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FOREIGN DIRECT INVESTMENT AND REGIONAL GROWTH: AN ANALYSIS OF THE SPANISH CASE*

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Abstract

The massive increase in foreign direct investment (FDI) inflows following the Spanish integration with the now European Union (EU) in 1986, has been one of the most important features shaping the behaviour of the Spanish economy in the last twenty years. In this paper we will try to assess the impact of FDI on regional economic growth following Spain's entry into the EU, using data for the 17 Spanish regions. To that end, we estimate an aggregate production function augmented with FDI inflows.

Key words: Economic growth, Foreign direct investment, Regions

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1. Introduction

As is well known, foreign direct investment (FDI henceforth) has played over the last fifty years an increasing role as a way of internationalization of the economic activity. In fact, FDI is one of the most relevant aspects of the recent wave of globalization, registering higher growth rates than both world trade and output.

On the other hand, FDI has been a crucial factor in the process of intense growth enjoyed by the Spanish economy since the beginning of the 1960s. Even more, the massive increase in FDI inflows following the Spanish integration with the now European Union (EU) in 1986, coupled with the prospects about the completion of the Single European Market by 1992, has been one of the most important features shaping the behaviour of the Spanish economy in the last twenty years. An overview of FDI trends during this period can be found in Bajo-Rubio and Torres (2001).

There are several studies available that investigate the main features of the FDI arrived to the Spanish economy, together with their economic implications. From a long-term perspective, the macroeconomic factors behind the FDI inflows received between 1964 and 1989 were analyzed in Bajo-Rubio and Sosvilla-Rivero (1994); also, the role of FDI in fostering the favourable effects of the European Single Market was stressed in Sosvilla-Rivero and Herce (1998). In turn, the sectoral allocation of FDI in manufacturing between 1986 and 1992 (i.e., the period where the affluence of FDI was more intense) has been examined in Bajo-Rubio and López-Pueyo (2002). A general survey on the more recent role of FDI in the Spanish economy can be found in Fernández-Otheo (2003). However, despite the importance of FDI in the Spanish economy, their regional aspects have been hardly explored. Some exceptions are Egea-Román and López-Pueyo (1991), Fernández-Otheo (2000), and Pelegrín-Solé (2002), where the focus is on the description of regional FDI trends in Spain and their explanatory factors, but without analyzing growth effects.

On the other hand, the role of FDI on economic growth has been extensively analyzed in recent years, by means of multivariate regressions of the rates of growth of (mostly) developing countries, over long-time spans, on a series of macroeconomic variables including the ratio FDI-GDP. In general, FDI shows a positive and significant influence on growth, although this effect would be stronger if host countries possess an adequate absorptive capacity to channel FDI flows toward real output expansion; a non-exhaustive listing of papers would include, among others, Blomström *et al.* (1994), Balasubramanyam *et al.* (1996), Borensztein *et al.* (1998), de Mello (1999), Campos and Kinoshita (2002), Durham (2004), Alfaro *et al.* (2004), or Laureti and Postiglione (2005). However, and as far as we know, the relationship between FDI and growth at a regional level has been hardly explored; we just can quote Ledyaeva and Linden (2006) or Yao and Wei (2007), who analyze the effects of FDI on growth for the regions of Russia and China, respectively.

In this paper we will try to assess the impact of FDI on regional economic growth in the Spanish case, by estimating an aggregate production function augmented with FDI inflows for the 17 Spanish regions, following the country's entry into the EU. In addition to the additional insight that this exercise might provide on the role of FDI in the Spanish economy, the Spanish case might be also a relevant case study. Unlike the cases of Russia and China mentioned above (i.e., two very large and weakly developed countries), Spain would be a medium-size industrialized economy, given the size of her main macroeconomic variables, which has experienced a process of rapid growth in the last forty years, starting from a relatively weak position as compared to the rest of Western European countries. This has been particularly true after her accession to the EU in 1986, allowing her an even deeper integration with other more advanced economies, so Spain has been able to join the Economic and Monetary Union from its start. Summarizing, the Spanish experience could be of interest for other medium-size economies following a process of integration with other relatively more advanced countries, such as those of Central and Eastern Europe.

The rest of the paper is organized as follows: the theoretical framework is presented in Section 2, and the main empirical results are shown in Section 3; finally, the main conclusions are summarized in Section 4.

2. Theoretical framework

Our starting point will be a simple production function that includes human capital (as in Mankiw, Romer and Weil, 1992), written for simplicity in a Cobb-Douglas form:

$$Y_t = A_t K_t^{\alpha} H_t^{\beta} L_t^{\gamma} \tag{1}$$

where Y, K, H, and L denote, respectively, output, physical capital, human capital, and labour; and A is an index of the level of technology. Dividing by L and taking logs, the above function would become:

$$\log\left(\frac{Y}{L}\right)_t = \log A_t + (\alpha + \beta + \gamma - 1)\log L_t + \alpha \log\left(\frac{K}{L}\right)_t + \beta \log\left(\frac{H}{L}\right)_t \qquad (2)$$

where $\alpha + \beta + \gamma$ indicates the degree of returns to scale for all production factors. Now, the question would be: how does FDI enter the above equation? The main arguments below are taken from Bajo-Rubio and Díaz-Roldán (2002), who present a survey on the relationship between FDI, productivity growth, and technological innovation, by the multinational enterprise (MNE).

In the standard neoclassical growth model, FDI would be considered as an addition to the capital stock of the host economy (see, e.g., Brems, 1970), so that the effect of foreign capital would be indistinguishable from that of domestic capital. Notice that, in this case, the assumption of diminishing returns to capital would imply that FDI would affect growth only in the short run, i.e., during the transition to the steady-state growth path. Such a characterization, however, is unsatisfactory given the recent trends in FDI. In fact, the main role of FDI would seem to be that of transferring assets from less efficient to more efficient owners, so that in practice FDI would consist of offsetting two-way flows that would be hardly related to productive investment (Lipsey, 2001). In other words, FDI would be less and less "greenfield", i.e., that FDI devoted to enlarge the production capacity of the host economy.

Endogenous growth models allow for a greater impact of FDI on growth. On the one hand, FDI could lead to externalities on the domestic production factors; the effect on growth, however, would be permanent only if the resulting returns to scale over all factors (i.e., including the externality) turn to be increasing. More importantly, the endogenous growth literature has tried to formalize technological innovation, which would emerge as a response to economic incentives, that is, profit opportunities detected by firms that would be influenced by the institutional, legal, and economic environment in which they act (Grossman and Helpman, 1994). And, in turn, this would lead to stress the role of FDI and, in general, the degree of economic integration, on influencing technological progress and consequently growth rates.

In this way, higher integration would mean an increase in market size, which would lead to greater incentives to R&D and hence higher growth; and this would facilitate the diffusion of knowledge across countries and avoid duplication of the research activity (Romer, 1990; Grossman and Helpman, 1991). In particular, integration among relatively similar economies would lead to a higher growth rate in the long run, since it would allow the exploitation at the world level of the increasing returns that would exist in the R&D sector (Rivera-Batiz and Romer, 1991). Even more, both FDI and growth could be the simultaneous result of an increased economic integration, on changing the relative strength of centrifugal and centripetal forces behind manufacturing agglomeration, in a model that combines endogenous growth with elements of economic geography (Gao, 2005).

On the other hand, as mentioned before, FDI has acquired in last years an increasing importance as a way of internationalization of the economic activity in the industrialized countries, enjoying growth rates remarkably above those of world trade. Indeed, the importance of FDI would not be limited to its spectacular growth in merely quantitative grounds, since it would have performed a crucial role in the diffusion of ideas and innovations across borders (Romer, 1993). In fact, the possibility to gain access to modern technologies is probably the main reason behind the interest on the side of the less technologically advanced countries to attract FDI. The reason is that MNEs conduct a great part of world R&D, as well as generating and controlling much of the most advanced production techniques. Still, the host countries should possess a minimum social capability in the form of an educated labour force and adequate organizational structures, i.e., the absorptive capacity to get a fully satisfactory transmission of such advanced technologies, in order to reach a higher output growth.

The literature has also analyzed extensively the possible presence of spillovers of the MNEs activities, when establishing a subsidiary leads to productivity or efficiency benefits for the host country's local firms, and the MNEs are not able to internalize the full value of these benefits (Blomström and Kokko, 1998). That is, the more evolved production methods, organizational and managerial techniques, marketing activities, and the like, of the MNEs, can be spread over the host country's local firms through several channels such as imitation, the higher competition associated with the presence of the subsidiary, or the mobility of the labour force previously trained and familiar with the more advanced techniques developed by the MNEs (Görg and Greenaway, 2004).

Notice that the empirical evidence on these spillover effects is far from being unambiguous. In fact, the positive spillover effects would shift downwards the average costs curve of domestic firms; but the increased competition would lead these firms to cut their output and so moving upwards along the new average costs curve, so that the net effect on average costs would be ambiguous (Aitken and Harrison, 1999). As stressed by Görg and Greenaway (2004), not all domestic firms would benefit equally from the spillover effects, but rather those enjoying a higher absorptive capacity of the new technologies, or those located geographically closer to the subsidiary of the MNE. Also, in terms of the development of local industry, the positive spillovers related with FDI would dominate when inflows are large, outweighing the negative competition effects associated with FDI (Barrios *et al.*, 2005). Finally, backward regions would be more likely to benefit from spillovers from FDI, since the potential productivity gains by domestic firms would be greater due to the scope for technological catch-up (Peri and Urban, 2006).

In general, a greater opening to FDI coming from the most advanced countries would lead to an increase in the rate of technological progress in the host country, and hence its rate of growth (Wang, 1990). Indeed, the incentive of a MNE to transfer technology would be inversely related to its perceived operation risks in the host country, which would explain that the average age of technologies transferred to their subsidiaries in developed countries is considerably lower than those transferred to developing countries; and technological transfer via FDI would be positively related to the investment in learning made by the host country's firms (Wang and Blomström, 1992).

According to the above theoretical arguments, we will assume that the level of technology A depends on its initial value, A_0, and the externalities from FDI inflows, in relative terms per employee:

$$A_t = A_0 \left(\frac{FDI}{L} \right)_t^{\theta} \qquad (3)$$

Finally, replacing (3) in (2):

$$\log\left(\frac{Y}{L}\right)_t = \log A_0 + (\alpha+\beta+\gamma-1)\log L_t + \alpha \log\left(\frac{K}{L}\right)_t + \beta \log\left(\frac{H}{L}\right)_t + \theta \log\left(\frac{FDI}{L}\right)_t \qquad (4)$$

or, denoting by *y*, *k*, *h*, and *fdi* the logs of *Y/L*, *K/L*, *H/L*, and *FDI/L*, respectively, we get

$$y_t = \log A_0 + (\alpha+\beta+\gamma-1)\log L_t + \alpha k_t + \beta h_t + \theta fdi_t \qquad (5)$$

This will be the equation to be estimated in the next section.

3. Empirical results

Equation (5) has been estimated for the 17 regions (comunidades autónomas) established after the approval of the current Spanish Constitution in 1978, with the sample period running from 1987 (the first year where regional data on FDI are available) to 2000. The data are taken from:

- *Regional Accounts*, elaborated at the Spanish National Institute of Statistics, for Gross Domestic Product;
- Mas *et al*. (2005a) for the physical capital stock;
- Mas *et al*. (2005b) for employment and human capital;
- *Foreign Investment Registry*, elaborated at the Spanish Ministry of Industry, Tourism and Trade, for gross FDI inflows.

Note that the physical capital stock includes both the private and public capital stock, where public capital embodies only the directly productive items included into the whole government capital stock (i.e., roads, water infrastructures, urban structures, ports, railroads, and airports), hence excluding the non-directly productive items (i.e., education and health); for details, see Mas *et al*. (2005a). The human capital variable has been proxied by the share of the employed population with two levels of higher education (first cycle or shorter courses, and second cycle or full-length courses). Finally, the variables in real terms are valued at 1986 prices.

In the empirical application, we use a dynamic panel approach where the lagged dependent variable is also included in the model. The regression equation would be the following:

$$y_{i,t} = \rho y_{i,t-1} + (\alpha + \beta + \gamma - 1)\log L_{i,t} + \alpha k_{i,t} + \beta h_{i,t} + \theta fdi_{i,t} + \eta_i + \varepsilon_{i,t} \qquad (6)$$

where η_i and $\varepsilon_{i,t} \sim N(0,\sigma^2)$ denote, respectively, the unobservable individual specific effects, and a random disturbance.

Equation (6) makes up a dynamic panel data model, where the dependent variable is partly explained by its past value. This model involves two econometric problems. The first one results from the dynamic nature of the data, which can introduce some correlation between the error term and the explanatory variables. So, the application of static panel data estimation methods would lead to biased estimates with dynamic panel data models. The second issue results from the potential endogeneity of the explanatory variables, which can be the case of FDI, since FDI influences GDP growth but GDP growth may influence FDI as well; that is, the causal relation can run in both directions. Therefore, an instrumental variable estimation has to be used to avoid any potential biases induced by simultaneity.

The econometric technique that allows accounting for the problem of error correlation and endogeneity of variables is the Generalized Method of Moments (GMM). An appropriate instrumentation technique for dynamic panel data has been developed by Arellano and Bond (1991) and Arellano and Bover (1995), which provides unbiased and efficient estimates. These authors suggest first-differencing the model to get rid of the individual specific effects and then using valid instruments (lagged values of the instrumented variables) to deal with the problem of the new error term being correlated with the lagged dependent variable. The use of instruments is also required in order to control for the potential endogeneity of the other explanatory variables. We assume that the right-hand side variables are predetermined (i.e., they are assumed to be correlated with past values of the error term, but uncorrelated with current and future values of the error term). So, at least two lagged values of the dependent variable (i.e., $y_{i,t-2}$ and any further lag $y_{i,t-3}$, $y_{i,t-4}$, etc.) are used as instruments for the equations in first differences. Since it makes use of all the available moment restrictions, the difference GMM estimator suggested by Arellano and Bond (1991) improves significantly estimation efficiency.

A drawback of the difference GMM estimator of Arellano and Bond (1991) is that, when first differences are taken, time invariant variables are wiped out. So, the estimator does not use the cross-sectional information reflected in the differences between regions. Another disadvantage is that lagged levels are often poor instruments for the equation in differences, especially in the case of panels with a small number of time periods with highly persistent data, which can lead to large finite-sample biases and poor precision in the estimators. To reduce this problem associated with the difference GMM estimator, we use a new estimator, namely, the system GMM, developed by Arellano and Bover (1995) and Blundell and Bond (1998). This estimator is based on an augmented system that includes the regression in differences in addition to the regression in levels with lagged differences as instruments. The second part of the system requires the additional assumption of no correlation between the variables in differences and the unobserved industry effects, although there may be correlation between the levels of the explanatory variables and the fixed effects.

On the other hand, the consistency of the GMM estimator depends on the validity of the instruments, which is examined by means of two specifications tests. The first one is the Hansen-Sargan statistic of over-identifying restrictions, which tests the hypothesis that the instruments are not correlated with the residuals. The validity of the instruments also requires the lack of second-order serial correlation in the first-differenced error term whereas, by construction, first-order correlation is expected even with an uncorrelated original error term. So, an additional test is included to examine the null hypothesis of no second-order correlation in the residuals.

The results of the econometric estimation of equation (6) are shown in Table 1. The two specification tests suggested by Arellano and Bond (1991) to test for the validity of the assumed moment restrictions are also included in Table 1. In all cases, the null hypothesis of no second-order serial correlation cannot be rejected; also, the validity of the instruments used in the estimation is not rejected by the Hansen-Sargan test. All the estimated equations include time dummies.

As can be seen in column (1), the coefficient on employment would be negative and significantly different from zero, so that the hypothesis of decreasing returns to scale over all inputs would not be rejected. Both the (private and public) physical capital stock and the human capital variable show a positive and significant effect on the evolution of output per employee. Finally, FDI inflows appear with a small and positive coefficient, but not significantly different from zero at the conventional levels.

Next, in column (2) we replace the human capital and FDI inflows by a multiplicative variable, as in Borensztein *et al.* (1998). This variable would indicate the existence of complementarities between human capital and FDI, so that the favourable effect of FDI on productivity would depend on the availability of some minimal endowments of human capital, which would proxy in turn the capability of the host country to absorb the new technologies. The coefficient on this variable proves to be positive and significant at the 5% level.

Finally, if the physical capital stock is split into its two components, private and public, as in columns (3) and (4), the results are roughly unchanged. In particular, the coefficients on FDI inflows and the multiplicative variable of human capital and FDI increase in size, but only the latter is significantly different from zero (now at the 1% level).

A problem with the previous results relates to the highly heterogeneous distribution of the gross FDI inflows received by the Spanish regions. As can be seen in Table 2, more than one half of the inflows over the period 1987-2000 came to the Madrid region, and one fourth to Catalonia; that is, these two regions account for almost 80 per cent of the gross FDI inflows received by the Spanish regions in that period. Three more regions (Andalusia, Valencian Community, and Basque Country) attracted around 4 per cent each; which, added up to the figures for Madrid and Catalonia would mean more than 90 per cent of total. Lastly, the figures for every of the remaining regions would not exceed 1.5 per cent of total each.

Therefore, we have re-estimated all the specifications in Table 1 allowing for a different coefficient on both FDI inflows and the multiplicative variable of human capital and FDI, for (i) Madrid; (ii) Catalonia; (iii) Andalusia, Valencian Community and Basque Country; and (iv) the remaining regions. The results appear in Table 3, and the separated coefficients for these four groups of regions are denoted by the subscripts *M*, *C*, *A-V-B*, and *rest*, respectively.

According to the results in column (1), the coefficients on the FDI inflows variable for Madrid and Catalonia are higher than the common coefficient shown in Table 1 (especially in the case of Catalonia), and clearly significant; the coefficient for Andalusia, Valencian Community and Basque Country is significant just at the 10 per cent level, unlike the rest of regions, where it did not prove to be significant. When we include instead the multiplicative variable of human capital and FDI in column (2), the coefficient on this variable has again a higher size than the common coefficient in Table 1 (unlike the case of Catalonia, where the coefficient is lower), and is clearly significant for the first three groups of regions; again, the rest of regions are an exception to these results. Finally, when the physical capital stock is split into the private and public stocks in columns (3) and (4), the conclusions are again basically unchanged.

Summarizing, FDI inflows would have played a positive and significant role in the evolution of GDP per employee in the cases of Madrid and Catalonia (somewhat higher for the latter), and, to a lower extent, Andalusia, Valencian Community and Basque Country, i.e., the Spanish regions that received higher FDI inflows. Also, FDI would also influence positively GDP per employee through its impact on human capital accumulation for Madrid, Catalonia (with a lower coefficient in this case), Andalusia, Valencian Community and Basque Country. Conversely, the effect of FDI would be non significant for the rest of regions, which have received a negligible amount of inflows over the period of analysis.

4. Conclusions

In this paper we have tried to assess the impact of FDI on regional economic growth in the Spanish case. To that end, an aggregate production function augmented with FDI inflows was estimated, using data for the 17 Spanish regions over the period 1987-2000, i.e., after Spain joined the EU.

Overall, our results support the outstanding role played by FDI as a vehicle for technology transfer, and its relationship with productivity growth. More specifically, FDI inflows would have played a positive and significant role in the evolution of GDP per employee in the cases of Madrid and Catalonia (somewhat higher for the latter), and, in general, the Spanish regions receiving higher FDI inflows. In addition, since FDI is particularly associated with human capital and labour skills, FDI was also found to influence positively GDP per employee through its impact on human capital accumulation for Madrid, Catalonia (with a lower coefficient in this case), and, again, the Spanish regions receiving higher FDI inflows. On the other hand, the somewhat different results found for Madrid and Catalonia, might be related to the different sectoral allocation of FDI in both regions, with Madrid more specialized in services (in particular, financial services), and Catalonia more diversified, with a higher weight of manufactures.

Finally, it should be stressed that these favourable effects of FDI on growth found for those Spanish regions receiving a higher amount of FDI inflows would be greatly dependent upon their stability and permanent nature. While the huge affluence of FDI to the Spanish economy following her accession to the EU in 1986, would have led to a positive outcome in terms of the evolution of GDP per employee (both directly and through its effect on human capital accumulation), the picture might be changing since the end of the 1990s (i.e., coinciding with the end of our sample period). In fact, last years have witnessed a process of foreign capital divestment, following recent changes in the strategies of MNEs, which has reached significant levels in the Spanish case (Fernández-Otheo and Myro, 2004). Accordingly, it would not be unlikely that the results found in this paper should be qualified in the next future. Also, this fact should be borne in mind by those countries seeking to attract FDI as an engine of technology transfer in order to fostering economic growth.

References

Aitken, B. J. and Harrison, A. E. (1999): "Do domestic firms benefit from direct foreign investment? Evidence from Venezuela", *American Economic Review*, 89, 605-618.

Alfaro, L., Chanda, A., Kalemli-Ozcan, S. and Sayek, S. (2004): "FDI and economic growth: The role of local financial markets", *Journal of International Economics*, 64, 89-112.

Arellano, M. and Bond, S. (1991): "Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations", *Review of Economic Studies*, 58, 277-297.

Arellano, M. and Bover, O. (1995): "Another look at the instrumental variable estimation of error-components models", *Journal of Econometrics*, 68, 29-51.

Bajo-Rubio, O. and Díaz-Roldán, C. (2002): "Inversión extranjera directa, innovación tecnológica y productividad. Una aplicación a la industria española", *Economía Industrial*, 347, 111-124.

Bajo-Rubio, O. and López-Pueyo, C. (2002): "Foreign direct investment in a process of economic integration: The case of Spanish manufacturing, 1986-1992", *Journal of Economic Integration*, 17, 85-103.

Bajo-Rubio, O. and Sosvilla-Rivero, S. (1994): "An econometric analysis of foreign direct investment in Spain, 1964-89", *Southern Economic Journal*, 61, 104-120.

Bajo-Rubio, O. and Torres, A. (2001): *The impact of Spain's integration with the EC on trade and foreign investment*, Wydawnictwo Akademii Ekonomicznej im. Oskara Langego we Wrocławiu, Wrocław.

Balasubramanyam, V. N., Salisu, M. and Sapsford, D. (1996): "Foreign direct investment and growth in EP and IS countries", *Economic Journal*, 106, 92-105.

Barrios, S., Görg, H. and Strobl, E. (2005): "Foreign direct investment, competition and industrial development in the host country", *European Economic Review*, 49, 1761-1784.

Blomström, M. and Kokko, A. (1998): "Multinational corporations and spillovers", *Journal of Economic Surveys*, 12, 247-277.

Blomström, M., Lipsey, R. E. and Zejan, M. (1994): "What explains the growth of developing countries?", in Baumol, W. J., Nelson, R. R. and Wolff, E. N. (eds.):

Convergence of productivity: Cross-national studies and historical evidence, Oxford University Press, Oxford, 243-259.

Blundell, R. and Bond, S. (1998): "Initial conditions and moment restrictions in dynamic panel data models", *Journal of Econometrics*, 87, 115-143.

Borensztein, E., De Gregorio, J. and Lee, J.-W. (1998): "How does foreign direct investment affect economic growth?", *Journal of International Economics*, 45, 115-135.

Brems, H. (1970): "A growth model of international direct investment", *American Economic Review*, 60, 320-331.

Campos, N. F. and Kinoshita, Y. (2002): "Foreign direct investment as technology transferred: Some panel evidence from the transition economies", *The Manchester School*, 70, 398-419.

de Mello, L. R. (1999): "Foreign direct investment-led growth: Evidence from time series and panel data", *Oxford Economic Papers*, 51, 133-151.

Durham, J. B. (2004): "Absorptive capacity and the effects of foreign direct investment and equity foreign portfolio investment on economic growth", *European Economic Review*, 48, 285-306.

Egea-Román, P. and López-Pueyo, C. (1991): "Un estudio sobre la distribución geográfica de la inversión extranjera directa en España", *Información Comercial Española*, 696-697, 105-118.

Fernández-Otheo, C. M. (2000): "Concentración y especialización regional de la inversión directa extranjera en España", *Economía Industrial*, 335/336, 67-82.

Fernández-Otheo, C. M. (2003): *Inversión directa extranjera de España en la década final del siglo XX: Nuevas perspectivas*, Fundación José Ortega y Gasset, Madrid.

Fernández-Otheo, C. M. and Myro, R. (2004): "Is the foreign capital leaving industrialized countries? The case of Spain", Working Paper on International Economics and Finance 04-03, AEEFI-FEDEA.

Gao, T. (2005): "Foreign direct investment and growth under economic integration", *Journal of International Economics*, 67, 157-174.

Görg, H. and Greenaway, D. (2004): "Much ado about nothing? Do domestic firms really benefit from foreign direct investment?", *World Bank Research Observer*, 19, 171-197.

Grossman, G. M. and Helpman, E. (1991): *Innovation and growth in the global economy*, The MIT Press, Cambridge, MA.

Grossman, G. M. and Helpman, E. (1994): "Endogenous innovation in the theory of growth", *Journal of Economic Perspectives*, 8, 23-44.

Laureti, L. and Postiglione, P. (2005): "The effects of capital inflows on the economic growth in the Med Area", *Journal of Policy Modeling*, 27, 839-851.

Ledyaeva, S. and Linden, M. (2006): "Foreign direct investment and economic growth: Empirical evidence from Russian regions", BOFIT Discussion Paper 17, Bank of Finland, Institute for Economies in Transition.

Lipsey, R. E. (2001): "Interpreting developed countries' foreign direct investment", in Deutsche Bundesbank: *Investing today for the world of tomorrow*, Springer-Verlag, Berlin, 285-325.

Mankiw, N. G., Romer, D. and Weil, D. N. (1992): "A contribution to the empirics of economic growth", *Quarterly Journal of Economics*, 107, 407-437.

Mas, M., Pérez, F. and Uriel, E. (2005a): *El stock de capital en España y su distribución territorial (1964-2002)*, Fundación BBVA, Bilbao.

Mas, M., Pérez, F., Uriel, E., Serrano, L. and Soler, A. (2005b): *Capital humano en España y su distribución provincial*, electronic edition, Fundación Bancaja, Valencia.

Pelegrín-Solé, A. (2002): “Inversión extranjera directa: Factores determinantes de la localización regional”, *Papeles de Economía Española*, 93, 122-134.

Peri, G. and Urban, D. (2006): “Catching-up to foreign technology? Evidence on the “Veblen-Gerschenkron” effect of foreign investments”, *Regional Science and Urban Economics*, 36, 72-98.

Rivera-Batiz, L. A. and Romer, P. M. (1991): “Economic integration and endogenous growth”, *Quarterly Journal of Economics*, 106, 531-555.

Romer, P. M. (1990): “Endogenous technological change”, *Journal of Political Economy*, 98, S71-S102.

Romer, P. M. (1993): “Idea gaps and object gaps in economic development”, *Journal of Monetary Economics*, 32, 543-573.

Sosvilla-Rivero, S. and Herce, J. A. (1998): “Efectos macroeconómicos del Mercado Único Europeo”, *Economía Industrial*, 322, 11-21.

Wang, J.-Y. (1990): “Growth, technology transfer, and the long-run theory of international capital movements”, *Journal of International Economics*, 29, 255-271.

Wang, J.-Y. and Blomström, M. (1992): “Foreign investment and technology transfer. A simple model”, *European Economic Review*, 36, 137-155.

Yao, S. and Wei, K. (2007): “Economic growth in the presence of FDI: The perspective of newly industrialising economies”, *Journal of Comparative Economics*, 35, 211-234.

Table 1: Estimation of a production function for the Spanish regions, 1987-2000 (I)

(GMM-system regressions results. Dependent variable: *y*)

	(1)	(2)	(3)	(4)
y_{-1}	0.8296*** (0.0424)	0.8636*** (0.0268)	0.8308*** (0.0431)	0.8549*** (0.0376)
log *L*	−0.0067* (0.0032)	−0.0061*** (0.0021)	−0.0059* (0.0031)	−0.0046* (0.0025)
k	0.1147*** (0.0349)	0.0949*** (0.0227)	–	–
kpr	–	–	0.1026*** (0.0343)	0.0909** (0.0313)
kpu	–	–	0.0204* (0.0106)	0.0266** (0.0113)
h	0.0367*** (0.0103)	–	0.0325*** (0.0089)	–
fdi	0.0018 (0.0016)	–	0.0026 (0.0016)	–
*h*fdi*	–	0.0029** (0.0014)	–	0.0039*** (0.0013)
Observations	221	221	221	221
Test *p*-values:				
AR(1)	0.008	0.000	0.009	0.008
AR(2)	0.943	0.940	0.942	0.920
Hansen-Sargan	1.000	0.802	1.000	1.000

Notes:

(i) Robust standard errors in parentheses; *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

(ii) AR(1) and AR(2) are tests of first- and second-order serial correlation.

(iii) Hansen-Sargan is a test of the over-identifying restrictions (two-step estimations); *p*-values below 0.05 suggest a rejection of the validity of the instruments at the 5% critical level.

Table 2: Total gross FDI inflows received by the Spanish regions, 1987-2000

(million euros and percentage on total)

	Total gross FDI inflows	%
Andalucía	5,227	4.30
Aragón	1,558	1.28
Asturias	1,139	0.94
Baleares	1,750	1.44
Canarias	1,707	1.40
Cantabria	266	0.22
Castilla y León	805	0.66
Castilla-La Mancha	382	0.31
Cataluña	30,701	25.26
Comunidad Valenciana	4,514	3.71
Extremadura	282	0.23
Galicia	997	0.82
Madrid	65,291	53.72
Murcia	628	0.52
Navarra	1,580	1.30
País Vasco	4,319	3.55
Rioja	382	0.31
Total	121,528	100.00

Source: *Foreign Investment Registry*, Spanish Ministry of Industry, Tourism and Trade.

Table 3: Estimation of a production function for the Spanish regions, 1987-2000 (II)

(GMM-system regressions results. Dependent variable: *y*)

	(1)	(2)	(3)	(4)
y_{-1}	0.8033*** (0.0397)	0.8344*** (0.0340)	0.8095*** (0.0378)	0.8318*** (0.0336)
log *L*	−0.0147** (0.0068)	−0.0164** (0.0068)	−0.0141* (0.0068)	−0.0138** (0.0063)
k	0.1167*** (0.0345)	0.0970*** (0.0239)	–	–
kpr	–	–	0.1023*** (0.0327)	0.0914*** (0.0291)
kpu	–	–	0.0209* (0.0115)	0.0269** (0.0111)
h	0.0363*** (0.0102)	–	0.0275** (0.0120)	–
fdi_M	0.0032** (0.0015)	–	0.0046*** (0.0015)	–
fdi_C	0.0051*** (0.0014)	–	0.0054*** (0.0013)	–
$fdi_{A\text{-}V\text{-}B}$	0.0033* (0.0014)	–	0.0037** (0.0016)	–
fdi_{rest}	0.0008 (0.0020)	–	0.0012 (0.0020)	–
$h*fdi_M$	–	0.0045*** (0.0013)	–	0.0052*** (0.0011)
$h*fdi_C$	–	0.0018*** (0.0005)	–	0.0019*** (0.0004)
$h*fdi_{A\text{-}V\text{-}B}$	–	0.0040** (0.0017)	–	0.0041** (0.0015)
$h*fdi_{rest}$	–	0.0009 (0.0014)	–	0.0015 (0.0016)
Observations	221	221	221	221
Test *p*-values:				
AR(1)	0.007	0.007	0.005	0.005
AR(2)	0.889	0.888	0.862	0.871
Hansen-Sargan	1.000	1.000	1.000	1.000

Notes: See Table 1.