

Reforms and growth *in Latin America*

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This article analyses the effects of the economic reforms applied by Latin American countries during the second half of the 1980s and after. In order to include the reform indices among the elements determining the per capita gross domestic product, in accordance with neoclassical growth models, the authors start by analysing the institutional nature of these reforms. The econometric analysis, carried out for a set of 17 Latin American countries for the 1970-1995 period, revealed that the five reform areas studied significantly affected GDP. On the basis of empirical analysis, it can be concluded that: i) the general impact of the reforms on per capita GDP was positive, as other studies have found; ii) the main mechanism by which the reforms raised per capita income was the positive effect they had on the productivity of the capital factor, and iii) capital accumulation also responded positively to the reforms.

I

Introduction

During the first half of the 1990s, the growth rates of the Latin American countries recovered in comparison with the previous decade. The main factors cited as causing this recovery included stabilization plans, which yielded good results, and more favourable international conditions, associated with improved liquidity and lower international interest rates; renewed flows of external capital into the region; and the growth of the United States economy, mainly from 1992 on. According to a series of relatively recent studies, the economic reforms made during the 1980s and 1990s were among the factors responsible for the region's growth. These studies include those by Easterly, Loayza and Montiel (1997), Fernández-Arias and Montiel (1997), Barrera and Lora (1997), Burki and Perry (1997) and Fajnzylber and Lederman (1999), along with the research project "Growth, employment and equity: Latin America in the 1990s" carried out by ECLAC, which includes a series of studies on this subject, such as those by Morley, Machado and Pettinato (1999), Hofman (2000), Paunovic (2000) and Escaith and Morley (2000).

A preliminary analysis of the performance of the Latin American economies during the period of the reforms reveals that average growth rates were higher than those posted in the 1980s, although lower than those between 1950 and 1980, when the "old" development model prevailed. Using very similar methodologies, Easterly, Loayza and Montiel (1997) and Fernández-Arias and Montiel (1997) examine the question of reforms and reach similar conclusions: in terms of growth, the response to the economic reforms was satisfactory and in line with expectations, taking into consideration international experience in this respect. The findings of Barrera and Lora (1997) were similar. They demonstrate that the reforms applied in the 1980s boosted long-term growth by 1.9 percentage points compared to the previous period, due above all to their effects on productivity and investment. The economy's total productivity rose 1.7% during the period under study, while the average rate of investment in the region grew by a similar amount.¹

¹ Burki and Perry (1997) compiled the results of the three studies mentioned in this paragraph.

Using the same methodology of growth accounting, Fajnzylber and Lederman (1999) tried to measure the effects of the economic reforms on total factor productivity in 18 Latin American economies. The main conclusion of their study was that, on average, productivity rose faster during the periods of economic reform.

With regard to the ECLAC research project mentioned above, Paunovic (2000) and Hofman (2000) examine the relationship between the reforms and Latin America's economic performance during the 1990s. On the basis of political economy concepts, the first of these authors analyses the reasons why the region's countries fall into sub-groups according to their performance in terms of growth rates, along with the relationships between this segmentation and each country's degree of progress in its reforms. According to this author, the countries which applied most reforms and managed to effectively stabilize their economies were the ones that posted the highest growth rates during the 1990s. Hofman (2000), for his part, examines the economic growth of a number of countries in the region and highlights the differences in GDP growth rates observed among those economies over time. He analyses the performance of this country sample at the aggregate level and in terms of economic growth, factor accumulation and different types of productivity measurement. He divides the period from 1950 to 1998 into sub-periods, using the debt crisis and the subsequent economic recovery as reference points. Based on this division, and applying growth accounting methods, Hofman draws some conclusions regarding each country. In general terms, during the reform period the countries under study registered a recovery compared to the 1980s (a period of crisis), but in terms of certain variables they did not manage to equal their performance during the 1950-1980 period.

The article by Escaith and Morley (2000) evaluates the same five areas of reform as our study, that is, trade openness, capital account liberalization, privatisation, and financial and tax reforms, and their impact on the growth of 17 Latin American economies from 1970 to 1996. On the basis of a statistical model which takes into consideration a large number of control variables,²

² These control variables include indicators for macroeconomic policy management and the dynamism of the international economy.

the authors conclude that altogether the reforms did not directly affect the region's economic growth, and they assume that this was due to the compensatory effects of the different reforms. Only tax reforms and capital account liberalization had a significant impact on these countries' economic performance. The authors do not, however, discount the possibility that the reforms may have indirectly affected growth in Latin America during the period under study, through such factors as investment and macroeconomic stability.

The claims made in the studies mentioned earlier that the reforms positively affected the economic growth of the Latin American countries were the starting point of this investigation. In contrast with some of these studies, however, the aim of the present article is not only to analyse the reforms' effects on growth, for there seems to be a consensus in the relevant literature that the general impact of the reforms was significant and positive. Here, conversely, the aim is to investigate how and through what mechanisms this effect was produced, considering what have been described as the prime sources of growth: factor accumulation and productivity.

This article is based on a different methodological approach from those used in most other studies of this subject. According to Temple (1999), the most common approach is based on *ad hoc* or informal growth regressions. Recent studies applying this method are essentially based on work by Barro (1991) and they link the rise in the product to a set of variables considered relevant from the empirical or theoretical point of view. However, the specification that must be calculated does not derive directly from theoretical models, which is why these regressions are called informal. The variables under consideration can be divided into two groups. The first corresponds to the initial level of the so-called state variables: the stock of physical and human capital, the latter in the form of indicators of educational level. The second group consists of control variables, such as government consumption as a percentage of GDP, the profit margin in the parallel foreign exchange market, the degree of political instability, and changes in the terms of trade, among others.

The present article is based on the premise that for a number of reasons a solid theoretical foundation and a formal empirical analysis can help in investigating the impact of these reforms. The most important of these reasons, for the purpose of this article, is that a theoretical formulation allows us to develop and test different hypotheses regarding the mechanisms by

which the reforms affected the region's performance.³

In addition to the present Introduction (section I), this article is composed of four more sections which analyse the relationship between economic reforms, institutional changes, and economic growth and its determinants (factor accumulation and productivity). Section II summarizes the main reforms adopted in Latin America—trade openness, financial and tax reforms, privatisation, liberalization of the capital account, and reforms in the areas of labour and social security—and analyses to what degree the reforms can be considered as changes of an institutional nature. For this purpose, Hirsch's approach (1988) from the perspective of law and economics is the theoretical reference used.

Section III briefly describes the economic growth model on which the empirical part of this article is based, which is Solow's growth theory, with the incorporation of contributions from Mankiw, Romer and Weil (1992), Hall and Jones (1996 and 1999) and Jones (2000). Two methods for including variables representing institutional changes in neo-classical growth models are then examined, one using the concept of social infrastructure, developed by Hall and Jones (1996 and 1999) and formalized by Jones (2000), while the other is based on the work of Garcia et al. (1999). On the basis of this theoretical economic growth model, section IV analyses the empirical relationship between the reform indices developed by Morley, Machado and Pettinato (1999) and factor productivity and capital accumulation. This analysis examines the reforms' impact on the per capita product, economic growth and factor accumulation of the Latin American countries in the past two decades, which makes it possible to identify the main mechanism by which these economic reforms generated growth: namely, by increasing the productivity of capital. Section V briefly sets out some final considerations, and lastly the Appendix presents convergence equation estimates.

³ Furthermore, using a specific theoretical model permits comparison with other theoretical approaches, particularly the model established for economic growth. As a result, the econometric results obtained using formal empirical models can also be compared with those of other studies, such as those by Campos and Nugent (1998) and Piedrahita (1998). This approach also helps to identify and evaluate the economic significance of dummy variables and coefficients estimated using panel data models, as proposed by Islam (1995), for example.

II

Economic reforms and institutional changes

Since the 1940s and 1950s, the Latin American economic situation has been characterized by strong protectionism and the presence of the State in various economic sectors and activities. As from the second half of the 1980s, that structure began to give way to a new strategy which, among other aspects, gave priority to market liberalization, a more outward-oriented approach (in the sense of stimulating trade and exports), and less State intervention. This set of policies gradually evolved throughout the region. The process had begun in the 1970s, in the midst of the first oil crisis. In that period, the reforms dealt with fewer areas than in the decades that followed and were restricted to a small number of countries. Despite their progress on many fronts, in the early 1980s most reform efforts suffered a setback due to the debt crisis, and it was only in the years that followed, especially from 1985 on, that the reforms gathered renewed strength and began to affect more economies. Then, in the late 1980s and early 1990s, as the process consolidated throughout the region, these measures ceased to be regarded as stabilization policies and began to be recognized as structural reforms.

The consensus concerning the need to carry out reforms of this nature was based on the perception that the “old” development strategy had become incapable of guaranteeing economic growth, mainly because of the imbalances, distortions and inefficiencies generated by the policies applied from the 1940s and 1950s onward.⁴ According to the consensus that developed after the debt crisis, strong protectionism, over-involvement of the State and excessive market regulation had reduced economic efficiency, restricting productivity growth, assigning resources badly, and limiting private enterprise. This was because when it came to making investment decisions, the actions of the State carried greater weight than efficiency criteria. According to Morley, Machado and Pettinato (1999), the various Latin American countries gradually developed their own particular view of how the

economy should function and what role the government should play.

In the light of the way this process evolved from 1985 to the mid-1990s, the extensive literature on this subject identifies seven main areas of reforms: trade, finance, taxation, capital account liberalization, privatisation, social security and the labour market. Because of their scope and the number of countries involved, the first five reform areas became known as first generation reforms, while the last two –social security and the labour market, which are still in their initial stages in the case of most Latin American countries– tend to be considered, along with another group of measures,⁵ as second generation economic reforms.

The first attempt at quantifying Latin American reforms may be attributed to Lora (1997), who developed a structural policy index for a set of 18 economies for the period from 1985 to 1995. This index is a simple average of another five indices reflecting changes in the areas of trade, taxation, finance, privatisation and the labour market, respectively. Morley, Machado and Pettinato (1999) developed another reform index for the 1970-1995 period for a sample of 17 Latin American countries.⁶ As with the Lora index, this was composed of another five indices for trade, finance, taxation, capital account liberalization, and privatisation.⁷ Figure 1 shows the behaviour of the six indices, the general index being the result of the simple average of the indices for each reform. These indices provide an overview of the trends and scope of these reforms from 1970 to 1995, along with the different behaviour of each of the five areas under analysis.

⁴ With regard to the specific objectives and technical details of the different areas of reform, see Edwards (1995), Lora (1997), IDB (1997), Morley, Machado and Pettinato (1999) and Bandeira (2000).

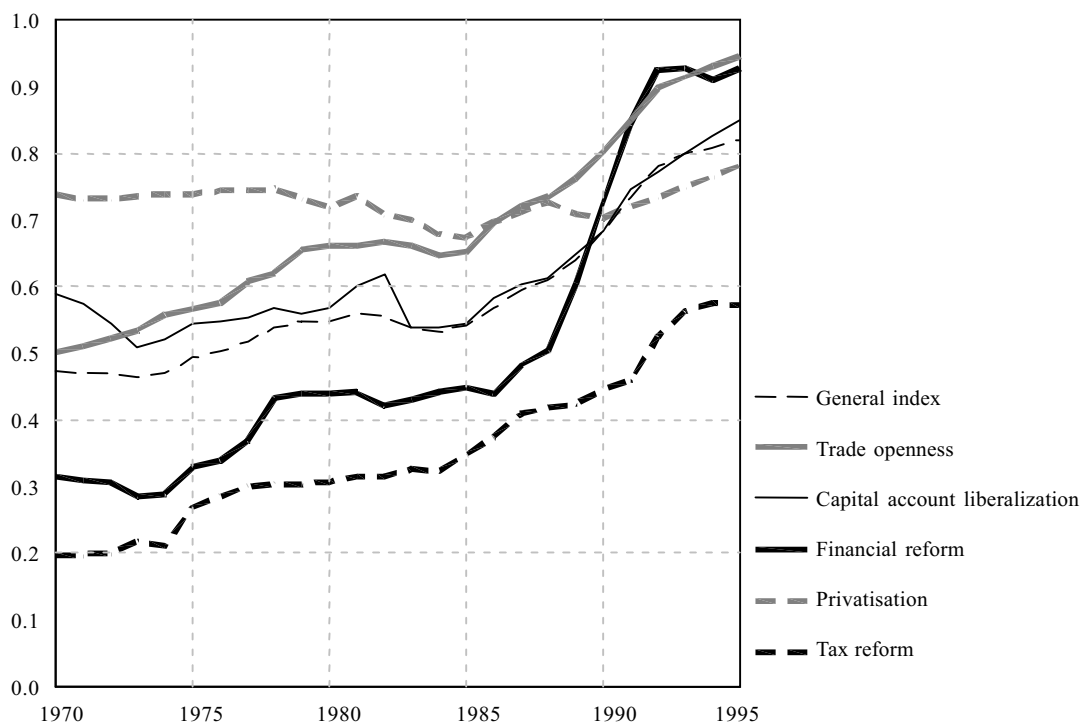
⁵ Particularly reforms of the State, mainly in the administrative area, and of institutions such as the legal system and the educational system.

⁶ Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Jamaica, Mexico, Paraguay, Peru, Uruguay and Venezuela.

⁷ The authors did not include social security and labour market reforms because these were still very incipient during the period analysed. In the preparation of these indices, only policy variables under government control were considered, and the indices were normalized within a 0 to 1 interval, assigning the value of 1 to any structure completely free of distortion.

FIGURE 1

The reform index and its components



Source: Morley, Machado and Pettinato (1999).

Notwithstanding the fact that each reform area may have had important specific characteristics which were as relevant as the differences between countries, this section seeks to develop a general argument applicable to the process of change which affected the Latin American economies.⁸ Generally, the literature on reforms in Latin America only highlights their economic side: their effect on relative prices. This article, however, argues that these reforms represented not just economic but also institutional changes.

As from the 1940s and 1950s, the State gradually assumed a crucial role in the economies of Latin America, propelling an industrialization process based on import substitution. The economic repercussions of its actions have been substantial. It may be said that the functioning of the different markets and their interaction has depended on the whole structure created

in the period prior to the 1980s. This environment, however, while favouring the industrialization process in many countries, generated various kinds of distortions, especially in the system of relative prices, resulting in inefficient allocation of resources, low productivity and loss of well-being. In this sense the reforms begun in the 1980s, by reducing controls on the different markets, represented significant economic changes.

Similarly, the reforms can also be said to have triggered an important process of institutional change, since they altered the “appropriability” of rights, transaction costs, the structure of the yield on investments, the environment in which trade was carried out, and the contracts between economic agents, as well as the rules governing property rights. The way economies function and the role placed by the State constitute the starting point for the debate about the institutional nature of the reforms. The basis for this analysis is a relatively new field in economic science: the application of microeconomic considerations in the field of law. The arguments that follow are based on

⁸ Bandeira (2000) gives detailed data on the different reform areas and national experiences and provides a summary of the main studies on this subject.

two major studies of this subject: Hirsch (1988) and Cooter and Ulen (1988).

Just as the price structures within economies were affected by the type of development of the Latin American countries, the economic agents' ability to appropriate their rights may also have been similarly conditioned in previous decades. This finally led to a situation that has been defined as the "imperfect appropriability" of rights. This concept is directly related with the idea of externalities, which arise when one economic agent's consumption or production affects another's profits, without the market providing suitable compensation. This amounts to saying that the functions of individuals or companies are interdependent. According to Cooter and Ulen (1988), the essence of the problem arising from the existence of externalities lies in the fact that maximizing profits does not automatically lead to efficient solutions within the economy. Those who make rational decisions centred on their own interest generally do not take into account the effect they may have on the profits or production of others. Thus, these effects occur without the consent of others and without due compensation.

Why does this occur? One of the main reasons is the imperfect appropriation of rights. Returning once again to the elements presented by Hirsch (1988), this imperfect appropriation occurs when an economic agent is unable to appropriate the full marginal value of the benefits generated or cannot avoid the cost imposed by another agent in the case of a negative externality. Therefore, even when from the economic point of view whoever exercises the right should be able to make decisions on resource use and claim the benefits these generate, other factors may mean that this right is not guaranteed. In this sense, just as rights help to define the set of opportunities and the behaviour of the agents –and hence the results of their actions and choices– the degree to which these rights are protected (degree of fulfilment) undoubtedly also influences these elements.

There are reasons and factors of an ethical and institutional nature which may help to reduce the appropriability of rights. When this happens, the validity of the so-called exclusion principle becomes uncertain. According to Musgrave's definition (1959), this principle establishes that people cannot enjoy the benefits of a specific item of merchandise unless they are willing to pay its owner the going price. This principle can be extended to the use of factors of production and any benefits or profits deriving from these. If it were possible to consume a certain item of merchandise by mutual agreement, without due

compensation, this principle would be violated. If the cost associated with guaranteeing exclusivity were high, that is, if it required considerable resources, the validity of the principle would also become uncertain and the appropriability of rights would be imperfect. Under these circumstances, when an exchange occurs or factors are used in productive activities, the agents end up effectively absorbing the cost of excluding other agents from consumption (or from the benefits arising from the activity). In other words, in the case in question the transaction costs would be higher, with three important consequences: i) reduction of the number of transactions within the economy; ii) interference in the existence of markets; and iii) the perpetuation of externalities.

Thus, to a large extent the appropriability of rights conditions the decisions of economic agents. Guaranteeing and satisfying property rights promotes the efficient use of resources within the capitalist system. According to the legal and regulatory framework –the institutions of the law– agents have more or less confidence that they will receive the appropriate profits from the use of their property (Hirsch, 1988, p. 25). It can therefore be argued that both the accumulation of factors and changes in productivity depend on institutional development, the central aspect of which is the degree of appropriability of rights. This means that the performance of a given country in terms of economic growth and social well-being will ultimately depend on the prevailing institutional structure.

This conclusion is crucial for understanding the institutional nature of the reforms. In the Latin American countries, in each area and market where there was State intervention it is possible to identify factors which ended up reducing the agents' ability to appropriate their rights.⁹ One factor common to almost every area was the extremely discretionary nature of governmental decisions and policies. Obviously, all public policy contains an arbitrary component, which may be associated with the government's ideological or political position. In the case of the Latin American countries, however, it could be argued that this component was particularly pronounced, mainly

⁹ It should be borne in mind that the institutional structure of a country alone will not guarantee the perfect appropriation of rights. The idea set forth in this article is that the special circumstances of Latin America have meant that, compared to other countries or regions, it has a lower degree of appropriability of rights, thus affecting accumulation, productivity and economic growth.

because of the nature of the industrialization process, which was led by the State. As from the 1970s, this discretionary aspect rose still further due to the increase in domestic and external imbalances. In reality, this component was always more closely associated with the adjustment plans implemented by the different countries in response to imbalances. In other words, both economic aspects and those typical of the development model chosen by most of the countries of the region reinforced the arbitrary component inherent in the formulation and implementation of public policies. Thus, the time frame and the results expected

by the economic agents were often affected by unexpected changes of course due to arbitrary decisions of the government.¹⁰

This reading of the previous economic model and the nature of the economic reforms applied in Latin America, which differs from the prevalent view in the literature on this subject, is a crucial argument of this article, for it makes possible an evaluation of the mechanisms whereby the reforms' effects were materialized, on the basis of a theoretical approach that combines neoclassical growth fundamentals with the theoretical aspects of the New Institutional Economy.

III

Institutional changes, factor productivity and growth

Several recent studies and research papers have analysed the effect of institutional variables on economic performance, especially with regard to growth and inequality. One of the fundamental principles in this line of work derives from concepts developed by Douglass North in the sphere of the New Institutional Economy. More specifically, several studies analyse the role of institutions in explaining the causes of economic growth, including the effects that institutional changes have had on factor productivity and accumulation. The studies by Hall and Jones (1996 and 1999), Jones (2000) and Garcia et al. (1999) follow this line.

The articles by Hall and Jones develop the concept of infrastructure in order to explain the differences in the output per worker observed in different economies. To do so, the authors start from an analysis based on an aggregate production function and the concept of factor accumulation. According to this analysis, country differences in the output per worker can be attributed to differences in physical capital, human capital, and total factor productivity: i.e., to what have been called the determinants of growth, considered to be associated fundamentally with the social infrastructure of an economy. Hall and Jones define social infrastructure as the government (or public) policies and institutions that determine the environment in which people accumulate skills and companies accumulate capital, invest in technology and generate output. According to these authors, a structure that encourages productive activities and capital accumulation, skills acquisition,

technology transfer and invention should lead to higher levels of output per worker.

Hall and Jones (1996 and 1999) start with a scheme based on a Cobb-Douglas aggregate production function in which each country's product Y is determined by the stock of physical capital K , human capital H , and knowledge A , so that $Y_i = K_i^\alpha (A_i H_i)^{1-\alpha}$. They restate the function as follows:

$$y_i = \left(\frac{K_i}{Y_i}\right)^{\alpha/1-\alpha} h_i A_i \quad [1]$$

where $y = (Y/L)$ and $h = (H/L)$. This equation allows us to break down the differences in the output per worker between countries into three parts: the capital-output ratio, education, and productivity. On the basis of this scheme, the authors make an empirical study of the relation between the output per worker and a set of variables that act as proxies for social infrastructure, since there is no group of variables that represents this concept directly.

Jones (2000) develops the idea of social infrastructure theoretically and proposes changes in the neoclassical growth model. The production function mentioned above is restated as follows:

$$Y = IK^\alpha (hL)^{1-\alpha}, \text{ with } H_i = h_i L_i \text{ and } h_i = e^{\phi_i u} \quad [2]$$

¹⁰ Bandeira (2000) analyses in detail how the economic reforms in Latin America tried, directly or indirectly, to increase the agents' ability to appropriate their rights.

where I represents the influence of the economy's infrastructure on total factor productivity: economies with the same values for K , h and L can have different levels of output per worker, if the economic environments in which these inputs are used are different.

Garcia et al. (1999) analyse the functional form for including institutional development in Solow's growth model, together with its conceptual consequences with regard to a modern institutional economy, following the line of work developed by Douglass North. Starting from the thesis put forward by Mankiw, Romer and Weil (1992), they propose two other possible hypotheses about the institutional variable's influence on the product and on the productivity of the economic factors. The first of these considers that institutions directly affect the productivity of physical capital, just as knowledge influences labour productivity. Based on this hypothesis, physical capital, corrected for the degree of institutional development I , as shown in equation [3], becomes "effective capital".

$$Y_i = (I_i K_i)^\alpha H_i^\beta (A_i L_i)^{1-\alpha-\beta}, \quad \alpha, \beta > 0 \text{ and } \alpha + \beta < 1 \quad [3]$$

The second way of evaluating the influence of institutional changes consists of viewing institutions as a production factor. Thus, it is posited that there is a stock of institutions that, along with other production factors, determines the economy's aggregate product. According to this proposal, the variable indicating the degree of institutional development is incorporated into the Cobb-Douglas production function raised to the exponent γ and is multiplied by the product of the other production factors, as shown in equation [4]. The difference between this second hypothesis and that of Jones (2000) consists of the idea that institutions directly influence the average and marginal productivity of the other production factors in so far as a γ that is not zero means lower ratios of capital/output, human capital/output, and labour/output.

$$Y_i = I_i^\gamma K_i^\alpha H_i^\beta (A_i L_i)^{1-\alpha-\beta-\gamma}, \quad \alpha, \beta, \gamma > 0 \text{ and } \alpha + \beta + \gamma < 1 \quad [4]$$

Garcia et al. (1999) calculate convergence and product determination equations for a sample of 67 countries, using a scale of satisfaction with political freedom as a proxy for the degree of institutional development. The results of these calculations and comparison of the institutional variable coefficients

indicate that the adjustment hypothesis defining effective capital is more empirically valid.

The inclusion of institutional variables in growth models in order to analyse the effects of economic reforms in Latin America was defined on the basis of the theoretical approach described earlier. We started from the hypothesis that the reforms, by eliminating restrictions and reducing discretionality, increased the possibility of appropriating rights and reduced distortions in relative prices, as discussed in the previous section, thus affecting factor productivity and capital accumulation within the economy. The initial hypothesis considered was that reforms only influenced the product in the case of physical capital. Applying this effective capital hypothesis, the neoclassical production function was restated, replacing physical capital with a variable expressing the factor adjusted for its productivity:¹¹

$$Y_i = (I_i K_i)^\alpha (A_i H_i)^{1-\alpha}, \text{ with } 0 < \alpha < 1 \quad [5]$$

Apart from the effective capital hypothesis, two other assumptions were also considered, each corresponding to a new specification of the production function. The first relates the institutional variable to human factor productivity according to models for estimating the influence of knowledge on this variable: this hypothesis has been called the effective human capital hypothesis. In this case, human capital is replaced by a variable that expresses this factor, adjusted according to its productivity, as shown in equation [6]:

$$Y_i = K_i^\alpha (I_i A_i H_i)^{1-\alpha}, \quad 0 < \alpha < 1 \quad [6]$$

The second assumption takes into consideration the institutional variable's effect on the total productivity of the economy, which assumes that the institutional structure influences the productivity of all factors, as shown in equation [7], which coincides exactly with the specification of Jones (2000).

$$Y_i = I_i \left[K_i^\alpha (A_i H_i)^{1-\alpha} \right], \quad 0 < \alpha < 1 \quad [7]$$

Using the same hypotheses as the Mankiw, Romer and Weil (1992) model regarding the initial stock and accumulation of knowledge, equation [5] can be applied

¹¹ Unlike Garcia et al. (1999), who use the Mankiw, Romer and Weil (1992) specification of human capital, here it was decided to include this variable in the Hall and Jones (1996 and 1999) and Jones (2000) models.

to derive a specification for the output per worker. If the function is rewritten in shortened form, we have:

$$[5']$$

where $\tilde{y} = Y/AH$, $\tilde{k} = K/AH$ and $H = e^{\phi.uL}$

Since the accumulation of knowledge is given by $A_t = A_0 e^{gt}$, and using the same hypothesis as Mankiw, Romer and Weil (1992) that $\ln A_0 = a + \varepsilon$, where a is a technological constant and ε is a specific random impact on the economy and, to simplify, $t = 0$, a final specification is obtained that includes the variable associated with institutional change, as represented by equation [8].¹² In this equation, the coefficient associated with the degree of institutional development is, at least in theoretical terms, identical to the coefficient for the physical capital saving effort. If these coefficients were different, however, there is evidence suggesting that the degree of institutional development would influence not only capital productivity. In that case, one of the other assumptions considered could be expected to prevail. The empirical formulae for these follow the same logic as equation [8] and are shown in equations [9] and [10].

$$\ln(Y_t/L_t) = a + \frac{\alpha}{1+\alpha} \ln I_t + \frac{\alpha}{1-\alpha} \ln s_k - \frac{\alpha}{1-\alpha} \ln(n+g+d) + \phi.u + \varepsilon_t \quad [8]$$

$$\ln(Y_t/L_t) = a + 1 \ln I_t + \frac{\alpha}{1-\alpha} \ln s_k - \frac{\alpha}{1-\alpha} \ln(n+g+d) + \phi.u + \varepsilon_t \quad [9]$$

$$\ln(Y_t/L_t) = a + \frac{1}{1-\alpha} \ln I_t + \frac{\alpha}{1-\alpha} \ln s_k - \frac{\alpha}{1-\alpha} \ln(n+g+d) + \phi.u + \varepsilon_t \quad [10]$$

The study of the effects of reforms on capital accumulation was based on the corresponding equation defining that process, as well as on a corollary of the Solow model. If, to simplify, knowledge is treated as constant and depreciation as non-existent, the expression for the accumulation of this factor establishes that the change in capital stock per worker in an economy depends on two factors: savings per worker and the growth rate of the labour force. This equation is restated in the expression below, in which k now represents capital per worker and k the investment per worker.

$$k_t = s_k f(k_t) - nk_t \quad [11]$$

In this sense, to influence the capital accumulation process reforms must change the first term, given that in this model labour market dynamics are determined by demographic aspects. Thus, in theoretical terms, the effects of reforms on the accumulation process are of the same nature as their influence on the generation of the amount of savings per worker within the economy. In line with the hypothesis that savings equal investment, their impact on investment per worker is of the same nature.

As indicated, according to the Solow model formulation, the corollary conclusion is that factors are remunerated according to their marginal productivity. With regard to the problem of maximizing company profits, the following relationship is obtained:

$$r = \alpha \frac{Y}{K}, \text{ where } 0 < \alpha < 1, \quad [12]$$

which defines the long-term interest rate or yield on capital. Investment is negatively related to this rate, because it reflects the marginal productivity of capital, which goes down with the stock of this factor. Likewise, the fraction of this product that goes to accumulation is not only related to r , but also to family decisions, which reflect such factors as personal preferences, point

¹² Solow's capital accumulation equation (1956), in which s_k reflects the saving rate, n the population growth rate, g the level of technological innovation and d the rate of depreciation, could also be rewritten in shortened form as follows:

$$\dot{\tilde{k}} = s_k \tilde{y} - (n+g+d) \tilde{k}$$

In a steady state, the variation in capital stock per unit of effective human capital is nil. We thus reach a break-even point, that is, a point where gross investment is in equilibrium. If equation [5'] is substituted in this equation, we have the capital stock per unit of labour in the steady state, as expressed by \tilde{k}^* . By substituting the corresponding expression for this variable, we obtain the equation for the product per unit of effective human capital in the steady state, indicated by \tilde{y}^* . Both equations are given below:

$$\tilde{k}^* = \left(\frac{I^\alpha s_k}{n+g+d} \right)^{\alpha/1-\alpha} \quad \text{and} \quad \tilde{y}^* = I^{\alpha/1-\alpha} \left(\frac{s_k}{n+g+d} \right)^{\alpha/1-\alpha}$$

If y^* is defined as the output per worker in the steady state, we have:

$$y^* = I^{\alpha/1-\alpha} \left(\frac{s_k}{n+g+d} \right)^{\alpha/1-\alpha} A e^{\phi.u}$$

If the above equation is stated in linear form by applying the natural logarithm, a new expression for the output per worker is obtained:

$$\ln(Y_t/L_t) = \frac{\alpha}{1-\alpha} \ln I + \frac{\alpha}{1-\alpha} \ln s_k - \frac{\alpha}{1-\alpha} \ln(n+g+d) + \ln A + \phi.u$$

in the life cycle, and institutional aspects. Let us assume that the first two factors can be captured by the dependency ratio by age: the higher this ratio, the lower the savings. Similarly, the influence of institutional elements, the context in which the reforms are applied, follows the line of reasoning analysed above. This simple theoretical scheme makes it possible to study the evolution of investment per worker and the effect of the reforms on this variable, using the following expression:

$$i = s_k f(k) = g(r, dep, I) \quad [13]$$

where i is the investment per worker, dep the dependency ratio by age, and I the indicator of economic reforms. It may be expected, therefore, that $g'(r) < 0$, $g'(dep) < 0$, and $g'(I) > 0$. The effect of reforms, if significant, must be positive, because of the economic and institutional nature of the measures applied.

IV

Economic reforms, institutional changes and growth in Latin America

The empirical analysis of the effects of reforms during the period from 1970 to 1995 was carried out using a balanced sample of 17 Latin American countries. The set of economies was defined according to the availability of data on the reform variables, in this case the six indices formulated by Morley, Machado and Pettinato (1999). Once these indicators had been prepared for the 1970-1995 period, this also defined the time interval to be considered. Six chronological observations were used for each country (1970, 1975, 1980, 1985, 1990 and 1995). Thus, the data bank comprised a total of 102 observations. The other variables were formulated according to World Bank indicators (World Bank, 2000) and data from Barro and Lee (1996), updated to 1995.¹³

The hypothesis assumed a constant depreciation rate of 3% per year, equal for all the countries. The exercise began with a g rate set at 1.2%, likewise constant and identical for all countries, in line with the basic Solow model.¹⁴ However, the hypothesis that $\ln A_{(t)} = a + \varepsilon$ permits the inclusion of differences

between countries in the level of knowledge or technology, which are captured by dummy variables for each country. With regard to the reform indices, the original variable I_t was changed to take into consideration the fact that these indicators are limited to the interval between 0 and 1. It was therefore considered that $I_t = e^\eta$ where η represents the reform indices (both the general index and those associated with the five areas of reforms). Savings correspond to the average rate posted over the 20 years prior to the period under analysis, and the rate n reflects the average between five-year sub-periods.

To begin with, specifications were estimated for the output per worker and per capita product, although the model's theoretical equations actually take into consideration the first case. With regard to the per capita product, the variable n represents the population growth rate and the model behaves as if everyone had a job. In general, the regressions that use the per capita product were those posting the best results. Consequently, and bearing in mind the problems associated with measuring the labour force in the countries of the region, per capita product was defined as a dependent variable.

The econometric analysis was divided into two parts. One involved investigating the impact on total factor productivity or the productivity of each factor considered individually. The other analysed the impact on capital accumulation. The first estimate was based on equation [14] below, in which $i = 1, \dots, 17$, and $t = 1, \dots, 6$. According to the theoretical values predicted in equations [8], [9] and [10], the evaluation of the

¹³ The data used in the regressions can be obtained from Bandeira (2000) or directly from the authors of the present article.

¹⁴ The values assigned to these two rates follow the general lines established in the literature on growth. See, for example, Mankiw, Romer and Weil (1992). In the specific case of the technological innovation rate, we followed Piedrahita (1998), who assumes that g is equal to the average real per capita GDP growth rate in Latin America for the period from 1916 to 1989, as established by the World Bank.

coefficient for the variable representing institutional change should define the most probable hypothesis: if the reforms only influence the productivity of the physical factor, if they only affect the productivity of human capital, or if they have a general impact on the productivity of the economy as a whole.

$$\ln(Y_{i,t}/L_{i,t}) = \beta_0 + \beta_1 \ln I_{i,t} + \beta_2 \ln s_{ki,t} - \beta_3 \ln(n_{i,t} + g + d) + \beta_4 u_{i,t} + \varepsilon_{i,t} \quad [14]$$

Table 1 shows the results of these regressions. All the models were estimated using the least squares method with fixed effects.¹⁵ Preliminary test results on the importance of including dummy variables indicated that only the fixed effect for countries was significant. The fact that the chronological dummy variables were not significant may be due to the correlation between those variables, educational level and the reform indices, since the last two do reflect a tendency.

The basic model estimated in table 1 corresponded to equation [14] and did not take into account the reform index. This variable, like the specific indices for each area, was gradually incorporated in order to identify its partial effects. The results for the first regression were quite reasonable and served as a point of reference for analysing the impact of the reforms. The coefficients for saving and average schooling were significant at the 5% level and had the expected sign. In contrast, the coefficient associated with the variable $n + g + d$ was not significant. This result seems to be related to the fact that this variable shows little variance and a high degree of multiple collinearity, reflected in the high value of the VIF statistic for every specification.

The second model, which included the general index of the reforms, gave better results. Through an estimate carried out using least squares with dummy variables, there was a slight increase in the adjusted R^2 , while the standard error of the regression declined. There were no signs of heteroskedasticity. The reform coefficient was significant at the 5% level and showed

TABLE 1

Latin America: Determination of per capita product, 1970-1995^a

	Basic model	Reform index	Trade openness	Financial reform	Capital account liberalization	Privatisation	Tax reform
Ln(s_k)	0.647 (0.112)	0.654 (0.106)	0.677 (0.110)	0.646 (0.108)	0.627 (0.111)	0.649 (0.108)	0.658 (0.106)
Ln($n+g+d$)	0.350 (0.250)	0.427 (0.239)	0.374 (0.245)	0.407 (0.244)	0.433 (0.250)	0.319 (0.242)	0.390 (0.238)
Schooling (u)	0.072 (0.023)	0.031 (0.026)	0.042 (0.027)	0.042 (0.026)	0.061 (0.024)	0.077 (0.023)	0.028 (0.026)
Reform (I)		0.394 (0.125)	0.190 (0.089)	0.160 (0.064)	0.194 (0.103)	0.625 (0.235)	0.346 (0.110)
Adjusted R ²	0.955	0.960	0.957	0.958	0.956	0.958	0.959
Mean standard error	0.130	0.124	0.127	0.126	0.128	0.125	0.123
White's test - n. R ²	24.800	23.540	24.542	27.164	29.165	27.267	23.379
χ^2 (5%)	37.653	43.773	43.773	43.773	43.773	43.773	43.773
F - fixed effect ^b	68.883	76.236	70.698	73.552	69.558	74.358	76.879
Hausman test	6.15	8.08	7.33	6.64	7.17	6.62	6.56

^a Numbers in brackets are the standard errors of the estimates.

^b The F statistic calculated for the fixed effect test is equal to 2.24. The basic model has 82 degrees of freedom, the other models 81.

¹⁵ In line with the studies by Mankiw, Romer and Weil (1992) and Islam (1995) on the nature of the term A_{it} , and in view of the hypotheses regarding the behaviour of that term, it was decided to work with the fixed effect model. The technological constant represents not only knowledge, but also all other aspects related to factor productivity. In this context, the fixed effects for countries indicate productivity differences which, given their

formulation, are correlated with the model's explanatory variables (saving, population growth and reforms). At all events, the Hausman test was applied to every empirical model in order to evaluate the possibility that the residual terms were not related to the set of explanatory variables, which would imply a better estimate of the parameters on the basis of the random effects model.

a low degree of correlation with the other variables of the model. Another interesting point concerned the human capital factor. The estimated coefficient for this variable, when controlled for the fixed effect by country and reforms, was low and insignificant. This was also due to the high collinearity and low tolerance of the coefficient in this second model (the VIF reached 8.003). Thus, the specifications in table 1 display a certain degree of correlation between the explanatory variables and the dummy variables for the countries which affects the estimated value of the coefficients. This problem did not call for corrective measures, however, because the level of multiple collinearity seems to be within acceptable margins.

In order to analyse the impact of each reform separately, the general reform index was replaced sequentially by each of its components, yielding the five models that follow. All represent values of adjusted R^2 that are higher and mean standard error that are lower than the basic model. The estimated coefficients for the s_k variables were very stable, with the implicit α staying somewhere between 0.38 and 0.40, while the coefficients associated with the $n + g + d$ variable were not significant. As regards the reform indices by area, all the other regressions yielded coefficients that were positive and significant at the 5% level, except the regression for capital account liberalization, which was significant at the 10% level. This indicates that each reform area positively affected the per capita product during the period under analysis.

To investigate how this effect occurred, a series of tests were conducted that consisted of applying a set of linear restrictions on the estimated coefficients for the s_k and I variables. These tests were defined according to the three theoretical specifications [8], [9] and [10] which establish the values predicted for each of these coefficients according to each of the hypotheses under consideration: effective capital, effective human capital and total productivity.

Using equation [14], the values for the coefficients associated with each variable were estimated, but this expression did not determine *a priori* which of the specifications was the most probable; only a coefficient β_1 was assigned to the institutions. Comparing this estimated coefficient with the others makes it possible to identify the role of the reforms. If the test of applying restrictions to the coefficients proves unable to refute the hypothesis that the coefficient β_1 is equal to β_2 , then the institutions can be considered to affect the productivity of capital. In this case, the coefficients associated with the reform indicator and the rate of

saving should be statistically equal, thus indicating the validity of the restriction present in equation [5].

If it proves impossible to refute the hypothesis that $\beta_1 = 1$, then the conclusion is that institutions respond to the effective human capital hypothesis, as proposed in equation [9]. This result is compatible with the restriction implicit in the theoretical specification formulated in equation [6]. Finally, if it proves impossible to refute the hypothesis that β_1 is equal to $1 + \beta_2$, then a conclusion favourable to the third hypothesis can be reached, as formulated in equation [10]: institutions affect both productive factors equally, thus affecting total factor productivity. This happens because in this case the effect of institutional reforms is identical to the sum of their partial effects, both on physical capital and effective human capital, as indicated by the reform coefficients in equations [8] and [9]. Table 2 shows the results of the tests corresponding to the three hypotheses.

The first test corresponds to the first hypothesis analysed: that the reforms mainly affect the productivity of physical capital. Table 2 offers evidence that reforms in general, and the privatisation process in particular, had a significant impact on the productivity of this factor, because it is not possible to reject the hypothesis that the coefficients associated with s_k and I are equal. In the case of the second hypothesis, regarding effective human capital, only privatisation seems to have significantly affected the productivity of the human capital factor. Evidently, it is not possible to affirm that the general impact of the reforms and the five areas under consideration were concentrated on the total productivity of these economies, in line with the third theoretical hypothesis. Thus, it can be concluded that the positive impact of the reforms was associated with effective capital, or even that this effect on the product of the region's countries was mainly due to an increase in the productivity of physical capital. The reduction or elimination of controls on the different markets seems to have promoted more efficient use of this factor.

The impact of the reforms on capital accumulation was then estimated. Starting from a parameter 1/3 for α and working with the product and capital stock series—the latter calculated according to the methodology suggested by Nehru and Dharehwar (1993)—, it was possible to calculate the long-term interest rate r . The function expressed below was then estimated, assuming a basic specification in which, once again, $i = 1, \dots, 17$, and $t = 1, \dots, 6$. For the purpose of this estimate, the dependency ratio by age was approximated by including

TABLE 2

Tests of linear restrictions on the coefficients β_1 and β_2
(Student's *t* statistic)^a

Hypothesis	Reform index	Trade openness	Financial reform	Capital account liberalization	Privatisation	Tax reform
$\beta_1 = \beta_2$	1.598	3.677	3.859	2.735	0.094	2.075
$\beta_1 = 1$	-4.837	-9.079	-13.120	-7.821	-1.593	-5.932
$\beta_1 = 1 + \beta_2$	-7.758	-11.224	-11.802	-9.051	-3.969	-8.723

^a Two-sided calculated *t*-statistic of 1.98 (Alpha = 5%).

TABLE 3

Latin America: Determination of per capita investment, 1970-1995^a

	Basic model	Reform index	Trade openness	Financial reform	Capital account liberalization	Privatization	Tax reform
Ln(<i>r</i>)	-0.905 (0.165)	-0.785 (0.157)	-0.857 (0.159)	-0.749 (0.159)	-0.850 (0.163)	-0.939 (0.174)	-0.774 (0.163)
Ln(<i>dep</i>)	-0.202 (0.194)	-0.632 (0.215)	-0.601 (0.234)	-0.547 (0.203)	-0.338 (0.201)	-0.222 (0.198)	-0.496 (0.209)
Reform (I)		0.647 (0.176)	0.368 (0.131)	0.324 (0.087)	0.301 (0.144)	0.228 (0.367)	0.459 (0.151)
Adjusted R ²	0.931	0.940	0.937	0.941	0.934	0.931	0.938
Mean standard error	0.186	0.173	0.179	0.173	0.182	0.187	0.178
White's Test - n.R ²	35.799	29.519	32.579	31.333	33.484	39.100	34.234
χ^2 (5%)	32.671	37.652	37.652	37.652	37.652	37.652	37.652
F - fixed effect ^b	57.142	64.808	62.017	66.683	59.704	51.436	63.056
Hausman test	4.49	15.18	8.30	8.48	5.43	6.56	7.15

^a Numbers in brackets are standard errors of estimates.

^b The *F* statistic calculated for the fixed effect test equals 2.24. The basic model has 83 degrees of freedom while the others have 82.

people 65 years of age and over. First of all the general index was verified, and then each reform separately.

$$\ln i_{i,t} = \beta_0 + \beta_1 \cdot \ln r_{i,t} + \beta_2 \cdot dep_{i,t} + \beta_3 \cdot I_{i,t} + \mu_{i,t} \quad [15]$$

Table 3 gives the main results and statistics for a set of specifications. The first model corresponds to the formulation in which per capita investment is a function of interest rates and dependency by age. The next model identifies the fixed effect by country as significant, indicating the presence of factors not taken into account in the model which are associated with each economy and affected investment in the period under analysis.¹⁶ The second model considers the

general reform index as an explanatory variable, in order to investigate the effect of the set of measures on capital accumulation.

The basic model's explanatory power is high (adjusted R² of 93.1%). However, if White's Test is applied, the hypothesis of heteroskedasticity cannot be discounted. This indicates that both the interest rate and dependency by age negatively affect investment. The coefficient associated with this second variable is not significant at the 5% level, however. The model that includes the reform index produced better results. The adjusted R² rises slightly as the standard error of the regression goes down. According to White's Test, there are no signs of heteroskedasticity. Inclusion of the reforms permits correction of the estimated coefficients for interest rates and dependency by age. The coefficients for the latter displayed the greatest variation, while the reform coefficient was significant at the 5% level and had the expected sign.

¹⁶ The fixed effect tests indicated that it was important to include the fixed effect of time. In contrast, the inclusion of chronological dummy variables gave rise to serious problems of heteroskedasticity, so that it was decided not to take into account the specifications including those variables.

With regard to the areas of reform, except for the estimated coefficient for privatisation all were significant at the 5% level. The model that included privatisation yielded the worst results. The adjusted R^2 was the lowest of the specifications in the table, while the standard error of the regression was the highest.

V

Final considerations

The empirical research conducted on the effects of the economic reforms in Latin America made it possible to obtain a series of tests to identify the impact of these policies on the per capita product of the economies of the region and at the same time provided useful elements for analysing the mechanisms by which this impact was materialized. These results must now be evaluated. On the basis of empirical analysis of the reforms' effects, it can be concluded that: i) their general impact on the per capita product was positive; ii) considering total and partial factor productivity, the main channel was the positive effect on the productivity of the physical capital factor; and iii) capital accumulation responded positively to the reforms, except in the case of privatisation, whose effect does not appear to have been statistically significant. The third conclusion tends to corroborate the second, in the sense that with an increase in the marginal productivity of capital, there should be a sustained or steadier rise in investment.

The recovery in the per capita product observed in the late 1980s and the first half of the 1990s therefore appears to be directly linked to the reforms' effects on productivity and capital accumulation. However, it should be noted that these results, like those that appear in the empirical literature on economic growth in general, are conditioned by the econometric specifications and samples used, as well as the set of control variables selected.

The empirical literature on this subject uses the product growth rate as dependent variable. As mentioned in the introduction, these studies show that the reforms had a positive impact on this rate in recent years. The exception was the article by Escaith and Morley (2000), which concluded that the positive impact of the reforms on growth was, at best, indirect. The methodology applied in the present article permits

This was also the only model that showed signs of heteroskedasticity. If we examine the other four reform areas, the results clearly indicate the positive impact of these measures on per capita investment during the period under analysis. Taken individually, each of the reforms confirms this result in general terms.

the conclusion that the general impact of the reforms on the per capita product of these economies was positive during the 1970-1995 period.¹⁷ As table 1 showed, all the reforms contributed to this result. Similarly, there seems to be proof that the reforms did in fact reduce distortions in relative prices (economic aspect) and increased the appropriability of rights, mainly by limiting discretionary powers (institutional aspect).

Only the study by Barrera and Lora (1997) investigated the channels through which the reforms achieved their impact (higher productivity or capital accumulation). These authors reached the conclusion that the main element had been the effect of these measures on total factor productivity, although a recovery in investment levels was also observed. The specifications used in the empirical stage of the present study made it possible to explore whether this effect applied to total or partial factor productivity. The results indicated that physical capital was the factor most favoured in terms of higher productivity during the reform process. The reforms' impact on effective capital is derived largely from the evidence associated with privatisation operations. This area of reform can be said to have clearly affected capital productivity, although its influence via effective human capital cannot be discounted. The other four reforms affected the product and investment, but tests carried out using the estimated coefficients did not permit a conclusion as to whether this occurred by way of effective capital or effective human capital.

¹⁷ The appendix examines the effect of the reforms on growth in the Latin American countries from 1975 to 1995. On the basis of a theoretical conditional convergence equation, it is considered that, taken both individually and together, the reforms had a positive effect on the region's economic growth.

An important corollary to the research presented in this article has to do with the effect of the reforms on income distribution. As already noted, the impact of these policies was greater in the case of physical capital than on labour. In other words, comparatively speaking, remuneration of capital must have risen more than other factors. The relative changes in productivity, and therefore wages, caused by reforms may have favoured the concentration of income to some extent. Morley (2000), who uses the same set of six economic reform indices to evaluate the effect of growth and the reforms on income distribution in Latin America, found signs that the reforms in general may have had a regressive effect on this distribution, although he sustains that it was not very significant, statistically speaking.

Parallel to the evidence presented by this author, there is a second study whose conclusions seem to confirm the impact of the reforms on distribution. Behrman, Birdsall and Székely (2000) explore the relationship between the implementation of the economic reforms and wage differences in 18 Latin American economies between 1980 and 1998 (as measures of the reforms they use the same indices as Morley, Machado and Pettinato). This study offers some

important conclusions. In the first place, the authors find proof that wage differences between workers with higher education and those with primary and secondary education increased considerably, particularly during the 1990s. With regard to the impact of the reforms, they reached the conclusion that on average these profoundly and positively affected these differences, although this effect tended to decline over time. They also examined the effect on wage levels: their results, although preliminary according to the authors, suggest that the reforms had a positive impact on wage levels. In short, this study indicates that, taking 1980 as the starting point, the reforms affected both the average level and variance of wages.

The empirical results and theoretical implications of the present article point in the same direction. The positive effect of the reforms on the productivity of human capital, although not integral, offers proof that the wage level for this factor did increase somewhat. At the same time, the fact that productivity increases occurred mainly in the case of the capital factor indicates that the reforms must have negatively affected income distribution, along the same lines as the increase in the difference in wages observed in the aforementioned study.

APPENDIX

The conditional convergence equation

As they affected productivity and capital accumulation, the economic reforms should be directly linked to the growth in the per capita product noted in the late 1980s and the first half of the 1990s. To evaluate this effect, the conditional convergence equation developed by Mankiw, Romer and Weil (1992) was used, with the product expressed, in this case, per unit of effective human capital $\tilde{y}(t)$, as shown in the following equation:

$$\ln \tilde{y}(t_2) - \ln \tilde{y}(t_1) = (1 - e^{-\lambda\tau}) \ln \tilde{y}^* - (1 - e^{-\lambda\tau}) \ln \tilde{y}(t_1) \quad [A.1]$$

The steady-state product, when no restriction is imposed on the production function in terms of the role of reforms, is expressed as:

$$\tilde{y}^* = I' \left(\frac{s_k}{n + g + d} \right)^{\alpha / (1 - \alpha)} \quad [A.2]$$

Substituting equation [A.2] in [A.1], and expressing the output per worker as $y(t)$ gives the following equation, which permits evaluation of the general impact of the economic reforms on the growth rate of the Latin American countries.

$$\begin{aligned} \ln y(t_2) - \ln y(t_1) &= (1 - e^{-\lambda\tau}) \gamma \cdot I + (1 - e^{-\lambda\tau}) \\ &\cdot \frac{\alpha}{1 - \alpha} \ln(s_k) - (1 - e^{-\lambda\tau}) \cdot \frac{\alpha}{1 - \alpha} \ln(n + g + d) \quad [A.3] \\ &+ (1 - e^{-\lambda\tau}) \cdot \phi \cdot u - (1 - e^{-\lambda\tau}) \cdot \ln y(t_1) \\ &+ (1 - e^{-\lambda\tau}) \cdot \ln A_{(0)} + g(t_2 - e^{-\lambda\tau} t_1) \end{aligned}$$

According to this formula, the growth rate will be positively associated with the degree of reform: countries which have applied more reforms should show higher rates while in the transition process. The econometric study was based on a set of 17 Latin American countries but was limited to the period from 1975 to 1995, for reasons of data availability. The specification of this set, in which $i = 1, \dots, 17$, and $t = 1, \dots, 5$, was based on expression [A.4] below, which was derived directly from equation [A.3].

$$\begin{aligned} \Delta \ln y(t) &= \beta_0 + \beta_1 \ln I_{i,t} + \beta_2 \ln s_{ki,t} \\ &- \beta_3 \ln(n_{i,t} + g + d) + \beta_4 u_{i,t} + \beta_5 \ln y(t_0)_i + \varepsilon_{i,t} \quad [A.4] \end{aligned}$$

where $\Delta \ln y(t)$ indicates the difference in product at two points in time, while $y(t_0)$ represents the product during the initial period of the analysis.

Table A.1 gives the main results from the estimation of this specification, using the fixed effect model. (According to the Hausman test, this model is appropriate for all specifications). The basic model, with fixed effect but without reforms, has little explanatory power, with the set of dummy variables proving significant. The estimated coefficient associated with the initial income level is significant at the 5% level and has the expected sign. This result indicates the validity of the conditional convergence hypothesis for the income of the region's countries.

TABLE A.1

Latin America: Determination of per capita product growth, 1970-1995^a

	Basic model	Reform index	Trade openness	Financial reform	Capital account liberalization	Privatisation	Tax reform
Ln(y_0)	-0.731 (0.127)	-0.706 (0.115)	-0.696 (0.122)	-0.721 (0.121)	-0.693 (0.116)	-0.689 (0.118)	-0.767 (0.119)
Ln(s_K)	0.219 (0.163)	0.210 (0.147)	0.222 (0.156)	0.215 (0.155)	0.170 (0.149)	0.183 (0.151)	0.251 (0.152)
Ln($n+g+d$)	0.590 (0.269)	0.659 (0.243)	0.585 (0.257)	0.638 (0.257)	0.777 (0.250)	0.493 (0.250)	0.632 (0.251)
Educational level (u)	0.036 (0.028)	-0.025 (0.030)	-0.008 (0.032)	-0.002 (0.030)	-0.002 (0.028)	0.035 (0.026)	-0.013 (0.031)
Reform (I)		0.449 (0.114)	0.231 (0.089)	0.156 (0.057)	0.372 (0.100)	0.709 (0.207)	0.355 (0.110)
Adjusted R ²	0.386	0.500	0.438	0.443	0.490	0.474	0.465
Mean standard error	0.111	0.100	0.106	0.106	0.101	0.103	0.104
White's Test - n.R ²	35.458	37.767	38.661	37.898	40.286	39.296	37.590
χ^2 (5%)	43.773	49.800	49.800	49.800	49.800	49.800	49.800
F - fixed effect ^b	3.908	5.455	4.645	4.421	5.570	5.241	4.823
Hausman test	45.74	65.39	55.2	56.78	70.54	62.94	61.48

^a Numbers in brackets are standard errors of the estimates.

^b The *F* statistic calculated for the fixed effect test equals 2.37. The basic model has 64 degrees of freedom, while the rest have 63.

The coefficients for the other variables do not appear to be significant, except for the break-even point for the investment rate, $n+g+d$, which has an inverse sign.

The second specification in the table includes the general reform index as an explanatory variable in the model with fixed effects. The rise in adjusted R² and the reduction in the standard error of the regression should be noted. There are no signs of heteroskedasticity problems. The fixed effect test shows the importance of the set of dummy variables. The coefficient associated with the reforms is significant (at the 5% level) and indicates that altogether these measures influenced growth in the countries of the region during the period under analysis. When evaluating the other variables, the effect of the initial product continues to be

important, while the *break-even point* continues to have the opposite sign to that which was expected.

If we look at the individual reforms, it is clear that the five reforms considered are important in determining the growth of the sample countries. The coefficient associated with privatisation is also worthy of note. Its value is a good deal higher than the others, as in the case of the equation for the per capita product. Once again, in all five specifications the rate of saving and the educational level do not seem important. The estimated initial income level coefficient is significant in all five models, thus supporting the convergence theory.

(Original: Portuguese)

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