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MARSHALLIAN EXTERNAL ECONOMIES AND LOCAL GROWTH

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ABSTRACT

Este trabajo trata sobre algunas cuestiones relacionadas con la naturaleza de las economías externas marshallianas. Para ello se examinan los últimos trabajos sobre externalidades MAR (Glaeser, Kallal, Scheinkman and Shleifer (1992), Eaton and Eckstein (1993), Rauch (1993a, 1993b), Ades and Glaser (1994), Ellison and Glaeser (1994), Henderson (1994a, 1994b)), modelos de crecimiento endógeno (Romer (1986, 1987a, 1987b, 1990), Lucas (1988), de la Fuente (1992), y distritos industriales (Becattini (1979, 1986, 1988, 1990, 1992), Bellandi (1986), Costa (1988), Sforzi (1989, 1990), Trullén (1990), Signorini (1994) entre otros). Se discute en cada caso lo que se entiende por economías externas y se presta una especial atención a la problemática convivencia de una herramienta de origen marshalliano en un marco de análisis walrasiano como el que se utiliza en los modelos de crecimiento.

This lecture concerns some questions related to marshallian external economies. We survey recent literature on MAR externalities (Glaeser, Kallal, Scheinkman and Shleifer (1992), Eaton and Eckstein (1993), Rauch (1993a, 1993b), Ades and Glaeser (1994), Henderson (1994a, 1994b), endogenous growth models (Romer (1986, 1987a, 1987b, 1990), Lucas (1988), de la Fuente (1992), and industrial districts (Becattini (1979, 1986, 1988, 1990, 1992), Bellandi (1986), Costa (1988), Sforzi (1989, 1990), Trullén (1990), Signorini (1994)). This paper also discusses the meaning of "external economies" in each case (MAR, Endogenous growth models and industrial districts). Emphasis is placed on the difficulties of treating as compatible two distinct system of analysis : the Marshallian amd the Walrasian.

Introduction

During the last three years there have been published a series of works about local growth whose basic theory lies in the existence of dynamic external economies (Glaeser, Kallal, Scheinkman and Shleifer (1992), Eaton and Eckstein (1993), Rauch (1993a, 1993b), Ades and Glaeser (1994), Ellison and Glaeser (1994), Henderson (1994a, 1994b)). These works depart from previous growth models, which have been primarily based on external economies and the creation and diffusion of human capital (Lucas (1988)), and focus instead on the role of cities themselves play in the growth process. While the theoretical marshallian framework used in the literature of dynamic external economies shows up as monopoly partisanship and local specialization, here we see a different Marshall, the Marshall of industrial districts and small dynamic firms.

In the working theoretical framework of the literature of dynamic external economies three theories predominate, each with its own opinion as to the role of monopolization and specialization, and how they relate to growth. The first theory, which falls under the category of MAR externalities (Marshall, Arrow, Romer) (Glaeser et al (1992)), focuses on local specialization and monopolization. The second, defended by Porter, promotes specialization and competition. Whereas the third, based on the work of Jane Jacobs (1965, 1985), emphasizes diversification and competition.[1] However, as will be shown presently, this interpretation of Marshall is distinct from the way it has been used in the literature of industrial districts.

Differing interpretations of Marshall are the inevitable result of treating as compatible two distinct systems of analysis: the Marshallian and the Walrasian (Robinson (1971)). While the Marshallian system is constructed on a model of partial equilibrium and follows closely the outstanding problems of the economy introducing a theory of production related to increasing returns, the Walrasian, using a model of growth equilibrium, allows us to view the economy as a whole (though its assumptions do contain a certain rigidity, making it difficult to apply directly to real problems (Robinson (1971), Kaldor (1975)). In this century, the relationship between both systems seems to have followed a dynamic in which the general equilibrium Walrasian model overtaken the Marshallian, but at the same time has been incorporating elements originally Marshallian for the purpose of bringing itself nearer to reality. This is the case with external economies, the introduction of increasing returns within the neoclassical framework, and the development of dynamic models. Debate over incorporation of Marshallian elements has not ceased, and these perpetually

[1] Jane Jacobs (1969,1985), an author who has situated herself outside of the neoclassical framework, surprisingly appears her work in Lucas (1988) as an example of what could be a microeconomic theory that would study the creation and difusion of human capital as it relates to cities.

disagreeing voices point out the inevitable difficulties which arise from trying to simultaneously use two distinct systems of analysis.[2]

The purpose of this paper is to emphasize this distinction, but also to highlight what the two systems have in common when the object in question is local growth. The structure of the paper is as follows: Section I introduces relevant literature on Industrial Districts, Section II explains the Marshall of the industrial districts; so that later, using the technique of dynamic optimization (Hicks, 1965), a model of the processes of local growth may be constructed. The model departs from the work of Romer (1986), but, similar to Lucas (1988), utilizes human capital as cumulative factor. Section III presents the problems and limitations of constructing the model. Finally, Section IV deals with the incorporation of space in the literature of economic growth.

Section I. Industrial districts

Throughout the nineteen-eighties, and on up to the nineties, a large body of literature developed on the topic of industrial districts (Becattini (1979, 1986, 1988, 1990, 1992), Bellandi (1986), Solinas (1987), Bianchi (1988, 1990), Costa (1988), Sforzi (1989, 1990), Best (1990), Trullen (1990), Harrison (1991, 1994), Signorini (1994) among others). At the beginning, these works examined some small and medium sized cities of the "Third Italy", whose small manufacturing firms presented a surprising dynamism during the great crisis of the late nineteen-seventies and early eighties. Giacomo Becattini, a Florentine economist firmly positioned in the marshallian tradition, re-views the marshallian industrial district, recognizing in it an adequate theoretical tool for studying this phenomenon.

The debate over the small firm and the role it should occupy in the economic theory has been dominated by a sector which, since the beginning of neoclassical firm theory, has been stressed the importance of internal scale economies, and in so doing behaved as though the small firms were doomed. But this conclusion crashes with what history shows us to be the persistent presence, in time and space, of the small firm. For, if internal scale economies are so important why have we not observed on great firm dominating the economy?

Conventional production theory might lead one to belive that economies of scale and mobility of factors of production would eventually bring all economic activities together in one great center.(Goodall, 1972)

[2]An example of the debate in its initial state appears in July 1930 issue of Economic Journal . Later, the controversies of Cambridge (Harcourt (1972)). A more recent example of said tension is the discussion between Romer (1987b)and Benhabid and Jovanovic (1991) over the independence of the growth models from the base of external economies and increasing returns.

Among the principal characteristics of the marshallian industrial districts, perhaps the more important is that the firms within it work in an environment of collaboration and competition different from that defined by the two poles of "firm" and "market" (Bianchi (1990)). Cooperation is established at various levels, from labor, marketing, and technology, to the recycling of office machines and surplus stock. Another important characteristic is that the product is exposed to international competition; and the pressure exerted by this international competition suggest a flexibility seldom achieved by larger firms. Finally, it is important to mention the industrial districts' self-containment. The districts are not located in large metropolitan areas but medium-sized or even small towns where the labor market is markedly local. Such an environment allows relationships based in the labor pool to overlap with those formed in the community, and become personal; by turn, reducing conflict in workplace. In sum, the marshallian industrial district can be defined as "... *an example of a local manifestation of a labor process that neither dissolves in the general market nor functions in only one or few firms*" (Becattini in Pyke et al. (1992), p. 65).

Section II. The Model: Endogenous Local Growth and Industrial Districts

The first models of endogenous growth given in the eighties are based on two different types of externality. In one, the externalities are associated with the process of the production of physical capital (Romer (1986))[3], or in the formation of human capital (human capital being understood as a combination of academic knowledge and the knowledge that comes from experience in workplace)(Lucas (1988), Azariadis and Drazen (1990)). On the other hand, Romer (18987a, 1987b) introduces a line of work in which the pecuniary external economies, resulting from the specialization of assets, determine growth[4]. Both processes -technological externalities (physical or human capital)

[3]Previously there have appeared some growth models in which the externalities manitain the currently accepted price-taker bahaviour (Arrow (1962), Phelps (1966) and Lucas (written in 1985, published in 1988)).

[4]Marshall revives the classical (Smith) tradition and incorporates it into his Theory of Variable Returns when he emphasizes the importance of the extent of the market. Such expansion allows for a more efficient distribution of the means of production. When there is a sufficient demand, the processes of production can be more efficient. After Marshall, pecuniary economies were analyzed by Young (1928) and, much later by Romer (1987a, 1987b). In these works, however, the spatial component we find in Marshall desappears.

Let's consider a function of production with increasing returns in the number of specialized intermediate producers. The intermediate list of utilized inputs is a function of

$+$

$x: R \rightarrow R$, where xi is the quantity of utilized intermediate goods.

The chosen function of production is the same seen in Ethier

$1-\alpha$

and pecuniary externalities- appear in the work of Marshall when he analyzes the external economies of the industrial districts; and, contrary to other literature on endogenous growth, focuses on the small firm and space. Specialization and interdependence go hand in hand but do not demand that the related activities closely linked. However, in some cases, interdependent specialism comes together in space and form more integrated local sequences. Such activities are complementary to each other and find it adventageous to be in close proximity, which is facilitated by location in an urban area as this reduces operational imperfections and friction of space. Urban areas provide many opportunities for such external economies to be internalized by the creation of complementarity firms. Activities which cluster into mutually supporting complexes within the district are based on input-output linkages, complementarity labour demands or technological interactions. These linkages may be vertical, diagonal or complementary. (Goodall, 1972) "*Mean while an increase in the aggregate scale of production of course increases those economies which do not directly depend on the size of individual houses of business, the most important of these result from the growth of correlated branches of industry which mutually assist one another, perhaps being concentrated in the same localities*" (Marshall, 1890, pp. 264).

(1982), and later, Romer (1987a, 1987b). $Y(X,L)=L \int R \quad Xi$. The function of production of the final output Y (X,L) depends directly upon the variety of utilized inputs Xi with respect to those which show constant returns so as to maintain current price taker behavior. $xi= N/M$, $i \in (0,M)$, where N represents the total list of utilized input. Returning to the function of production of the final consumer good and substituting it in the previous

expression, we get $Y = L \int 0 \quad (N/M) = L\,(N/M)^{1-\alpha} = L^{\alpha}\, M^{1-\alpha}\, N^{\alpha}$.

From here we can see that, if it were not for the presence of fixed costs, the solution would come to augment M *ad infinitum*, with N remaining constant (Romer, 1987a, 1987b). Problems occur upon considering the manufacture of intermediate goods when scale economies already exist. But a free market reduces the benefits to zero and in this way makes the number of intermediate producers endogenous.

Let's further consider that all the inputs are produced with the raw material Z beginning below a cost function
$G(Xi)<Z$.

Owing to the presence of fixed costs, there can be only one producer for each factor. The firms producing the final good take as a given the product price and the price list pi, thus obtaining the conditioned demand of factors xi.

In its own way, each producer of intermediate factors takes as a given both the price of the raw material Z and the conditioned demand. The function of production of the final good takes the form $Y = B\, Z^{1-\alpha}\, L^{\alpha}$, B being constant. Increasing returns in Z and L appear thanks to the introduction of fixed costs in the production of intermediate factors as well as the fact that the final product depends on the range of utilized components. One of the benefits of introducing new intermediate goods, which is not contemplated by the price system, is an associated pecuniary externality

The Theory of Variable Returns is the fundamental block upon which Marshall builds his Theory of Production. Different from Marshall, Walras disregards such a theory for the sake of preserving competitive equilibrium. In the existent literature on industrial districts, in which interest is revived by production and its accompanying microeconomic base, space and time determine the presence of increasing returns.

Using a method of dynamic optimization, the following model tries to illustrate, within the framework of general equilibrium, the growth process which Marshall associates with the industrial districts and the generation and diffusion of knowledge. "*...the mysteries of the trade become no-mysteries; but are as it were in the air, and children learn many of them unconsciously*"(Marshall (1890, pp. 227).

The key point here is that the reason the endogenous growth model is practical at the state level in applied research is because it does not account for the spacial dimension of the externalities. That is, it is assumed that, as Lucas (1988) says, the externality theoretically restricts the interior of each country's frontiers (which, of course, does not make sense in an open world).

The model: Increasing Returns, Human Capital and Knowledge Spillovers

The following is a simple dynamic model of general equilibrium at the local level, where the cumulative factor is local public human capital and where externalities have given rise to a type of knowledge spillovers. Let's consider an individual production function on a local scale, in which the product is a consumer good which, within each of the firms, depends upon both a private level of human capital "e", and an "x" factor made up of other privately controlled factors such as capital and labor. The "x" factor we will consider as fixed. Finally, because human capital cannot be totally internalized, the resulting externalities will operate as another --public--input. If N is the number of firms in this locality, then the aggregate level of
local human capital is $E= \Sigma_{i=1}^{n} e_i$. N is furthermore equal to the number of agents maximizing its consumption (like in Romer (1986)). Finally, the production function will include the private human capital level "e", the local human capital level "E", and the "x" factor.

With respect to privately controlled inputs, the function of production shows diminishing returns; however, when all factors are considered, including the local public human capital level, the function of production exhibits increasing returns. $F_{ei}(x_i, e_i, E)>0$; $F_{xi}(x_i, e_i, E)>0$; $F_{eiei}(x_i, e_i, E)<0$; $F_{xieiE}(x_i, e_i, E)>0$. F is a grade one homogeneous function; but when we incorporate local public human capital, or E, F goes up, to a grade higher than one. $F(\Phi x_i, \Phi e_i, \Phi E)>$

$F(\Phi x_i, \Phi e_i, E) = \Phi F(x_i, e_i, E)$.

To close this economy, let's assume there exists a trade-off between consumption and investment in human capital (like Cass (1965) does, taking consumption and physical capital); so that, upon consumption, the product either gives something back to the capital and labor, or invests itself in the acquisition of a greater level of human capital. If y_i is the production level of the firm *i*, c_i is the consumption level of a privately controlled inputs, the total production level of the economy is $Y = \sum_{i=1}^{n} y_i$, the total consumption level is $C = \sum_{i=1}^{n} c_i$, and the local public human capital level is $E = \sum_{i=1}^{n} e_i$ which, when equilibrium is symmetrical, is in turn equal to Ne_i. In per capita terms, equalizing the product with the aggregate level of consumption and investment in human capital, $Y/N = C/N + (E/N)$. Where the growth rate of population N/N is equal to n. Reordering the terms, we obtain $Y/N = C/N + e + ne$, which is equivalent to the formula $y_i = c_i + ne_i + e_i$. From here, the function of per capita consumption may be expressed as

$c_i = y_i + ne_i + e_i$. (Phelps, 1961)

Finally, let's suppose that the function of utility over private consumption takes the standard form. That is, that is capable of being additively separated and discounted by the factor δ_{it}, like in Romer(1986),

$U_i(c_i)\, e^{-\delta_{it} t}$ with $\delta_{it} > 1$. Introducing the function of discounted utility within program of dynamic maximization results in

$$\text{Max} \int_{t=0}^{\infty} U_{it}(F_{it}(x_{it}, e_{it}, E_t) - ne_{it} - e_i)\, e^{-\delta_{it} t}$$

Let us now examine two scenarios. The first relates to an existing competitive equilibrium, while the second refers to the Social Optimum. In the competitive equilibrium scenario, the agents take as a given the prices of the factors and the local human capital aggregate level without considering the influence of its externality over the rest. The function of production may thus be expressed in a more concise manner, where $F_{it}(x_{it}, e_{it}, E_t)$ is equivalent to $f_{it}(e_{it}, E_t)$ when the composition of the vector of inputs x remains constant. This expression, in turn, is equivalent to $F_{it}(e_{it})$ in as much as $E_t = Ne_t$. Note that the only diffemce between the two problems lies in the specification of the production function. In the first case, $f_{it}(e_{it}, E_t)$ it is concave but depends on time through

its deppendence on the path E(t). In the second case, it is convex and invariant over time (Romer, 1986 p.1021)

F_{it}, don't forget, is concave in respect to e_{it}. Taking $\int_{t=0}^{\infty} U_{it}(c_{it})\, e^{-\delta_{it} t}$ and utilizing the function of production in its reduced form we achieve a program of maximization $\max \int_{t=0}^{\infty} U_{it}(c_{it})\, e^{-\delta_{it}}$ subject to the equality

$c_{it} = F_{it} - ne_{it} - e_i$ that may also be expressed in the following manner:

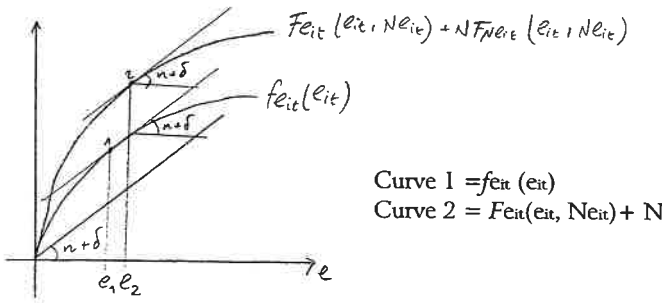
$\text{Max} \int_{t=0}^{\infty} U_{it}(f e_{it}(e_{it}) - ne_i - e_i)\, e^{-\delta_{it} t}$. The derivative of the utility, in respect to the rate of variation of private human capital stock, is equal to $U_{eit} = U_{it}(c_{it})\,(f_{eit} - n)\, e^{-\delta_{it} t}$, being $f_{eit} = \delta f(e_{it})/\delta e_{it}$. The derivative in respect to e_i is equal to $-U(c_{it})\, e^{-\delta_{it} t}$, and

$\delta U e/\delta t = -U(c_{it})\, c_i\, e^{-\delta_{it} t} + \delta_{it} U_{it}(c_{it}) e^{-\delta_{it} t}$

When U_{eit} is made equal with $\delta U e/\delta t$ we get $(U_{it}(c_{it})/U_{it}(c_{it}))ci = -f_{eit}(e_{it}, Et) + n + \delta_{it}$. Because in a dynamic equilibrium the rate of variation of consumption is equal to zero, the former expression becomes $f^{*}_{eit}(e_{it}) = n + \delta_{it}$ where the marginal productivity of private human capital is equal to the sum of the rate of population growth n, plus the rate of discount δ_{it}.

If we consider e_{it}, the Social Optimum, the maximizing function must incorporate E. So that, taking $F_{it} = F_{it}(e_{it}, Ne_{it})$, and applying the condition of Euler, $e^{-\delta_{it}}$ $(-U(c_{it})(F_{eit}(e_{it}, Ne_{it}) - n - \delta_{it}$. When $c_i = 0$, $F_{eit}(e_{it}, Ne_{it}) + NF_{Neit}(e_{it}, Ne_{it}) = n + \delta_{it}$. Each firm will face a private marginal product of human capital equal to $f_{eit}(e_{it})$, but the shadow price of human capital will be $F_{eit}(e_{it}, Ne_{it}) + NF_{Neit}(e_{it}, Ne_{it})$. Given this difference, each firm would choose to acquire less than the socially optimal amount of human capital. (Romer 1986, p. 1023).

Figure 1



Curve 1 = $f_{eit}(e_{it})$
Curve 2 = $F_{eit}(e_{it}, Ne_{it}) + NF_{Neit}(e_{it}, Ne_{it})$

Figure 1 demonstrates how the human capital level of equilibrium, from a social standpoint e_2, is superior to that obtained in a competitive equilibrium e_1. Thus, the consumption level of the privately controlled inputs will be higher than its level of efficiency. In a situation of increasing returns, competitive prices are not feasible in the long term; so that even if all the components redistribute themselves according to the value of their marginal productivity, by Euler's Theorem, such payments would exhaust the product value.

Section III, Problems:

Certain mathematical considerations of dynamic maximization cannot be mechanically applied with the goal of constructing a growth model appropriate to the district. The assumptions necessary in order to be able to apply the optimization techniques force us to abandon central elements of the theory of the district, such as the heterogeneity of the product, the heterogeneity of individual firms, relationships between the cost functions of different firms, and the very existence of an aggregate production function. This is undoubtedly the reason the road toward the construction of contrasting models (Cheshire et al. (1994)) has been blocked. However, despite such problems, the modelization is useful in that it allows us to contemplate in detail important characteristics of the districts such as the breach between private and public interest, the existence of an optimum level of human capital, and the importance of space. Then again, this theoretical liberty has permitted us to approach the process by which the "individual firm" is not the protagonist, but the union of both firms and their relationships (Becattini,1990)

Technical advances, the introduction of parametric external economics, for example (Chipman (1970), have made the conditions of competitive equilibrium more flexible. Still, important problems--some of which have been around since the nineteen-twenties--continue to appear related to the use of two systems that sometimes adopt opposed positions. Such persistence seems to corroborate the distance between the two systems of analysis. Some of the problems that have been appearing are the following:

1. Individual Firm *versus* Local System of Firms: The main difficulty which presents itself when one tries to confront the theme of Marshallian Variable Returns with the Walrasian neoclassic general equilibrium is the fact that, while the Walrasian theory is constructed on the individual firm, in the case of the industrial district and marshallian external economies what is most important is the system of firms and their relationships. This point, central to the theory of the districts, can't be made with a Walrasian mode of analysis. In a strict sense this fact could invalidate the model. For all practical purposes, there doesn't seem to be a satisfactory solution to this problem in as much as our object is not to reveal all the holes in the theory of the district so much as it is to bring special attention to the difference between private and social efficiency.

2. Stationary States and the "Time" Factor in Marshall: One of the objectives of the dynamic equilibrium models is to overcome the limitations of a stationary framework. However the dynamic of the growth models suggests a harmony among the market ownership that is a far cry from the pains Marshall takes to describe potential problems in the long term. Similarly, the "Short-term" in Marshall is substantially different from the "Short-term" in Walras. While Walras sees the short-term as the period in which factors are considered given and fixed (Robinson (1971), Marshall (1890) defines the short-term by the fact that, while stock of plant is considered fixed, it is still possible to augment the level of production by means of a greater use of the installed capacity.

3. Increasing Returns and Competitive Equilibrium: As I stated previously, treating as compatible the presence of increasing returns and a framework of competitive analysis is a problem that has been appearing since the twenties (Sraffa (1926, 1930), Pigou (1927), Robbins (1928), Robertson (1930), Robinson (1965, 1971), Shakle (1967), Chipman (1970), Becattini (1986b), Romer (1986, 1990), Prendergast (1992). The problem, sometimes called "The Marshall Dilemma" (Shakle (1967)), can be articulated in the following manner: How to reconcile the presence of increasing returns with the expansion of scale economies in a competitive analysis framework? That is, if augmenting the level of production reduces costs, does some restriction, which impedes the concentration of production in one or a few firms, exist? In his negation of such a compatibility, Sraffa (1926, 1930) adopts an extreme posture and proposes utilizing a framework of analysis that is not based on the competitive equilibrium. Robertson (1930), on the other hand, preserves accepted price taker behavior, basing his argument on the presence of external and internal-external economies. Who has won this debate? The answer, without a doubt, is difficult; and probably, if we were to ask a group of economists, each situated in his or her own specialization, their answers would disagree. It seems a waste of time that some specialities have been maintaining for many years the accepted price-taker behavior (in the

literature of growth, for example), while others (Industrial Organization, or International Trade) are more likely to employ non competitive models.

This tension between increasing returns and competitive equilibrium seems to disappear however, upon introducing, as Marshall did, the element of "time". The Marshallian short term comes about by the presence of fixed stock of plant which make the short-term supply curve slope positively, indicating cost increases that are marginal in respect to the level of production. When the market is expanded over the long-term, however, a gradual improvement is seen in the productive processes, giving rise to the famous decreasing Marshallian supply-curve, which decreases as time passes. As Marshall says, if we consider just one output level at a different time, due to the technological and organizational specifics of that time, the medium cost would be different. The term Scale Economies (Medium Cost diminishes as the level of output increases) is a reduced, and thus limited, version of this Marshallian argument (Medium cost diminishes when the level of output increases.). Actually, there appears to be an Experience Curve which combines what is called "learning by doing" and Scale Economies (Amit (1986)).

4. The Aggregate Production Function: Some of the techniques assumed necessary for the construction of an aggregate production function collide with central aspects of the theory of the district. These generally accepted assumptions are: homogenous product; individual production functions differentiated only by a technical augmentation factor (Fisher (1967)); the presence of a constant scale of returns and the independence of the function of costs (process of individual maximization). In the case of the district, we have lines of production and different qualities of product; different techniques with different returns and increasing returns at the aggregate local level

On the other hand, the aggregate production function is constructed on the sum of sectors at a national level. The "sector" and its spatial indefinition does not permit contemplation of the effect localized growth processes have over the base of expansion of the external economies among the firms that conform to the district (Becattini (1986a)). This brings us to a technical problem: national accounts are not accustomed to dispensing information at a local level; thus making the construction of a local aggregate production function is difficult from a practical point of view.

5. Profit and Interest Rate: Marshall identifies the measure of long-term interest with the measure of capital gains(Robinson (1971)). In the short-term interest type appears associated with capital markets. In standard growth models the interest rate of equilibrium is identified by the profit level, that, when society is viewed as a whole, in turn is equal to the marginal

productivity of capital. The Marshallian interest rate is thus different from that of the growth models.

Section IV, The Incorporation of Space in the Literature of Economic Growth:

Beyond the models of industrial localization, and the use the urban economy has made of marshallian external economies (Goldstein and Groenberg (1984)), David and Rosembloom (1990), Van Hagen and Hammond (1994), and others), space occupied no marked level in the growth models until the work of Lucas (1988) appeared and addressed, spatially, the problem of the creation and diffusion of human capital. Later, with the work of Glaeser et al. (1992) a line of investigation seems to have been initiated in which the cities and their industrial structure play a central role. The methodology utilized in the literature over Dynamic External Economies is separate from the elegant growth models.

Those endogenous growth models which came out during the eighties are characterized by the impossibility of applying Euler's Theorem, and, even more, of making equal the price of the factors with their marginal productivity. If the Production Function is grade one homogenous in respect to privately controlled factors, the externality is unable to give something back in the form of a public good. As is well known, public goods are defined as having two basic characteristics, that are non-rivalry and non-exclusivity. However when we introduce space into the argument, these characteristics become applicable only in part. As Harvey (1973) points out, local public goods have differing grades of usefulness that result of the distance of each agent to such public good. Non-rivalry and non-exclusivity are not absolute ideas but only characteristics that are, in a sense, dependent upon relative proximity. If, for example, we consider a public park in a city neighborhood, it is quite obvious that the people living closer to that park will receive the externalities more intensely than persons living further away. Is it possible to in some way apply this same logic to the case of human capital and information. Where is the number of meetings (Jovanovic and Rob (1989)) maximizing the creation and diffusion of information? For Lucas (1988), the answer is clear: in the cities. In the case of the districts, these cities are medium-sized, are self-contained, and the externalities forcefully generate a work environment that privileges the acquisition of new knowledge and the application and diffusion of new technologies. A problem with the above stated is the following: if the externalities are not absolute but rather contain an element of rivalry related to the fixed supply of human capital in said cities, then there ought to exist some price which regulates access to Public Human Capital, different from that generally accounted for in the endogenous growth models, in which it is assumed that the factor of a public character receives no compensation in as much as it arises as a lateral effect of

the production of capital (Arrow (1962), Romer (1986, 1987a, 1987b, 1990), Lucas (1988), Azariadis and Drazen (1990), de la Fuente (1992)). Rauch (1993a, 1993b) proposes the differences in the level of land rents as an index of the weight of local public human capital in respect to other factors.

The fact that the function of production of not grade one homogeneous makes it difficult to assign a price to the public factor E. One way to solve this problem is to outline a context defined as short-term, where the function of production is grade one homogeneous with respect to all the factors. In this case, the factors will receive marshallian quasi-rents (Romer (1990)). Let's look at an example.

Considering a function of production which relates the output level with a vector of privately controlled inputs (x), the private human capital level (e) and the local public human capital level (E) with the form $Y = x^{a} e^{b} E^{c}$, being a + b +c = 1. Applying Euler's Theorem we get F (x, e, E) = Fx (x, e, E)x + Fe (x, e, E)e + Fe(x, e, E)E. Fx is the quasi-rent received by the vector of privately controlled factors, Fe is the quasi-rent of private human capital, and FE is the quasi-income of local public human capital. From what has just been expressed, it is logical to associate the technologies that base their strength in the expansion of local external economies with some of the costs associated with land rent (Rauch, 1993a, 1993b).

* * *

The theoretical framework utilized in recent works about Marshallian dynamic external economies leaves out the invaluability of the general equilibrium models, with the object of approximating theoretical problems that can't be approached with the more rigid Walrasian model. The questions at hand are two: first, which market structure (monopoly or competition) maximizes the creation and diffusion of human capital? secondly, is specialization, or local diversification, the best vehicle for the diffusion of human capital? Empirical evidence suggests that competition and local diversification make urban growth possible. These characteristics are presented as contrapuntal to the MAR externalities, which depend on monopoly and local specialization. It is made clear, by incorporating space into the literature of growth, that the above posited questions are similar to those posited in the literature of industrial districts. As far as the ideal market form, we have seen how the district, in contrast to the process of monopolization, is an example of competition and active collaboration. Regarding the question of specialization or local diversification in Marshall the industrial district is relative to local specialization (and in this way is different from the large cities -their strength is in the diversification- (Jacobs

(1969, 1985). The specialization to which Marshall refers has no reason to correspond with what in national accounts is understood as sector specialization. The district is composed as much out of principal activity as it is of subsidiary industries, which can be introduced into different sectors. (Becattini (1992)).

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