growth effect of those factors that have been at the root of European economic integration. In particular, addressing the role of technology diffusion and localised knowledge spillovers, endogenous growth theory approaches have hypothesised FDI to contribute to growth through the inflow of superior technologies from abroad. Another effect of European economic integration on regional growth can be deducted from new economic geography models that posit that market integration leads to changes in the location patterns of economic activity, and, specifically, higher regional specialisation. Higher levels of regional specialisation in turn may be expected to produce higher growth due to the exploitation of intra-industry knowledge spillover effects or due to economies of scale in markets of intermediaries. Besides, it has been posited that external trade may also foster growth: in addition to technology diffusion via the import of intermediaries, trade may affect growth via productivity improvements boosted by higher international competition, and by the exploitation of economies of scale implied by a larger market. The present empirical study draws upon these approaches.

This work is analysing regional growth in Hungary for the period of 1994-2001 in an aggregate framework, with data on the NUTS III level that comprises 20 regions. First I assess the contribution of the production inputs, labour and capital, to regional growth. I then introduce the following variables to explain differences in total factor productivity: The share of firms with FDI in the total number of firms as a proxy of international knowledge diffusion, the level of absolute manufacturing specialisation of regions intended to proxy agglomeration externalities within industries, and the share of exports in regional manufacturing output that is assumed to relate to higher competition in foreign markets. Finding no evidence for regional fixed effects, endogeneity of the regressors, and residual autocorrelation, I estimate the growth equations by OLS with standard errors corrected for heteroskedasticity, and with standard errors corrected for contemporaneous correlation across panels (PCSE). Considering the exceptional weight of the capital region in the Hungarian economy, I check for the robustness of the results to the exclusion of the capital region. This work is an extension to Iara and Traistaru (2003) that revisits the effect of FDI, regional specialisation and the openness of regions on regional growth once the change in production inputs, capital and employment, is controlled for. This allows for a clearer picture on the contribution of FDI to growth beyond the increase of the capital stock, and helps avoiding possible bias from omitting these arguments of the production function. The framework adopted here reveals that the change in regional export activities has the foremost effect on growth, a result that is robust across specifications. Besides, I find the sector composition of employment to be of paramount importance for regional growth performance. The latter is in line with Iara and Traistaru (2003). The estimations further indicate that controlling for capital accumulation, higher levels of FDI and the increase in regional specialisation may contribute to regional growth, but these findings are not robust to the controlling for contemporaneous correlation across regions or time specific effects. As regards these main results, there are no substantial differences between the regressions with and without the capital region.

This paper is structured as follows. Section 2 explains the theory arguments on the growth impact of the variables focused upon, and complements these with related empirical findings. Section 3 introduces the dataset and presents summary statistics. In section 4, estimation results are discussed. In section 5, I conclude.

2 Regional growth in Hungary: Insights from theory and empirical work

The starting point of thinking on economic growth is provided by neoclassical growth theory as elaborated by Solow (1956) and Swan (1956). In this framework, growth is derived from a standard production function with capital and labour as arguments. Assuming constant returns to scale, growth dynamics is determined by the development of the capital stock, while labour and total factor productivity is exogenous. While a change in the savings rate enhances the level of per capita output, it leaves its growth rate unaffected: steadily higher growth is only possible if the pace of total factor productivity growth is increased.[1] The long-run rate of growth equals the exogenous rate of technological progress. As concerns differences across economic units, neoclassical theory leaves barriers to technology diffusion out of regard and predicts growth rates to converge, while steady state income levels depend on the rate of saving and population growth (Nijkamp and Poot 1998: 12). As a qualification, the concept of conditional convergence allows different steady states of economic units that are characterized by initial conditions, but it posits convergence once economic structures are controlled for.

With similar data as used in the present paper, Iara and Traistaru (2003) have found that average growth of the Hungarian regions 1994-2000 is positively related to the initial income levels of the regions, both in absolute terms and conditional on certain economic characteristics. With other words, the Hungarian regions have experienced a period of divergence. Regional growth in Hungary in the 1990s therefore appears not to be sufficiently described in the neoclassical framework. On the other hand, recent thinking has highlighted the impact of some factors on economic growth that have been at the root of, or shaped by, the European integration of the Hungarian economy. In the following, I look at approaches illuminating the role of foreign direct investment, regional production structures, and foreign trade for regional growth.

Spurred by controversial empirical findings with regard to the predictions of neoclassical growth theory and the discomfort with leaving technical change as the ultimate determinant of growth unexplained, new growth theory evolved as a set of approaches endogenising technological progress. In the neoclassical model, knowledge is not explicitly considered: it could be regarded in this framework as a freely available public good that is part of exogenous total factor productivity. New

[1] For textbook reviews of the neoclassical growth model, see Barro and Sala-i-Martin (1995) and Romer (2001).

growth theory instead focuses on the role of knowledge for growth, its acquisition, and its accumulation. Technological change is considered the outcome of a knowledge production function that allows for increasing returns to scale (Romer 2001: 100). The reason is that existing knowledge can be replicated at no cost so that with a particular set of knowledge, doubling output can be achieved with doubling the other inputs only. While part of the new growth theory contributions focus on the production of knowledge in the R&D sector (e.g. Romer, 1990), others instead model the growth-enhancing effect of knowledge by allowing for spillovers (i.e., the appropriation of knowledge by a greater community with no or only partial compensation to the producer – see Nijkamp and Poot 1998: 15).[2]

With the premises of new growth theory, growth differentials across spatial units can be related to differences in the share of resources devoted to the production of technology (Nijkamp and Poot 1998: 17), differences in the extent of knowledge spillovers within spatial units, and barriers to the diffusion of knowledge across these units (Romer 2001: 126). Besides of the production of knowledge, theory and empirical work have addressed the diffusion of technology and the localised character of knowledge spillovers. Along with the movement of goods, services and labour, a potential channel for cross-country technology diffusion is FDI. Blomström and Kokko (2003) provide a comprehensive discussion of the effects of FDI on the host economies. They review various mechanisms by which FDI may enhance domestic productivity. These include the transfer of know-how by demonstrating new technologies and training labour that may later flow to domestic firms, the boost of competition (although inflowing FDI may also create monopolies), the establishment of new standards of inventory, quality control, and standardization via production linkages, and the pressure on local firms to adopt higher managerial effort or better marketing techniques. Aside of the market structure argument, common to these effects is the presumption that foreign firms are systematically different from domestic firms insofar as they have hold of some superior knowledge that may eventually flow over to the domestic sector. In their discussion of the mixed empirical evidence on both intra-industry (Jacobian) and inter-industry (Marshall-Arrow-Romer) spillovers from firms with foreign participation, Blomström and Kokko (2003) underline the importance of human capital and an existing level of technology for the adaptation of the knowledge spillovers that emanate from FDI.

In addition to technology transfer and knowledge externalities, systematic differences in regional growth can be expected from variations in regional economic structures. Recent new economic geography (NEG) approaches allow deriving hypotheses on how regional growth can be affected by changes in regional economic structures in the context of external economic integration. Instead of growth however, NEG is primarily concerned with the location of economic activity, agglomeration and specialization (de Groot et al., 2001). Growth outcomes can be inferred from the predictions of NEG models. Particularly suited to the process of Western integration of the Central and Eastern European economies in the 1990s is the model of Fujita et al. (2000: 329ff.). In their framework, industrial location is driven by intra-industry linkages, which make firms locate close to each other, and consumer demand, that may be scattered across space. Distinguishing two internal and one external region and two industries, Fujita et al. elaborate that from an initial core-periphery pattern, trade liberalisation brings about the decentralisation of industry location and increased specialisation of regions: the reliance on local demand is reduced, but intra-industrial linkages promote industrial specialisation.[3]

NEG models do not examine the impact of location patterns on economic growth. Higher regional specialisation however may be expected to produce higher growth due to the exploitation of intra-industry knowledge spillover effects, or due to economies of scale in markets of intermediaries.[4] As

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[2] For a definition of knowledge spillovers, see Caniels (2000: 6). Audretsch and Feldman (2004) provide a comprehensive overview of the literature on knowledge spillovers.

[3] The data used in the present paper contain slight evidence for this prediction: from 1995, except 1997/98, the Hungarian regions experienced increasing regional specialisation on average. The rate of change in the specialisation level of regions was small, though.

[4] The pioneers of new economic geography do not concede knowledge spillover effects to be at work in the dynamics of firm location across space but they advocate the possibility of economies of scale in input markets instead (Caniels 2000: 27).

concerns the former, it has been argued that knowledge spillovers realised from spatial concentration are only characteristic of industries that are highly reliant on knowledge. This view has received support from Audretsch and Feldman (1994) who found that differences in the spatial concentration patterns across industries were related to the importance of knowledge in production. But it has also been posited that specialisation affects growth positively regardless of the particular industry. This is known as Smithian specialisation (Jungmittag, 2004).

Theories on international trade and economic integration have also brought forward mechanisms to explain how trade liberalisation may affect economic growth – other than by changing the regional economic structure as discussed above. Most importantly, trade liberalisation can be expected to increase the efficiency of production, due to the more competitive market structure, the reduction of trade costs, and the exploitation of economies of scale (see e.g. Badinger 2003: 56). In addition, trade liberalisation may add to technology diffusion via the import of intermediaries (Badinger and Tondl 2005: 70).

In the light of the above one can also expect some factors related to European integration to enhance growth in the Hungarian regions in addition to growth differences related to changes in factor endowments: More FDI may be associated with higher growth due to the transfer of technology from abroad. Increased regional specialisation resulting from increased openness can be also expected to bring about higher growth due to economies of scale and knowledge spillovers. Furthermore, economic growth may be boosted by increased trade integration directly.

For transition countries, various studies have scrutinized the growth effect and from FDI and possibly related knowledge spillovers. Campos and Kinoshita (2002) investigate the growth effect of FDI in 25 countries in the 1990s in an augmented Solow model. They argue that FDI flows to transition countries are specifically obvious examples of technology transfer, since these countries have suitably educated workforces to adopt new technologies, but they had been deprived of international technology transfer. They find robust evidence for the positive impact of FDI on economic growth. On the NUTS II regional level, Tondl and Vuksic (2003) find for five Central European countries 1995-2000 (including Hungary) that FDI strongly contribute to growth. Focusing on Hungary specifically, several studies with micro data have investigated the relationship between FDI and economic performance. Sgard (2001) examines the effect of FDI on output with a large panel of manufacturing and construction firms. He finds that foreign ownership does contribute to higher productivity and produce positive intra-sector spillover effects. His results also show that FDI is productivity enhancing in the exporting markets only, while firms in the domestic sector may face difficulties in adjusting to the competition. Schoors and Van der Tol (2002) assess the impact of FDI on firm productivity as well, using a cross-section of Hungarian firms 1997/98. In line with Sgard (2001), they find a positive productivity effect of FDI. Besides, they provide evidence on positive intra-sector spillover effects conditional on absorption capacity, showing however that such effects are rather characteristic of more open sectors. They also find that inter-sector spillover effects can be more important, but these unambiguously positive only in the very open sectors (i.e. manufacturing). Using data for 1995-99 in a dynamic panel framework, Damijan et al. (2003) also provide evidence that FDI foster growth in Hungary, but they find neither intra- nor inter-industry linkages significant for firm output growth. Focusing on employment, Fazekas (2003) provides descriptive evidence that the regional pattern of employment in Hungary has been driven by the spatial distribution of firms with foreign participation. He also argues that the concentration of firms with foreign ownership has been sustained by an increasing regional productivity gap, which may be related to spillovers from firms with FDI. The labour market research of Kertesi and Köllô (2000) also shows that FDI have brought superior technology to Hungary: they find that during the 1990s, the productivity gap of young versus old skilled workers has been considerably larger in foreign-owned than in domestic-owned firms. – The present study provides empirical results on the role of FDI for growth in Hungary from a regional perspective with aggregate data. At the same time, it is considering the role of export activity and regional specialisation for regional growth as well. The data allow distinguishing 20 regions and cover (in levels) 8 years.

Results of growth analyses should be taken with caution. Parallel to the resurrected interest in growth, the robustness and straightforward interpretation of growth regressions has been subject to critique.

Brock and Durlauf (2001) provide a review of the concerns about the empirical growth literature. Among others, they point at the inconclusiveness of empirical work that follows from “open-ended” theories: The list of variables affecting economic growth in theory is not closed, and the empirical assessment of their growth contribution is aggravated by collinearity. Additional caveats arise from the context of transition, where stable economic relationships may be slow to emerge. In addition, this empirical research is strongly limited by the short length of the time series. Therefore, the results presented below are meant to provide tentative evidence.

3 The data

Our dataset consists of annual data for the Hungarian capital city and the 19 counties called “megye” that form the NUTS III system of spatial units. The dataset covers the years 1994-2001, providing seven years of rates of change of these variables. GDP and capital are in constant 1995 prices, where CPI is used for deflation. The national deflator originates from the International Financial Statistics Yearbooks of the International Monetary Fund. The other data originate from various data releases from the Hungarian Central Statistical Office (HCSO). Details on the definitions of the data are given in Table 1 in the appendix.

As dependent variable, GDP per capita is used. Since regional data on the capital stock of the Hungarian economy are unavailable, I calculate the regional capital stock and its changes from investment using the perpetual inventory method (for details, see Table 1), employing investment data going back until 1991. Following e.g. Badinger and Tondl (2005) for the Eurozone countries in the last quarter of the 20th century, I assume a depreciation rate of 5%. Due to the diminishing sensitivity of the calculated capital stock data to the initial year, optimally one should have a time series of calculated capital stock figures reaching back sizably longer than needed, however, I am constrained by the lack of data. Another shortcoming of the capital stock data is that the investment figures are recorded by the region of companies’ headquarters instead of the region where they were carried out. The joint availability of investment data by headquarter and location in 1999 allows to check for the differences between the two series: Only in the case of Budapest is there a larger deviation (20% more investment by headquarter). For the other regions, the deviations are within the range of +/- 2.5%. By years, the two series are correlated by 0.95 and more.

Instead of regional employment figures, I have to use data on employees. Unfortunately, in the period considered, there have been changes in the data collection both as concerns the spatial assignment of the data and the collection treshold (see Table 1 for details).

Regional specialisation is measured with the Herfindahl index, calculated from data on employees in eight manufacturing branches (see Table 1). As an absolute index, the Herfindahl index does not include normalization by some benchmark specialization pattern.

I measure the export orientation of the Hungarian regions with the share of exports in their industrial output. Sure enough, this measure relates to the final step of the production process only; the potential export orientation of intermediaries for exported goods that may have been produced in other regions is not taken into account. The measure also disregards of agricultural exports.

As a measure of FDI intensity, the number of firms with foreign participation in subscribed capital in the total number of enterprises in the county is taken.

The employee data are also used for controlling for regional economic structures. As compared with the total number of persons employed, employee figures tend to contain higher shares of persons working in industry and lower shares in agriculture and services. Bearing this in mind, I use the share of agriculture and of industry (including construction) in the total number of employees respectively as control variables, leaving services as the base category.

Tables 2 and 3 provide summary statistics on the variables employed with and without the capital region respectively. Correlations between the variables in levels, logarithms and log differences respectively are shown in Tables 4 to 6.

Regional GDP per capita has increased in all years but 1995/96 on average. From an average 450,000 HUF in 1994, average real GDP per capita has increased to 565,000 HUF in 2001. This implies an average increase by 2.2% p.a. Throughout the period considered, there has been a widening gap between Budapest and the other regions with Budapest constantly producing over 100% higher per capita GDP levels than the other regions. 1997 to 2000, a gap has also opened between the regions of Fejér, Vas and Gyôr-Moson-Sopron and the rest of the regions that, however, diminished in 2001 due to a negative growth performance of these three regions. As until 2000, from 0.28 in 1994, the coefficient of variation of the per capita GDP levels has constantly increased to 0.40 until 2000, where it slightly diminished. The variation coefficient of the data without Budapest has been much lower, between 0.15 and 0.27.

Average investment amounted to 95,000 HUF per annum and capita in the years under review. Since investment has been registered by headquarters, unsurprisingly, Budapest has recorded around 150-250% more investment per head than the counties. On average, investment per head has increased in all years but 1998/99. With values between 0.4-0.7 (all regions) and 0.33-0.55 (without the capital), regional variation in investment per head has been constantly higher than in GDP per capita. There is a clear positive relationship between investment and GDP per capita as well as GDP growth.

Between 1994 and 2001, the share of employees in total population has been around 22% in the Hungarian regions. In the whole period, the employment rate is considerably higher in Budapest than in the counties, even though employment is registered by headquarter since 1998 only. This may reflect extensive commuting activity to the capital. Until 1998, the employment rate has been decreasing on average and slightly increased from 1999 (the change in 1998 to 1999 is obscured by the change in the data definition, see Table 1). While higher employment coincides with higher GDP per capita, the correlation between the changes in these variables is insignificant.

In 1994, there have been 12 firms with foreign participation per 1000 domestic enterprises. This rate peaked in 1998 at 19, diminishing thereafter to 16 in 2001. In 1994, Budapest hosted three times more establishments with foreign participation than the counties. Since 1996 however, the lag of the counties has continuously reduced. Even without the capital though, there has been a sizeable variation in FDI densities across the counties, with the variation coefficient averaging at 0.45 (counties only). The correlation of FDI levels is significant both with per capita GDP levels and its growth.

At 0.21, the Herfindahl index of specialisation of the Hungarian regions has been low in 1994. The index slightly increased until 2001 to 0.22 by 0.002 index points annually. The change in the index was positive in all years but 1994/95 and 1998/99 on average, with and without the capital. Throughout the period considered, the counties of Tolna and Vas were among the three most specialised regions. Fejér experienced a huge increase in its specialisation level in 1996 and has been since then, as the most specialised county, overtaken only in 1998 by Tolna. The group of the least specialised countries, with indices around 0.15-0.17, has been most of the time composed by the counties of Veszprém, Zala, Csongrád, and Borsod-Abaúj-Zemplén. From 0.15 in 1994, the variation coefficient of the regional specialisation levels of the regions doubled until 2001. The data show a highly significant but low positive correlation between per capita GDP and the Herfindahl index. Changes in GDP levels display a positive correlation of 0.13 with the change in the Herfindahl index that is significant at 12%. In contrast, GDP change is not correlated with the level of regional specialisation.

Between 1994 and 2001, the Hungarian regions accomplished a considerable increase in manufacturing exports. In this period, from an average of 28%, the share of exports in manufacturing output rose to 50%. The export performance of Budapest has been steadily below the average of the counties. Gyôr-Moson-Sopron and Vas were the countries realising highest average exports in the period reviewed (at 35% and 53% 1994 and 80% and 78% in 2001 respectively), while Tolna and Baranya were the countries with lowest export shares (at 14% and 13% in 1994, rising to 26% in 2001). The correlations between the export share of industrial output and GDP levels (of 0.25) as well as between the export share and the log GDP change (0.16) and the log change in the export share and the latter (0.18) are highly significant.

In 1994, 10% of the employees worked in agriculture on average. This share steadily dropped by 0.44 percentage points p.a. on average to 7% in 2001. Budapest has had the lowest share of employees in agriculture, at 5% on average, whereas counties' average without the capital has been at 9%. There is a highly significant correlation between the share of agriculture in employment and per capita GDP and its log change, of –0.45 and -0.25 respectively.

In 1994, 38% of the employees in Hungary worked in industry and construction. Until 2001, this share increased by 0.42 percentage points on average (with decreasing shares in 1994/95, 1998/99, and 2000/2001). This share has been lowest in Budapest with 21-23%. With around 50% on average, Fejér, Vas and Komárom-Esztergom had the highest shares of industrial employment in the period considered. The correlation between the share of industrial employment and GDP per capita and its log change respectively is not significant.

4 Econometric evidence

In specifying the estimation equation, I start from a neoclassical production function with Cobb-Douglas technology:

$$Y_t = F(K, L) = A_t K_t^{\alpha} L_t^{1-\alpha} \tag{1}$$

where Y_t is output, K_t is physical capital, L_t is labour, A_t is total factor productivity (TFP) at time t respectively, and α and $(1-\alpha)$ are the elasticities of output with respect to the inputs. In this formulation, returns to scale are assumed to be constant. Rewriting the function in per capita (i.e. per inhabitant) terms (denoted by lowercase letters), taking logs and first differencing, this approach results in the following equation:

$$\Delta \ln y_t = \Delta \ln A_t + \alpha \Delta \ln k_t + (1-\alpha) \Delta \ln l_t \tag{2}$$

In the empirical assessment of the growth contribution of the factors related to new theory approaches as discussed above, I assume these factors to affect total factor productivity:

$$A_t = f(X_{1,t}, X_{2,t}, X_{3,t}, ...) \tag{3}$$

with X_t being FDI intensity, export market orientation, and the degree of regional specialization respectively. Plugging A_t in equation (2) yields the following equation to be estimated:

$$\Delta \ln y_t = \alpha \Delta \ln k_t + (1-\alpha) \Delta \ln l_t + \beta_1 \Delta \ln X_{1,t} + \beta_2 \Delta \ln X_{2,t} + \beta_3 \Delta \ln X_{3,t} + \Delta \ln A'_t + \varepsilon'_t \tag{4}$$

In the econometric analysis of the determinants of regional growth in Hungary, a growth function with the regressors related to neoclassical theory only and an augmented version, including variables for FDI intensity, regional specialization and export orientation, are estimated. Results are presented for both versions with and without time dummies. In any of the specifications, F-tests of the joint significance of regional effects had p-values close to one. Therefore, I conclude that there are no systematic differences among the regions' total factor productivity growth related to their unobserved characteristics, and do not employ region specific effects.

Budapest has a predominant role in the Hungarian economy. While it accounts for around 20% of the population in Hungary, around one third of national GDP is produced here. Many of the variables used describe Budapest as different from the counties. To check whether the observations of Budapest bias the picture of the counties I present the estimated equations also with the capital region excluded.

Many of the variables used are originally in percentages. While taking these percentages directly would comfortably provide semi-elasticities (note that the coefficients remain the same if one writes

(4) in levels), I prefer to take logs as required by the linearization of the model derived from the production function.[5]

Note that (4) hides a dynamic model: It can be reformulated as

$$\ln y_t = \ln y_{t-1} + \alpha \Delta \ln k_t + (1-\alpha)\Delta \ln l_t + \beta_1 \Delta \ln X_{1,t} + \\ + \beta_2 \Delta \ln X_{2,t} + \beta_3 \Delta \ln X_{3,t} + \Delta \ln A'_t + \varepsilon'_t \qquad (5).$$

Consequently, the estimation methodology most suited to the nature of the growth equation is GMM for dynamic panels such as Blundell-Bond. However, the limited size of the dataset at hand does not permit the use of such methods. On the other hand, the fixed effects have no explanatory power in the present model so that bias from the lack of strict exogeneity that is intrinsic to dynamic panel models does not seem to be a risk. An issue to be further investigated is the absence of error autocorrelation. I check for this using the LM test for serial correlation of order one in the residuals discussed in Baltagi (2001: 90). For the models presented below, one can reject the presence of a common nonzero autocorrelation coefficient in the errors. Given the shortness of the time series at hand, panel-specific error autocorrelation cannot be tested for.

Some regressors, in particular investment (Bond et al., 2001), FDI intensity and the change in export orientation, may be endogenous. I checked for the possibility of endogeneity applying the Durbin-Wu-Hausman test (Davidson and McKinnon, 1993) where I used lagged values of the regressors as instruments in the auxiliary regression. In no specification has the test shown endogeneity to be a matter of concern.

As formulated in (4), the degree of FDI intensity, regional specialization and output orientation determine the level of total factor productivity so that it is their change that bears on regional growth. The growth-enhancing effects of FDI intensity and regional specialization may both be regarded as relating to knowledge spillovers. One could also assume that the presence of knowledge spillovers allows innovations to spread better and faster in the region. This would imply that in regions that are endowed with higher levels of FDI intensity or are more specialized total factor productivity systematically grows at a relatively higher rate. Consequently, these variables entered in (4) in levels. In the same vein, regarding the control variables for economic structure employed, sector shares in employment may bear on productivity suggesting that it is structural change that brings about growth effects, or alternatively, there may be sector-specific effects of productivity growth, implying a level effect of the sector control variables on growth. To discern whether these variables produce a growth effect in levels or changes in an initial specification I include these variables both in levels and in changes, and decide then based on the t-test statistics. These tests suggest considering the variables for economic structure, export orientation and regional specialisation in differences and FDI intensity in levels. This is done in the estimations reported below. The high correlation between contemporary and lagged values of these variables does not allow to perform a nested test of the joint significance of the respective variable in contemporary and lagged terms.

For error autocorrelation, no evidence has been found. However, the residuals may be not independent across units. To check for the robustness of the results against cross-sectional correlation in the residuals that may point at spatial patterns in the data-generating process, I also present the panel corrected standard error (PCSE) estimates of the above specifications. The estimation results with all observations used are presented in Table 7 (OLS) and Table 9 (PCSE), while the results from the same estimations without the capital region are contained in Tables 8 (OLS) and 10 (PCSE). All variables have the expected signs with the occasional exception of the change in the employment rate that is, however, mostly insignificant. The specifications with and without the capital region and from OLS with White-corrected and with panel-corrected standard errors, respectively, reveal some robust findings but also notable differences. Below, the findings from OLS with White-corrected standard errors are discussed first.

[5] However, this does not apply to the sector shares of employment that are included for the sake of controlling for economic structures only.

The change in the capital stock is found significant when time-specific effects are not controlled for. The size and significance of the coefficients does not depend on the inclusion of the capital region. When significant, the coefficient tells that doubling investments per capita boosts the rate of regional GDP growth by 8-10%.

In the estimations with all regions the employment rate is insignificant. Excluding the observations for the capital region however, in the specifications with year dummies, the employment rate appears to be significant and shows a strong effect (in differences) on growth. A hypothetical doubling of the employment rate boosts regional growth by nearly 30%. The lack of stability of this coefficient across the specifications is not surprising, given that the employment variable is especially burdened with noise. However, the positive coefficient can be interpreted as evidence that for regional growth, employment raising economic activity overbalanced the productivity-enhancing effect of the cutback of over-employment and firm restructuring.

When included in a regression without year dummies, the share of firms with foreign participation in the total number of firms is significant at 10% suggesting a 1% increase in growth from a doubling of this share. Notably, FDI appears to have a level effect on growth, which may suggest that firms with foreign owners maintain their technology advantage vis-à-vis other domestic firms still in the years after their establishment, be it by the constant inflow of superior technology or by the absence of knowledge spillover effects to domestic firms. However, the significance of the FDI density variable is not robust against the inclusion of year dummies and the exclusion of the capital region, even if specifications 5 and 6 in Table 7 that omit insignificant control variables attest some impact of the presence of FDI on regional growth.

Increased export orientation of the regions measured by the change of exports in industrial output has a clear impact on regional growth. The export share variable is highly significant and stable in size across all specifications, be it with or without year dummies and with or without the capital region. Regions with twice as high a share of exports in industrial output accomplish 7% higher growth rates. The Durbin-Hausman-Wu test with lagged levels of the variable as instruments shows no indication of endogeneity bias in the results.

In all estimations with heteroskedasticity-robust standard errors except for those with the full set of year dummies (including the insignificant too), the Herfindahl index of regional specialisation in differences is significant at the 10% level. In any of the specifications, the specialisation variable in differences performs much better than its level indicating that intra-industry knowledge spillovers cannot be exploited for a steadily higher pace of growth. These results remain the same if the observations for the capital region are excluded. When significant, the coefficient of the specialisation variable suggests that regions with specialisation levels twice as much as others incur regional growth that is higher by around 8-9%. In size, the effect is comparable to the effect of increased regional investment.

Finally, the share of agriculture in the number of employees is found to have a clear growth impact, but changes in the sector structure of employment are not found to affect growth. The employment share of agriculture proves significant at the 5% level in most specifications. Its estimated effect appears very strong: A region having twice as much employment in the agrarian sector as another appears to achieve a 20-25% lower growth rate.

Re-estimating the above set of models with panel-corrected standard errors shows that the findings concerning FDI intensity and regional specialisation are not robust against considering contemporaneous correlation between the regions. Columns 1-5 in Tables 9 and 10 show the same models as the respective columns in Tables 7 and 8 without correction for contemporaneous error correlation. Column 6 is the specification that results from dropping insignificant year dummies. With panel corrected standard errors, more year dummies remain significant. The specification that results from dropping insignificant year dummies in Table 9 (all regions) leaves us with the following: The impact of investment on growth is lower, with a doubling of investment per capita enhancing the growth rate by 6%. The coefficients of export orientation and the sector share of agriculture in employment remain significant with similar sizes as found before. However, the year dummies included effectuate that FDI density and the change in regional specialisation are no longer significant at conventional levels. This result also holds for the estimations with panel-corrected standard errors using a sample without the capital region. In addition, the investment rate is now insignificant. In contrast, the employment rate enters the regression highly significantly with a coefficient of 0.28.

In sum, the present regression analysis shows that the share of agricultural employment and the change in export orientation of the regions are the paramount determinants of regional growth in Hungary. Investment per capita, the change in the employment rate, FDI density and the change in regional specialisation are found to enhance regional growth in some but not all specifications. Given the short time span of the data coverage, this does not imply strong evidence against the role of these factors in regional growth.

5 Conclusion

Based on Iara and Traistaru (2003), the present work re-assesses the contribution of FDI, regional specialisation and export activities to regional growth in Hungary in the period 1994-2001 in an augmented Solow model framework, seeking to explain total factor productivity growth by FDI levels, increased export activity, and increasing levels of regional specialisation. In addition to investment and increased employment, FDI is often argued to assist the inflow of superior technologies to the country that in turn may have spillover effects to the domestic economy. Regional specialisation may spur regional growth either by intra-industry spillover effects or by offering regional economies of scale in markets of inputs. External trade, finally, may bring by higher economic growth by enhancing productivity as an effect of higher competition in foreign markets.

Summarizing the findings of the above analysis, export activities and the sector composition of employment are found to matter most clearly for regional growth. In quantitative terms, the latter is especially relevant: A region having twice as high a share in agricultural employment than another produces only a growth rate that is 15-20% lower. Higher growth of the back-lagging regions in Hungary can thus be expected from onward structural change with labour moving out of the agrarian sector. This suggests that policies designed to address development issues in rural areas should be an important aspect of regional policy in new member states. Further to a low share in agriculture, regions experiencing high growth are also characterized by extensive export activity. Doubling the share of export in manufacturing output enhances the growth rate by around 7%. Therefore, from a policy perspective, promoting the orientation of the Hungarian economic actors towards foreign markets is likely to be beneficial for the boost of regional growth, too. FDI and increasing regional specialisation are not found significant for enhanced regional growth, once contemporaneous correlation across the regions or time specific effects were controlled for. The former suggests the presence of spatial correlation in the variables.

The present findings confirm the role of the composition of the regional economy for growth, as found in Iara and Traistaru (2003), even if increased employment and capital stocks are controlled for. However, the growth contribution of FDI is found less clear. In contrast, the present specifications assign an undoubted role of increased export activities to spurring regional growth.

The inconclusive findings on the growth effect from FDI do not match the clearly positive results in the studies with firm data or NUTS II data. In the above analysis, the variation in growth rates is however found dominated by time specific effects. It remains for further research to establish the growth effect of FDI in at the aggregate level of NUTS III regions, when, by adding to the length of the sample, time will help to discern more clearly how FDI bears on regional growth.

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Appendix

Table 1 Definition of variables

Variable	**Abbreviation**	**Description**
GDP per capita	GDP/POP	GDP per capita, in 1995 prices (CPI-deflated). Contains taxes and subsidies.
Capital stock per capita	CAP/POP	Own calculation from gross investment data $I_{1,...,T}$ using the perpetual inventory method: Initial year's capital stock $K_1=I_1/g$, where g is the average rate of growth of I in 1...T. Subsequent years: $K_t=K_{t-1}(1-\delta)+I_t$, with the depretiation rate δ=0.05 (see Badinger and Tondl, 2005). Investment data series starting 1991 used. Investment data refer to location of companies' headquarters; they contain public investment including social security funds.
Employment rate	EMP/POP	Number of employees in regional population. Until 1997, data refer to the location of workplaces (excep public administration). Since 1998, assignment by headquarters. Budgetary and social security organisations are included irrespective of the number of emloyees. Up to 1998, enterprises included only if having more than 20 employees (construction enterprises: more than 10). As of 1999, enterprises with more than 4 employees are considered.
FDI density	FDI	Number of enterprises with any foreign share in subscribed capital per total number of domestic enterprises (including inactive enterprises, budgetary institutions, and NGOs).
Regional specialisation index	HERF	Herfindahl index of specialisation, region i: $H_i=\Sigma_j(E_{ij}/E_i)^2$, calculated from shares of employment in branches j=1…M, E_{ij}, in total regional employment, E_i. NACE branches considered: DA, DB+DC, DD+DE, DF+DG+DH, DI, DJ, DK+DL+DM, DN.
Export orientation	S_EXPOUT	Share of exports in industrial output.
Employment share of agriculture	S_EMPLAB	Share of employees in agriculture (NACE 1-digit categories: A, B) in the total number of employees in the region.
Employment share of industry	S_EMPLCF	Share of employees in industry and construction (NACE 1-digit categories: C to F) in total number of employees in the region.

Table 2 Key variables: NUTS III regions' average and coefficient of variation, 1994-2001

	1994	1995	1996	1997	1998	1999	2000	2001	avg. 94-01
GDP per capita: avg.	477	481	478	498	520	528	549	565	512
- coeff. of variation	0.28	0.29	0.31	0.33	0.34	0.37	0.40	0.37	0.34
Investment per cap.: avg.	72	79	90	92	111	100	106	106	95
- coeff. of variation	0.42	0.63	0.54	0.48	0.39	0.72	0.62	0.66	0.56
Employment rate: avg.	24.0	23.0	22.1	21.7	20.5	22.9	23.0	23.1	22.5
- coeff. of variation	0.18	0.20	0.20	0.20	0.34	0.34	0.35	0.35	0.27
FDI density: avg.	11.5	12.7	13.5	14.7	19.1	18.2	17.3	16.1	15.4
- coeff. of variation	0.55	0.55	0.55	0.54	0.48	0.51	0.51	0.53	0.53
Reg.specialisation: avg.	0.2062	0.2047	0.2078	0.2147	0.2205	0.2114	0.2195	0.2219	0.2133
- coeff. of variation	0.15	0.14	0.17	0.20	0.18	0.21	0.28	0.29	0.20
Export in ind. output: avg.	27.6	32.9	35.7	40.8	44.3	46.2	48.9	50.1	40.8
- coeff. of variation	0.34	0.37	0.38	0.37	0.38	0.42	0.36	0.37	0.37
Employees in agric.: avg.	9.6	9.1	8.9	8.6	9.2	8.0	7.2	6.5	8.4
- coeff. of variation	0.37	0.35	0.37	0.38	0.40	0.40	0.38	0.39	0.38
Employees in ind.: avg.	38.2	37.5	38.3	39.0	41.2	41.0	41.5	41.2	39.7
- coeff. of variation	0.16	0.20	0.18	0.19	0.19	0.18	0.18	0.19	0.18

Table 3 Key variables: NUTS III regions' average and coefficient of variation, 1994-2001, without capital region

	1994	1995	1996	1997	1998	1999	2000	2001	avg. 94-01
GDP per capita: avg.	451	454	450	468	489	495	510	524	480
- coeff. of variation	0.15	0.16	0.18	0.21	0.24	0.25	0.27	0.21	0.21
Investment per cap.: avg.	67	70	82	84	106	88	94	92	86
- coeff. of variation	0.33	0.43	0.43	0.32	0.34	0.55	0.43	0.40	0.40
Employment rate: avg.	23.3	22.3	21.4	21.1	19.1	21.3	21.4	21.5	21.4
- coeff. of variation	0.13	0.14	0.15	0.15	0.17	0.16	0.16	0.15	0.15
FDI density: avg.	10.5	11.7	12.4	13.6	18.0	17.0	16.0	14.8	14.2
- coeff. of variation	0.45	0.46	0.47	0.47	0.43	0.44	0.43	0.45	0.45
Reg.specialisation: avg.	0.2072	0.2054	0.2087	0.2156	0.2216	0.2129	0.2211	0.2237	0.2145
- coeff. of variation	0.15	0.14	0.17	0.21	0.18	0.21	0.28	0.29	0.20
Export in ind. output: avg	27.6	33.1	35.9	41.1	44.8	46.8	49.5	50.6	41.2
- coeff. of variation	0.35	0.38	0.38	0.37	0.38	0.43	0.36	0.38	0.38
Employees in agric.: avg.	10.0	9.6	9.3	9.1	9.6	8.5	7.6	6.9	8.8
- coeff. of variation	0.29	0.27	0.29	0.31	0.32	0.32	0.30	0.31	0.30
Employees in ind.: avg.	39.0	38.3	39.3	40.0	42.2	42.0	42.5	42.2	40.7
- coeff. of variation	0.12	0.17	0.14	0.15	0.16	0.14	0.15	0.15	0.15

Table 4 Correlations between the variables

	GDP per capita	Investment per capita	Employ-ment rate	FDI density	Exports in industrial output	Regional speciali-zation	empl. share: agriculture
Investment per cap.	**0.89*** **	1.00					
Employment rate	**0.90*** **	**0.78*** **	1.00				
FDI density	**0.77*** **	**0.71*** **	**0.65*** **	1.00			
Exports in ind. output	**0.26*** **	**0.29*** **	0.11	**0.33*** **	1.00		
Reg. specialization	**0.15***	0.11	0.06	-0.11	0.40	1.00	
Empl. share: Agriculture	**-0.48*** **	**-0.51*** **	**-0.40*** **	**-0.50*** **	**-0.16** **	**0.29*** **	1.00
Empl. share: Industry	-0.14*	-0.11	**-0.23*** **	-0.06	**0.51*** **	**0.33*** **	0.05

Note: *, **, *** indicate significance at 10%, 5%, 1% respectively.

Table 5 Correlations between the transformed variables

	D_log (GDP per capita)	D_log (capital per capita)	D_log (employ-ment rate)	log (FDI density)	D_log (exports in ind. output)	D_log (reg.spec.)	log (empl.share: agriculture)
D_log (capital p.c.)	**0.25*** **	1.00					
D_log (empl. rate)	0.04	0.05	1.00				
log (FDI density)	**0.25*** **	**0.15***	**0.36*** **	1.00			
D_log (ex-port share)	**0.18** **	-0.06	**-0.19** **	-0.06	1.00		
D_log (reg.spec.)	0.13	0.09	-0.10	-0.04	-0.05	1.00	
log (empl. share: agric.)	**-0.25*** **	**-0.24** **	-0.13	**-0.42*** **	0.03	0.02	1.00
log (empl. share: ind.)	0.12	-0.06	0.03	0.05	0.03	0.04	0.06

See note to Table 4.

Table 6 Correlations between the transformed variables: Capital region excluded

	D_log (GDP per capita)	D_log (capital per capita)	D_log (employ-ment rate)	log (FDI density)	D_log (exports in ind. output)	D_log (reg.spec.)	log (empl.share: agriculture)
D_log (capital p.c.)	**0.22*** **	1.00					
D_log (empl. rate)	0.02	0.02	1.00				
log (FDI density)	**0.21** **	0.04	**0.33*** **	1.00			
D_log (ex-port share)	**0.19** **	-0.05	**-0.18** **	-0.05	1.00		
D_log (reg.spec.)	0.14	0.11	-0.09	-0.03	-0.05	1.00	
log (empl. share: agric.)	**-0.22*** **	-0.12	-0.03	**-0.23*** **	0.01	0.01	1.00
log (empl. share: ind.)	**0.23*** **	-0.09	**0.18** **	**0.42*** **	0.004	0.03	**-0.38*** **

See note to Table 4.

Table7 OLS estimation results

Dep. variable: Δln(GDP/POP)	(1)	(2)	(3)	(4)	(5)	(6)
Δln(CAP/POP)	**0.1087*** (0.0412)**	0.0641 (0.0451)	**0.1029*** (0.0382)**	0.0526 (0.0438)	**0.0867** (0.0370)**	**0.0830** (0.0381)**
Δln(EMP/POP)	0.0007 (0.0379)	0.1202 (0.0908)	0.0031 (0.0475)	0.0924 (0.0866)	-0.0206 (0.0483)	-0.0211 (0.0481)
ln(FDI)			**0.0149* (0.0090)**	0.0118 (0.0088)	0.0135 (0.0086)	**0.0144* (0.0086)**
Δln(S_EXPOUT)			**0.0690*** (0.0244)**	**0.0721*** (0.0210)**	**0.0657*** (0.0223)**	**0.0665*** (0.0219)**
Δln(HERF)			**0.0893* (0.0525)**	0.0423 (0.0564)	**0.0929* (0.0515)**	**0.0961* (0.0525)**
S_AGRI	**-0.2989*** (0.0980)**	**-0.2401*** (0.0891)**	**-0.2171** (0.1092)**	**-0.1762* (0.0990)**	**-0.2208** (0.1007)**	**-0.2088** (0.0985)**
S_IND	0.0929 (0.0656)	0.0857 (0.0680)	0.0759 (0.0634)	0.0633 (0.0659)	0.0578 (0.0620)	
year dummies	N	Y	N	Y	1995	1995
constant	Y	Y	Y	Y	Y	Y
R^2	0.12	0.24	0.20	0.29	0.25	0.25
adj. R^2	0.15	0.29	0.24	0.36	0.30	0.28
N	140	140	140	140	140	140
year dummies F	n/a	F(6,129) = 4.64***	n/a	F(6,126)= 5.05***	F(1,131) = 21.16***	F(1,132)= 20.71***

Note: *, **, *** indicate significance at 10%-, 5%-, 1% respectively. Robust standard errors in parentheses.

Table 8 OLS estimation results: Capital region excluded

Dep. variable: Δln(GDP/POP)	(1)	(2)	(3)	(4)	(5)	(6)
Δln(CAP/POP)	**0.1047*** (0.0407)**	0.0431 (0.0448)	**0.1033*** (0.0387)**	0.0359 (0.0471)	**0.0872** (0.0372)**	**0.0882** (0.0386)**
Δln(EMP/POP)	-0.0120 (0.0450)	**0.2886*** (0.1075)**	-0.0002 (0.0533)	**0.2747*** (0.1055)**	-0.0220 (0.0541)	-0.0182 (0.0539)
ln(FDI)			0.0148 (0.0108)	0.0078 (0.0110)	0.0131 (0.0105)	**0.0158* (0.0094)**
Δln(S_EXPOUT)			**0.0693*** (0.0247)**	**0.0721*** (0.0204)**	**0.0661*** (0.0226)**	**0.0672*** (0.0220)**
Δln(HERF)			**0.0885* (0.0533)**	0.0113 (0.0528)	**0.0927* (0.0522)**	**0.0956* (0.0539)**
S_AGRI	**-0.2225* (0.1353)**	-0.1615 (0.1261)	**-0.2215* (0.1318)**	-0.1480 (0.1218)	**-0.2188* (0.1222)**	**-0.2574** (0.1197)**
S_IND	0.1303 (0.0919)	0.1144 (0.0875)	0.0741 (0.0995)	0.0800 (0.0936)	0.0600 (0.0955)	
year dummies	N	Y	N	Y	1995	1995
constant	Y	Y	Y	Y	Y	Y
R^2	0.11	0.26	0.19	0.31	0.24	0.24
adj. R^2	0.14	0.31	0.23	0.38	0.29	0.28
N	133	133	133	133	133	133
year dummies F	n/a	F(6,122)= 5.70***	n/a	F(6,119)= 5.50***	F(1,124)= 19.48***	F(1,125)= 18.23***

Note: *, **, *** indicate significance at 10%-, 5%-, 1% respectively. Robust standard errors in parentheses.

Table 9 PCSE estimation results

Dep. variable: Δln(GDP/POP)	(1)	(2)	(3)	(4)	(5)	(6)
Δln(CAP/POP)	**0.1087*** (0.0414)**	**0.0641** (0.0317**	**0.1029*** (0.0404)**	0.0528 (0.0369)	**0.0867*** (0.0296)**	**0.0569* (0.0293)**
Δln(EMP/POP)	0.0007 (0.0672)	0.1202 (0.0812)	0.0031 (0.0643)	0.0924 (0.0719)	-0.0206 (0.0447)	0.0328 (0.0467)
ln(FDI)			0.0149 (0.0105)	0.0118 (0.0106)	0.0135 (0.1037)	0.0726 (0.0557)
Δln(S_EXPOUT)			**0.0690*** (0.0218)**	**0.0721*** (0.0223)**	**0.0657*** (0.0195)**	**0.0725*** (0.0206)**
Δln(HERF)			0.0893 (0.0583)	0.0423 (0.0622)	**0.0929* (0.0561)**	0.0130 (0.0102)
S_AGRI	**-0.2989*** (0.0766)**	**-0.2401*** (0.0718)**	**-0.2171*** (0.0790)**	**-0.1762** (0.0753)**	**-0.2208** (0.0727)**	**-0.2016*** (0.0702)**
S_IND	0.0929 (0.0792)	0.0857 (0.0868)	0.0759 (0.0685)	0.0633 (0.0777)	0.0578 (0.0686)	0.0590 (0.0707)
year dummies	N	Y	N	Y	1995	some
constant	Y	Y	Y	Y	Y	Y
R^2	0.12	0.24	0.20	0.30	0.25	0.28
adj. R^2						
N	140	140	140	140	140	140
year dummies X^2		$X^2(4)$= 2852.37***		X^2 (6) = 1805.52***	X^2 (1)= 14.36***	$X^2(4)$ = 48.56***

Note: *, **, *** indicate significance at 10%-, 5%-, 1% respectively. Robust standard errors in parentheses.

Table 10 PCSE estimation results: Capital region excluded

Dep. variable: Δln(GDP/POP)	(1)	(2)	(3)	(4)	(5)	(6)
Δln(CAP/POP)	**0.1047** (0.0437)**	0.0431 (0.0308)	**0.1033** (0.0425)**	0.0359 (0.0356)	**0.0872*** (0.0306)**	0.0398 (0.0304)
Δln(EMP/POP)	-0.0120 (0.0791)	**0.2886*** (0.1151)**	-0.0002 (0.0751)	**0.2747** (0.1178)**	-0.0220 (0.0504)	**0.2802*** (0.1108)**
ln(FDI)			0.0148 (0.0096)	0.0078 (0.0088)	0.0131 (0.0093)	0.0082 (0.0081)
Δln(S_EXPOUT)			**0.0693*** (0.0219)**	**0.0721*** (0.0224)**	**0.0661*** (0.0196)**	**0.0712*** (0.0209)**
Δln(HERF)			0.0885 (0.0588)	0.0113 (0.0652)	**0.0927* (0.0569)**	0.0110 (0.0651)
S_AGRI	**-0.2225*** (0.0895)**	**-0.1615** (0.0792)**	**-0.2215** (0.0932)**	**-0.1480* (0.0904)**	**-0.2188*** (0.0848)**	**-0.1493* (0.0917)**
S_IND	0.1303 (0.1224)	0.1144 (0.1159)	0.0741 (0.1035)	0.0800 (0.0999)	0.0600 (0.1052)	0.0797 (0.1004)
year dummies	N	Y	N	Y	1995	some
constant	Y	Y	Y	Y	Y	Y
R^2	0.11	0.26	0.19	0.31	0.24	0.31
adj. R^2						
N	133	133	133	133	133	
year dummies X^2		467.31***		1847.86***		461.90***

Note: *, **, *** indicate significance at 10%-, 5%-, 1% respectively. Robust standard errors in parentheses.