

Walter B. Stöhr
McMaster University

Spatial Growth Differentials in Latin America: The Role of Urban and Transport Investment

The significance of spatial growth differentials

Problems of spatial development in Latin America appear at different levels. They are related to the following issues: a) Inter-regional disequilibria and the diffusion of development between different regions of a country -- questions of national integration, b) Growth poles and the diffusion of development within the urban system of a country -- questions of inter-urban relations and urban hierarchy, c) Diffusion of development from urban centers to their rural hinterlands -- questions of intra-regional integration; d) Diffusion of development between countries -- questions of international integration. These four problem groups are all related to one central phenomenon, namely to obstacles in the transmission of developmental impulses through space, and to the failure of an automatic establishment of equilibrium in the distribution of population, resources and economic activities. These phenomena are worldwide. But Latin America presents them in a particular magnitude.

a) Inter-regional disequilibria in Latin America are particularly complex due to the concurrence of two phenomena: 1) high inter-regional income differentials compared in a world-wide context. (Williamson, 1965, 12), a phenomenon indicating by itself obstacles to the spatial transmission of developmental impulses. 2) The existence of large still unutilized areas (Ginsberg, 1961, 50 and map XIX) with potential resources which could contribute to overcoming the present state of underdevelopment. These two phenomena could compensate each other, but in Latin America they do not. This combination of high inter-regional income differentials along with the existence of large still untouched resource frontiers indicates that in most Latin American countries there exist particularly strong barriers to the internal spatial transmission of development.

b) Latin American countries are among the most highly urbanized of the underdeveloped world (Ginsberg, 1961, 34 and map XI). At the same time, many of them have a high degree of primacy of the national capital within the urban hierarchy (Ginsberg, 1961, 36 and map XII). This would seem to indicate that, in

spite of the great importance of the urban sector in Latin America, there exist unusual obstacles to the transmission of developmental impulses within the urban hierarchy from the top downward (Berry-Horton, 1970, 64).

c) The lack of urban-rural transfer of development seems equally conspicuous in Latin America (ECLA, 1970). Apart from the chronically precarious terms of trade of agricultural products, the particularly scarce innovational capacity of rural areas of Latin America in social, political and economic terms appears to be the main reason for this fact. The latter has to be explained by the continuous state of complete dependency of rural areas upon outside decisions -- first foreign and later urban (among them the typically absentee-owner "latifundista") -- from colonial times to the present. This has prevented the emergence of autochthonous decision-making structures in most rural areas of Latin America. The economic consequence of this strong rural dependency on outside agents is the striking under-utilization of rural resources and the role of most Latin American countries as net importers of agricultural products. Again, a lack of spatial transmission of developmental impulses is apparent.

d) Differences in national development levels and the obstacles they create for international integration are common to most continents and have been widely studied. The Latin American situation is special in the sense that a lack of physical communication between many countries aggravates the problem of economic integration. Transport investment therefore potentially plays a much more important role for international integration than it does in other on-going integration schemes. Another characteristic of the Latin American case is that international integration is being attempted while most countries are still trying to push along national integration by incorporating peripheral areas of their own territories (particularly in the interior of the continent).¹ This often leads to conflicts in priority between different levels of integration and to the question whether a certain degree of national integration is a prerequisite for international integration or, on the other hand, whether international integration can effectively promote national integration. Many border development programs derive their changing fate from this dichotomy.

Policies for spatial development in Latin America

To cope with the political, economic and social problems arising from these disequilibria, a great number of spatial development efforts are being undertaken

in Latin America in the form of more or less explicit programs for the development of areas such as a) depressed areas, new natural resource areas and border areas, b) growth poles and growth corridors, c) programs for rural development (though few in number), and d) multilateral programs for the integration of border areas and of different scales of multinational integration (Pedersen-Stöhr, 1969, 2-12).

These programs consist basically of three types of policy variables:

- 1) measures directed towards "*creating growth*" by increasing the regional production capacities (through mobilization of additional capital, labor, technology or natural resources) or by increasing regional demand (through income transfers).
- 2) measures oriented towards increasing the efficiency of existing capacities by improving the interaction of production factors, economic activities and demand. These measures are "*permissive*" for growth. Most of them create external economies. These measures can be directed to the development of specific localities and in material terms will then consist mainly of urban investment. Or their emphasis can be on interrelating activities in different localities, in which case they will consist mainly of transport and communications investment.
- 3) measures oriented towards the change of social structures and institution building.

Measures of the second category, and particularly urban and transport investment, are the biggest demanders for public funds. Considerable transport investment has been made to connect depressed areas, resource frontiers or border areas with existing core regions (Friedmann, 1966, XV). Cases in point are the newly built roads between the Southeast and the depressed Northeast of Brazil, the Carretera Marginal de la Selva connecting potential resource areas in the East of Peru with each other, or the numerous new highways under construction in the interior of such countries as Brazil and Bolivia to establish dominance over border areas. The developmental impact of these investments has been greatly varied and little systematic knowledge exists on the reasons for success and failure (Wilson, 1966, 174).

Similarly, investment in urban infrastructure and in productive facilities in many instances has been concentrated in selected locations with the intention of

creating "growth poles." Take the cases of Ciudad Guayana in the resource frontier of Venezuelan Guayana, of the Reconcavo de Bahía in the depressed Northeast of Brazil, of Arica-Tacna on the respective sides of the Chilean-Peruvian border, or Brazil's new capital, Brasília. At the national level an increasing number of countries are defining "national systems of growth poles" for all their territory. Effects have been more varied even, with some of the selected locations not producing any economic growth, others doing so in the form of enclaves retaining growth without diffusing it to surrounding areas, and only a very few fulfilling the expectations put into them as an instrument of regional development. Again, we have no systematic knowledge on the reasons for success or failure of these projects, nor on the contribution that urban investment can make to them.

Systematic research efforts along these lines are greatly needed.

Decision criteria for urban and transport investment

Urban investment, as used here, includes all infrastructure investment (Jensen, 1967, 13) in urban areas and transport investment means investment in transport and communications at any level above the local one.

The spatial allocation of urban and transport investment, like infrastructure investment in general, can take place from two approaches:

a) with a *demand* criterion (*politique d'accompagnement*) which allocates resources according to distribution of demand for the respective facilities or services on the part of existing (or projected) population and economic activities. In this case spatial development of the foregoing time period determines infrastructure investment. It is related to Hirschman's development strategy via directly productive activities (DPA - Hirschman, 1965, 83). In this case, urban and transport investment play a passive role with regard to spatial development. We shall not deal with this approach in more detail. Relevant techniques for this and the following approach are discussed by Klaassen (1968, 19).

b) with a *supply* criterion (*politique d'entrainement*) which requires estimating regional development potentials, and where infrastructure investment is used to induce development. This approach is related to Hirschman's strategy of development via social overhead capital (SOC), Evidently the key problem here is the estimation of regional growth potentials and the contribution which

infrastructure investment can make to fill it. This has been attempted on a disaggregated basis for specific industries (Klaassen, 1967). Methods have also been proposed for aggregate estimations via regional production functions (Jensen, 1967, 80). We shall apply this latter approach, using Siebert's theorems on the impact of the mobility of growth determinants on regional growth (Siebert, 1969, 132).

The importance of supply criteria for allocating infrastructure for spatial development is stressed by another fact. Spatial development programs are undertaken for peripheral areas which have insufficient demand structures. A primarily demand oriented infrastructure policy will therefore have insufficient effect. The major impulses will have to come from supply oriented infrastructure investment which induces economic development. We shall in the following, therefore, concentrate on supply oriented allocation criteria.

The role of urban and transport investment in spatial development

Spatial development as a policy issue is concerned with the extension of developmental impulses through space. A major concern in this context is to influence growth differentials between regions.

There exists a body of knowledge on the relationships between transport investment and the location of individual activities. Much less consolidated is our knowledge on the influence of urban investment upon the location of activities. But no theory exists as yet on the impact of these two groups of investment upon entire spatial systems. One reason for this lack of theory is that studies on the subject have generally been conducted in aggregate terms, not differentiating between types of regions.

From aggregate analysis we know, for instance, that at the national level transport investment can have not only positive but also negative impact upon development (Owen, 1964). The latter would be the case when investment is made in transport although it would have a higher marginal productivity in other sectors. We are dealing here with a static problem of optimal resource allocation between sectors of the economy.

The same problem is relevant in a regional perspective, but here an additional dynamic aspect gains still greater importance: namely the influence of transport investment upon the transmission of developmental impulses through space.

Transport investment between two regions can on the one hand lead to an increased withdrawal of resources (Hirschman's "polarization" and Myrdal's "backwash" effect) from one region, or on the other hand improved accessibility can increase commodity flows and through multiplier effects or changes in the terms of trade exert levelling effects on the growth differentials between regions (Hirschman's "trickling down" and Myrdal's "spread" effect). The impact on regional growth will depend on whether the withdrawal effects or the leveling effects are stronger.

In view of the "permissive" character of urban and transport investment, their development impact will essentially depend on the regional economic structures they act upon. For requirements of a dynamic analysis these structures can most usefully be characterized by the determinants conditioning their growth (= growth determinants), namely production factors (natural resources, labor, capital and technology), commodity flows, and external economics.

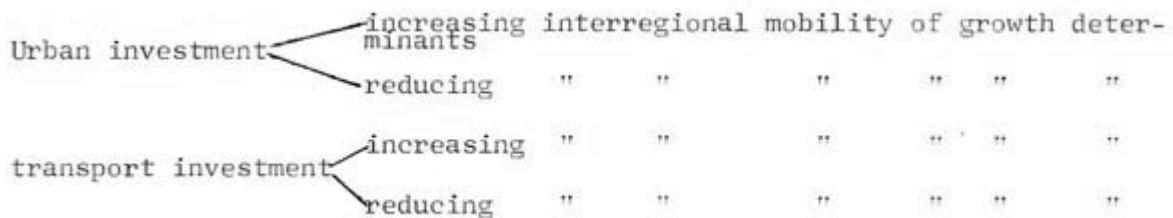
What we are interested in basically is the impact of urban and transport investment upon a) the spatial incidence and movement of growth determinants, which is a function of the mobility of the growth determinants. In policy terms it involves the possibility of changing this mobility through infrastructure investment; b) the efficiency of the interrelation of these growth determinants and the possibility to increase that efficiency through external economies created by infrastructure investment, and c) in the differences in impact of various combinations of policy variables. For each of these questions we are furthermore interested in the varying response which different areal types have to these policy variables. The subject is dealt with here primarily from an economic point of view. This should by no means suggest that social and political aspects are not heavily involved in interregional disequilibria of development. The emphasis on the economic approach seems justified however in view of the key position which economic problems hold for the solution of spatial problems in developing countries, as distinct from many affluent countries.

a) Restrictions in the *mobility of growth determinants* are a primary cause for differentials in growth between regions (Siebert, 1969, 132). Three types are relevant: 1) restrictions in the mobility of production factors; the less mobile production factors, the greater interregional growth differentials (Siebert, 1969, 140). 2) restrictions in the mobility of commodities; these tend to compensate immobilities of production factors (Siebert, 1969, 146). 3) restrictions in the

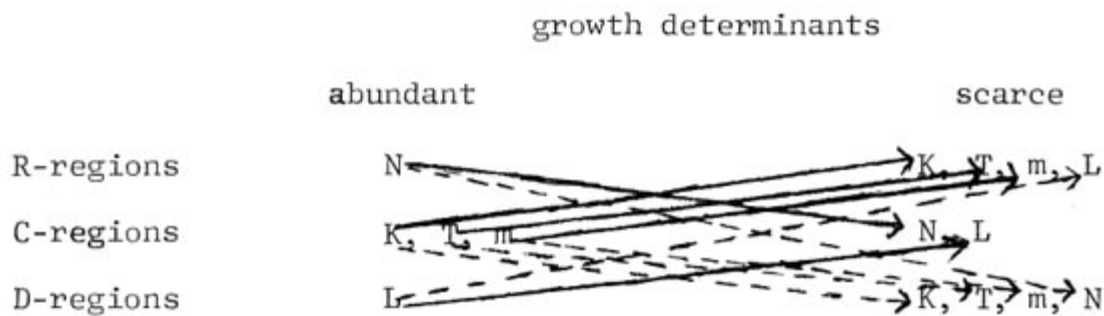
mobility of external economies; the less mobile external economies, the greater interregional growth differentials (Siebert, 1969, 141).

Let us now turn to the impact of urban and transport investment upon growth differentials between regions: Investment for interregional mobility of growth determinants will (under *certeteris paribus* conditions) tend to reduce growth differentials between regions. This effect will be exerted by interregional transport and communications investment and by certain types of urban investment serving the transfer of information. On the other hand, investment binding growth determinants to a specific locality or region will tend to reinforce the growth of the area it is applied to. Into this second category fall most types of urban investment as well as intra-urban and intra-regional transport and communications investment.

This indicates, that in their aggregate form neither urban nor transport investment can be significantly interrelated with spatial development. For the present purpose we shall therefore have to disaggregate both of them into



We may assume that with increased mobility, growth determinants will more readily move from regions where they are abundant (expressed by low factor prices) to regions where they are scarce (expressed by high factor prices) . The five growth determinants comprised by production factors (natural resources =N, labour =L, capital =K, technology =T) and by manufactured commodities (=m) can theoretically be distributed between "abundant" and "scarce" in a great number of alternatives. Out of these theoretical alternatives we shall choose three combinations as representative of frequently encountered types of regions:



R-regions combine an abundance of natural resources with a scarcity of all other growth determinants; this combination is typical of resource frontier regions. C-regions combine a relative abundance of capital, technology and manufactured commodities with a scarcity of natural resources and of (productive) technology; this combination is typical of core-regions. D-regions combine an abundance of labor with a scarcity of all other growth determinants, which is characteristic of depressed regions. The potential flows that will result from increased mobility of growth determinants are indicated by arrows: autonomous flows (without complementary measures) are indicated by continuous lines, While induced flows (supported by complementary measures such as public incentives or infrastructure investment) are indicated by interrupted lines.

The mobility of external economies is conditioned in a different way and is dealt with in the following.

b) The type and amount of *external economies* available in different regions is a second major factor causing interregional growth differentials. External economies are savings resulting from interdependencies among different activities. They can operate through the market mechanism between different production activities via backward or forward linkages (pecuniary external economies [Scitovsky, 1954, 143-151]). In this case they are mobile in that they are not limited to the activities of one region. Their spatial extension depends upon interdependencies facilitated by the interregional transport and communications network. External economies can also operate outside of the market mechanism in the form of urbanization or technological external economies. In this case they stem mainly from urban investment, are available only to activities of a specific location or area and are essentially immobile (Robinson, 1959, 214).

The more immobile external economies are available to a region the greater will

growth differentials in its favor be (other conditions being equal). The more mobile external economies, the smaller the interregional growth differentials (Siebert, 1969, 141).

Since interregional transport investment facilitates mobile external economies, and urban investment immobile external economies, their effects upon interregional growth differentials would tend to be opposite. *Investment in the interregional transport network* will increase the mobility of production factors and commodities, enhance potential interaction of activities through space and thereby extend the spatial range of mobile external economics; under *certeris paribus* conditions, they will *reduce* interregional growth differentials. Most types of *urban investment* (except that serving the interregional transfer of information), on the other hand, will create external economies available only to a specific locality or area and will therefore, again under *certeris paribus* conditions, tend to *reinforce* the growth of the area they are applied to.

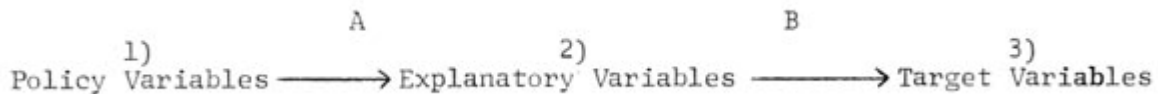
This statement has to be qualified by type of region, however. Since mobile external economies depend on interregional linkages between different production activities, the intensity and direction of these linkages are relevant for the spatial transfer of external economies. The intensity of linkages is what Perrous refers to as the dominance effect of a "propulsive" firm (*firme motrice*) whose characteristic is the creation of external economies (Aydalot, 1965, 962). As concerns the direction of linkages, the "propulsion" effect is generally transferred via backward linkages, i.e. from consumer good to intermediate manufacturing industries, or from these to primary activities (Hirschman, 1965, 98 and Körner, 1967, 690), show that pure resource locations, offering only forward linkages, are much less able to attract growth than locations with a "pressure of demand" offering backward linkages). This way it is supported by the security of existing markets (Kuznets, 1963), a condition particularly important in cases of scarce marginal demand as in most developing countries. "Propulsion" via forward linkages (e.g. from a basic industry to intermediate and consumer goods industries) is therefore much less likely in most Latin American countries.

Returning to the three prototypes of regions, and indicating backward linkages by solid arrows (with a weight of 2) and the less "propulsive" forward linkages by interrupted arrows (with a weight of 1)

spatial development

In this paper we have assumed that there exists an interrelation between 1) urban and/or transport investment, 2) the mobility of growth determinants (the main groups are: production factors, commodities, and external economies, as outlined above), and 3) spatial development. We are further assuming that the relationship between these three sets of variables is not uniform but depends on the initial characteristics of the region under consideration.

The variables under 1) are directly open to policy intervention and may therefore be called policy variables. Those under 3) are the target of policy, namely the magnitude of spatial growth differentials (defined e.g. in terms of regional product, income, employment) which usually cannot be directly related to the policy variables. We therefore need another set of variables under 2) in order to explain the impact of policy variables upon target variables. These may be called explanatory variables or systems variables (Hodge, 1969). In schematic form these functional relations can be described as follows:



Relations under A are impact studies analyzing the consequence of policy variables (such as urban and transport investment) upon explanatory variables (such as specific growth determinants). Relations under B are concerned with the importance these growth determinants have for spatial growth given specific regional characteristics.

In order to rationalize policy decisions in the field of urban and transport investment with regard to spatial development, questions such as the following will need to be clarified:

A. Questions on the *interrelations between urban and/or transport investment and the mobility of growth determinants*.

1) What is the influence of different types of urban and/or transport investment on the mobility (or immobility) of major growth determinants such as production factors: commodities, external economies, (natural resources, labor, capital, technology), at different levels (urban, inter-urban, urban-rural, national

and multinational)?

2) What is the efficiency of urban and/or transport investment for increasing the mobility of growth determinants as compared to that of other policy variables oriented towards increasing production capacities and demand or towards changing social structures and institution-building?

B. Questions on the *interrelations between the mobility of growth determinants and regional growth*, according to the characteristics of region(s) concerned. Relevant characteristics for differentiating regional growth responses would seem to be:

1) The *weight* of the production factor whose mobility is changed in the production function of the respective region (Siebert, 1969, 136, theorem 3). The hypothesis is that the smaller the increase in mobility of a factor with great weight in the regional production function, the greater that region's growth advantage relative to other regions.

2) The *scarcity* of the production factor whose mobility is to be changed in the region (as expressed in its factor prices [Siebert, 1969, 139, theorem 5]). The hypothesis is that if the mobility of a scarce factor of a region is increased beyond that of an abundant factor, the region will grow faster relative to other regions. On the other hand, if the mobility of an abundant factor is increased beyond that of the scarce one, the region's relative growth rate will be reduced.

3) The *easiness* with which an immobile scarce factor of a region can be *substituted* by more abundant ones (Siebert, 1969, 149, theorem 16). The hypothesis is that the easier it is to substitute an immobile scarce factor of a region by a more abundant one, the greater the growth advantage of the region to others.

4) The impact which increased mobility of growth determinants has upon the *terms of trade* of a region (Siebert, 1969, 150, theorem 18). The hypothesis is that the less the mobility of a scarce factor of a region can be increased (thus raising its production costs) and the more the mobility of commodities for which there exists import demand in the region increases, the less favorable the region's terms of trade and the less its growth advantage relative to other regions.

5) The degree to which the *direction of linkages* between economic activities influences the transfer of (pecuniary) external economies (Körner, 1967 and Hirschman, 1965, 98). The hypothesis is that backward linkages are more likely

to attract external economies to a region than forward linkages and. that therefore regions with predominant backward linkages stand better growth chances through mobile external economies than those with predominant forward linkages, all other conditions being equal.

This is by no means an operational model as yet. It is hoped to be useful, however, as a framework for orienting spatial analyses and interrelating them in a developmental context, and for defining data needs for the analysis of the interrelations between urban/transport investment, the mobility of growth determinants, and the trend of interregional growth differentials.

Summary

Spatial growth differentials in Latin America have been defined at four levels; interregional, interurban, urban-rural and international. Policies to influence these growth differentials have relied considerably on urban and transport investment. Very little is known to date about the impact of these two types of investment on regional growth and the results of these policies have therefore often been disappointing. As a basis for clarifying the potential role of these two policy instruments, the paper reviewed relevant decision criteria and analyzed the functional relationship between urban/transport investment and spatial growth differentials via their influence on the mobility of such growth determinants as production factors, commodities and. external economies.

REFERENCES CITED

Aydalot, Philippe. "Note sur les economies externes et quelques notions connexes." *Revue Economique* XVI, November, 1965.

Berry, B. J. L. and F. E. Horton. "The Distribution of City Sizes," in *Geographic Perspectives on Urban Systems*, (Englewood Cliffs: Prentice Hall, 1970), pp. 64 ff.

Economic Commission for Latin America (ECLA). *Social Change and Social Development Policy in Latin America*, E/CN. 12/826, (Santiago-New York: United Nations, 1970).

Friedmann, J. *Regional Development Policy: A Case Study of Venezuela*. (Cambridge: M.I.T. Press, 1966.)

- Ginsberg, N. *Atlas of Economic Development*. (Chicago, 1961.)
- Hansen, N. "Development Pole Theory in a Regional Context." *Kyklos*, Vol. XX, 1967.
- Hirschman, Albert D. *The Strategy of Economic Development*. (New Haven, 1965.)
- Hodge, G. Urbanization in Regional Development. Paper prepared for the Canadian Council of Urban and Regional Research, Ottawa, 1969.
- Jensen, Paul G. *Infrastrukturinvestitionen als Mittel der Regionalpolitik*. Gutersloh (Germany), 1967.
- Klaassen, L. H. *Methods of Selecting Industries for Depressed Areas*. (OECD, Paris, 1967.)
- Klaassen, L. H. *Social Amenities in Area Economic Growth, An Analysis of Methods of Defining Needs*. (OECD, Paris, 1968.)
- Körner, H. "Industrielle Entwicklungspole als Instrumente der Regionalpolitik in Entwicklungsländern." *Kyklos*, Vol. XX, 1967.
- Kuznets, S. "Consumption, Industrialization and Urbanization." In *Industrialization and Society*, Hoselitz, B. F. and W. E. Moore (eds.), Paris, 1963.
- Myrdal, Gunnar. *Economic Theory and Under-developed Regions*. (London: Duckworth, 1957.)
- Owen, Wilfred. *Strategy for Mobility*. (Washington, D.C.: The Brookings Institution, Transport Research Program, 1964.)
- Pedersen, P. and W. Stöhr. "Economic Integration and Spatial Development of South America." *American Behavioral Scientist*, Vol. XII, No. 5, May-June, 1969.
- Robinson, E. A. G. *The Structure of Competitive Industry*. (Digswell Place and Cambridge, 1959.)
- Scitovsky, T. "The Concept of External Economies." *Journal of Political Economy*, Vol. 62, 1954.
- Siebert, Horst. *Regional Economic Growth: Theory and Policy*. (Scranton, Pennsylvania:

International Textbook Company, 1969.)

Stöhr, W. "Regional Development in Latin America, Experiences and Prospects". Paper presented at the 2nd Interamerican Seminar on the Regionalization of Development Policies in Latin America, Pan American Institute of Geography and History, Santiago, Chile, 1969.

Williamson, J. G. "Regional Inequality and the Process of National Development, A Description of the Patterns." *Economic Development and Cultural Change*, Vol. XIII, No. 4, Part 2, 1965.

Wilson, George W. "What the Cases Show." In *The Impact of Highway Investment on Development*. (Washington, D.C.: The Brookings Institution, Transport Research Program, 1966.)