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# A Importância da Organização Interna da Firma para o Processo de Fragmeção Espacial da Produção: uma Simulação

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# Managerial institutions as a determinant of the spatial dispersion of the economic activities

Carlos Eduardo Lobo e Silva

## Abstract

The relationship between link-service costs and the locational distribution of economic activities has been widely recognized. However, little (if anything) has been done to formally show the importance of managerial arrangements for the map of production. In the model, vertically integrated firms make two interdependent decisions: the location of their establishments and their managerial arrangements. Once close establishments and delegating decisions work as substitute goods for communication services, those decisions determine the intensity of use of communication services. One of the interesting features of the model is that communication services are taken as a substitutable production factor. From the interaction of the firms' decisions, urban systems presenting some of the phenomena that have been identified by the empirical and theoretical literature emerge. Production fragmentation and functional specialization of cities with headquarters concentrated in the metropolitan area are more likely to occur under decentralized management, low communication costs, low transportation costs, and standardized production process.

Key words:
Location Decision, Production Fragmentation, Managerial Structures, Theoretical Approach.

**JEL: R12, R30, D23.**

## 1. Introduction

The relationship between link-service costs and the locational distribution of economic activities has been widely recognized. However, little (if anything) has been done to formally show the importance of managerial arrangements for the map of production.

This paper claims that building the link between management and location decisions not only introduces one more important aspect to the debate, but also allows us to enrich the theoretical treatment of intrafirm communication costs, which will be considered as a substitutable production factor.

While the consequences of reductions in transportation costs have been extensively studied and modeled[1], communication costs have been incorporated into the models as a given production cost that appears whenever headquarters and plant are spatially separated. In Ota and Fujita (1993), intrafirm communication costs are fixed and firms decide the intensity of communication with other firms. The authors analyze the configuration of a single city. Duranton and Puga (2005) model intrafirm communication costs by assuming Samuelson's "iceberg" form to explain what they call functional urban specialisation. Both papers build general equilibrium models to obtain insightful results. However, none has analyzed how the relationship between communication costs and managerial strategies can determine the spatial dispersion of economic activities.

In the present model, vertically integrated firms take the communication cost – among other aspects - to make two interdependent decisions: the location of their establishments and their managerial arrangements. Once close establishments and delegating decisions work as substitute goods for communication services, those decisions determine the intensity of use of communication services. From the interaction of the firms' decisions, urban systems presenting some of the phenomena that have been identified by the empirical and theoretical literature emerge. The production fragmentation and the functional specialization of cities with headquarters concentrated in the metropolitan area are correlated to the following conditions: flexible managerial structure, low communication costs, low transportation costs, and standardized production process.

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[1] The seminal paper by Krugman (1991) and the more recent work by Tabuchi and Thisse (2011) are examples among many others.

The simulations of this paper extend the model proposed in Silva and Hewings (2012). In the original model, the owner of a vertically integrated firm – formed by the owner and the controller – decides on (1) its managerial structure (centralized or decentralized) and (2) the location of the manufacturing plant (close to or far from the headquarters). Both decisions represent trade-offs for the firm. Once the owner has decided upon these aspects, the owner and the controller decide their effort to learn about questions related to the manufacturing process. Since the interests of the owner and the controller are not opposite, though divergent, delegating the decision may work as a (imperfect) substitute good for linking services. As a consequence, firms with strict hierarchical system and little individual autonomy tend not to spatially fragment their production to avoid link-service costs.

The extension of the model incorporates many firms and new parameters. Besides choosing their delegation scheme, each firm (owner) decides the locations for both the headquarters and the manufacturing plant. The key parameters of the model are (1) the cost of communication between the owner and the controller, in case they are located in different cities; (2) the cost of transportation to deliver production to a distant market; and (3) the characteristics of the activity, which defines the room the controller has to deviate from the owner's interests.

Given the parameters, the owners decide also considering the market size and the amount of business services of each location, which are endogenously determined in the simulations. As result, an urban system emerges from the interaction among the locational decisions of firms. The simulations proposed show that lower link-service costs *or* a more flexible managerial structure tend to generate both more spatially fragmented economic activities and more functionally specialized cities. Specifically, as production becomes more fragmented, there is a tendency for headquarters to agglomerate in the metropolitan area, which is abundant in business-services, whereas some medium cities end up specialized in manufacturing.

Instead of replacing any element pointed out by the literature, the contribution of this paper is to add one more aspect – the internal organization of firms – to the debate about the location of vertically integrated production chains within an urban system.

Next section presents the model. The results are found in the third section, which precedes the final considerations.

## 2. Model and equilibrium

Two establishments compose each firm: the head-quarters and the plant of manufacture. The owner lives at the head-quarters, whereas the controller lives at manufacturing plant. The owner chooses two things: who will have the formal authority and the location of both establishments. Whoever has the formal authority will have the final word in any decision. The production presents constant return to scale and can be represented by a sequence of decisions.

Each decision process follows the steps defined in Aghion and Tirole (1997): there are $V$ possible projects and they have to choose one to undertake. Each project $k \in \{1,...,v\}$ is associated to a monetary gain $B_k$ for the owner (principal) and a benefit $b_k$ for the controller (agent). After the owners' decisions, the owner and the controller decide the amount of effort they will carry out to learn about the projects. By hypothesis as in Aghion and Tirole (1997), they learn either everything or nothing about the projects. If the person who has the formal authority learns everything, she chooses the best project for her. Otherwise, she asks the other part to make the choice, since their interests are divergent, but not opposite. If the other part has not learned anything they do not choose anything and the outcome is zero. It is assumed there is a project with very negative expected outcome, which makes them not to choose anything in case they learn nothing.

Thus, the trade-off of the owner's decision is that giving the formal authority to the subordinate incentives her to increase her effort to learn, but reduce the owner's control over the final decision.

In Silva and Hewings (2012) and here, those projects can be seen as possible solutions / answers for problems / doubts that come out at the manufacturing plant. The model proposed in Silva and Hewings (2012) interacts the trade-off coming from Aghion and Tirole (1997) with a new one: fragmenting the production into two locations allows the firm to choose the most appropriate place for each establishment, but also increases the communication costs between the owner and the controller. Hence, the model reveals that delegating the decision – which tends to reduce the communication between owner and subordinate - is often a condition for the firm to benefit from locational advantages through fragmenting its production.

The extension incorporates many firms and places. Each firm (owner) chooses the locations for the headquarters and the manufacturing plant, and defines its internal delegation scheme. Then, owner and controller decide their effort to learn about the problem. To make their decisions, firms consider the market size and the amount of business services of each location, which are endogenously determined in the simulations; and the following parameters: the cost of communication between the owner and the subordinate in case they stay at different cities; the cost of transportation to delivery its production to a distant market; and the characteristics of the activity, which defines the room the controller has to deviate from the owner's interests.

The utilities of the owner and the controller are defined as follows:

$$U^{j}_{p,h} = E^{j}_{p,h}B + (1 - E^{j}_{p,h})e^{j}_{p,h}\alpha E^{j}_{p,h} + \ln(1 - cE^{j}_{p,h}) + L_{p,h} \tag{1}$$

$$U^{*j}_{p,h} = e^{*j}_{p,h}\alpha B + (1 - e^{*j}_{p,h})E^{*j}_{p,h}B + \ln(1 - cE^{*j}_{p,h}) + L_{p,h} \tag{2}$$

$$u^{j}_{p,h} = E^{j}_{p,h}\beta b + (1 - E^{j}_{p,h})e^{j}_{p,h}b + \ln(1 - e^{j}_{p,h}) \tag{3}$$

$$u^{*j}_{p,h} = e^{*j}_{p,h}b + (1 - e^{*j}_{p,h})E^{*j}_{p,h}\beta b + \ln(1 - e^{*j}_{p,h}) \tag{4}$$

Equations (1) and (2) represent the utility of the owner, which depends on her effort (*E*) and the controller's effort (*e*). *B* is the expected utility of the best solution for the problem; whereas $\alpha$ measures the compatibility between the interest of the owner and the interest of the controller. The third term shows the cost of effort and *c* is the communication costs, which will be one if the headquarters and the plant of manufacture are at the same city, and bigger than one otherwise. Finally *L* is the locational advantage coming from the owner's location decisions. Asterisk means that the final decision was delegated to the controller.

Note that, in the case the owner delegates the decision, the controller is allowed to make the decision and, only if he does not learn anything, the controller asks the owner to participate of the decision process.

Equations (3) and (4) show the utility of the controller. *b* is the expected gain of the best solution for the problem. The compatibility between the interests of both from the controller's point of view is represented by $\beta$.

The interaction of firms' decisions is captured in *L*, which is composed by two terms:

$$L_{p,h} = H_h + P_p \tag{5}$$

Where:

$$H_h = h_h - [g(pop_h - popin)]^2 \tag{6}$$

$$P_p = (1-t)d_p + t\sum_{s=1}^{N} d_s \tag{7}$$

$H_h$ and $P_p$ are the locational advantages that a firm obtains from placing, respectively, the headquarters at city *h* and the plant at city *p*.

The locational advantage of city *h* for headquarters is positively related to the number of headquarters located there ($h_h$) and negatively related to the congestion costs, which presents exponential effects. The difference between the current population of city *h* and the initial population (common to all cities) is $(pop_h - popin)$. *g* is a parameter for the congestion costs. Two assumptions justify the positive relationship with the number of headquarters: new headquarters attract more business services, and firms benefit from both a great variety of business services and the presence of other headquarters (Davis and Henderson, 2008).

Equation (7) captures the importance of locating the manufacturing plant close to the market. $d_n$ measures the size of the market to be explored at city *n*, which is defined as the total population of city *n* divided by the number of plants in city *n* plus 1:

$$d_n = pop_n / (m_n + 1) \tag{8}$$

In equation (7), *t* represents the efficiency of the transport system - *t* equals to zero means infinite transport costs. Note in equation (7) that when $t = 0$, firms have access only to the local market.

The simplification about the potential size of market is based on the idea that firms' profits increase with the size of the demand of their products, whereas profitability decreases as more sellers share the same consumers[2].

Finally, the population of city *n* is a function of the number of headquarters and the manufacturing plants.

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[2] This simple idea is a common starting point in empirical models of entry, as in Berry (1992) and Bresnahan and Reiss (1991) .

$$pop_n = \sigma p_n + h_n \qquad (9)$$

Where $\sigma$ is a parameter greater than one.

In terms of location (with $N$ places) and delegation scheme, the owner has $2N^2$ choices. For each of these choices, it is possible to find levels of (no-negative) effort of the owner and the controller that determine Nash equilibrium. Therefore, two-step process determine the outcome: firstly, the owner chooses both the locations of the establishments and the delegation scheme and, secondly, the owner and the controller decide their level of effort.

After the first decisions, i.e., given ($p$, $h$, $i$) - where $p$ and $h$ are the locations of the plant and the headquarters respectively, and $i$ is the delegation scheme – and as long as some conditions are satisfied, there will be an unique equilibrium defined by the choices of effort ($E_i$, $e_i$). Thus, a backward-induction strategy solves the owner's maximization problem: knowing the outcome of the equilibrium of each location-delegation choice, the owner chooses the set of ($p$, $h$, $i$) that maximizes her utility.

This process describes the decision of a single firm, given the location of all others. However, firms jointly reach the equilibrium if and only if they have made their best choices given the other firms' choices.

**Simulations procedure** - In the simulation, the number of cities and firms was arbitrarily defined as 50 and 100, respectively. The only purpose of this choice was to make the simulation able to reveal what the model claims. The distance between any two cities is the same. Besides, in the first period, they have the same population size and no firms. As consequence, none of the cities has business services in period zero. Thus, for the first firm, the locational advantage is zero for all locations.

At the beginning of the first period, the first firm appears. Since there is no business service in this economy yet and the populations across cities are the same, the headquarters of firm 1 will be located in the city where the plant is located (say, city 1) in order to avoid unnecessary costs of communications. Given this choice, before the second period starts, the simulation updates the population and the amount of business services in city 1. The size of population increases and the business service sector becomes positive. Now, the economy is ready to receive the second firm.

The options for the second firm are: (1) locating both establishment at city 1 to avoid internal communication costs and to benefit from both bigger population and positive business services. The disadvantage of this choice is the presence of a competitor (firm 1) at the same city. An alternative (2) is to locate both establishments at city 2. In this case, it saves internal communication costs and explores the local market as the unique local firm. The negative aspect of this choice is to give up of a bigger population and positive business services of city 1. Finally, option (3) is to split production, locating plant of manufacture at city 2 to explore its market without local competitor and headquarters at city 1 to benefit from positive business services. The disadvantage is the internal communication cost that turns out to be positive since the production becomes spatially fragmented.

After the decision of the second firm, new updating occurs and the third firm appears. Note that the third firm (and all next firms) faces the trade-off described above, once no choice satisfies all the desirable objectives: placing the manufacturing plant at the city with the biggest market to be explored, considering the number of local competitors; placing the headquarters where the amount of business services is the maximum; and avoiding internal communication costs.

Therefore, considering 50 cities and the possibility of delegating the final decision, the simulation calculates the outcomes of 5,000 options ($2x50^2$). As already mentioned, each outcome is a Nash equilibrium, in which the level of effort of the owner is the best response to the level of effort of the controller and vice-versa.

The location of the economic activity will be in equilibrium when all firms have chosen their best strategy in terms of location, delegation scheme, and effort, given the decisions of the other 99 firms. Thus, after all firms making their first decisions, a new round starts. Differently from the first round, in the second round the first firm will decide, knowing the locations of others. The equilibrium is reached when the decisions of all firms made in round $z$ were the same as those made in round $z$+1. There is no cost of migration.

It is worth emphasizing that the objective is to show how and why some aspects - namely the managerial arrangements, communication and transportation costs, and the degree of standardization of the production process - can affect the distribution of production over a given region. The parameters used do not come from estimations; their role is to introduce into the simulation the assumptions made in the model construction. Thus, the results coming from the simulations do not aim to measure any effect; rather they only suggest tendencies.

## 3. Results

Before presenting the main results, it is worth to divide the outcomes into four categories for the purpose of explanation: (1) divergent urban system: all the economic activity is concentrated at a single location; (2) convergent urban system: the opposite, economic activities are evenly spread across cities; (3) poorly fragmented urban system: some firms are fragmented, but there is high concentration of spatially integrated firm in the metropolitan area; (4) highly fragmented urban system: many firms are fragmented, establishments concentrated in the metropolitan area are essentially headquarters, and there are some medium cities that received more than one manufacturing plant.

To capture the effect of some parameters on the fragmentation process, tables 1 to 5 show that changes of one of the parameters transform a poorly fragmented urban system into a highly fragmented one or vice-versa.

Each table below presents the results of a simulation, and the parameters used appear in the title of the respective table. Besides, each column shows how many cities have a certain characteristics.

For instance, the simulation whose results are in table 1 considers the following parameters: $\alpha = 0.75; c = 1.1; B = 4; b = 2; popin = 10; t = 0; g = 0; \sigma = 3$[3] ($t = 0$ means infinite transport costs). The third column tells us that 11 cities have the same characteristics: no headquarters, two manufacturing plants, and 16 people living in each one. Note that the sum of the first line is 50, which is the total number of cities. Moreover, the number of manufacturing plant can be obtained through the following computation: 40x1 + 2x11 + 1x38 = 100.

Table 1: Situation 1 ($S1$):
$\alpha = 0.75; c = 1.1; B = 4; b = 2; popin = 10; t = 0; g = 0; \sigma = 3$

| # of cities | 1 | 11 | 38 |
|---|---|---|---|
| HQ | 100 | 0 | 0 |
| MP | 40 | 2 | 1 |
| Pop | 230 | 16 | 13 |

Assuming that table 1 represents the highly fragmented urban system, it is possible to find values for parameters $c$, $t$, and $\alpha$ that have the same effect on the

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[3] $\beta$ is assumed to be zero. This simplifying assumption means that the owner's choice is not better than a random choice for the controller.

production fragmentation. Tables 2-5 incorporate these changes. Table 2 assumes all the parameters of situation 1, except the cost of communication that becomes equal to 1.4. Table 3 brings the results of simulation that considers the values of situation 1, except the transport costs that become equal to 0.7. The next simulation (table 4) changes the value of $\alpha$.

Table 2: $S1 + c = 1.4$

| # of cities | 1 | 49 |
|---|---|---|
| HQ | 100 | 0 |
| MP | 51 | 1 |
| Pop | 263 | 13 |

Table 3: $S1 + t = 0.7$

| # of cities | 1 | 49 |
|---|---|---|
| HQ | 100 | 0 |
| MP | 51 | 1 |
| Pop | 263 | 13 |

Table 4: $S1 + \alpha = 0.4$

| # of cities | 1 | 49 |
|---|---|---|
| HQ | 100 | 0 |
| MP | 51 | 1 |
| Pop | 263 | 13 |

The values of *c*, *t*, and $\alpha$ were chosen in such way that the new values generate exactly the same effect on the distribution of the economic activities. Tables 2-4 show that lower communication costs, lower transportation costs, and higher degree of standardization of the production process (higher $\alpha$) incentive the fragmentation process.

What seems to be remarkable is that the results of tables 2-4 can also be obtained by not allowing the owners of firms to delegate the final decision to the controller (table 5). Hence, having a flexible managerial structure - in which the decisions can be decentralized – may be a condition for the production fragmentation occurring or becoming more intense.

Table 5: $S1 +$ no delegation

| # of cities | 1 | 49 |
|---|---|---|
| HQ | 100 | 0 |
| MP | 51 | 1 |
| Pop | 263 | 13 |

Combining two changes may lead to a divergent urban system with all production concentrated in the metropolitan area, as shown in table 6.

Table 6: $S1 +$ no delegation $+ c = 1.4$

| # of cities | 1 |
|---|---|
| HQ | 100 |
| MP | 100 |
| Pop | 410 |

Even in this case, introducing a new value for any parameter that favors the fragmentation process, the total divergence disappears. Table 6 and 7 reproduce the results of the same simulations, except the value of $\alpha$.

Table 7: $S1 + \alpha = 0.9$ + no delegation $+ c = 1.4$

| # of cities | 1 | 13 |
|---|---|---|
| HQ | 100 | 0 |
| MP | 87 | 1 |
| Pop | 371 | 13 |

The second set of results comes from simulations that include positive congestion costs (*g*). Because of it, the results do not converge any more, i.e., the firms' decisions of round *z* are different from decisions of round *z* + 1. Thus, table 8 presents the results after 10 rounds.

The main aspect to be highlighted is that metropolitan areas cannot be as big as before, once the congestion costs offset the gains of agglomeration. As consequence, instead of only one metropolitan area, a few of them emerge. The number of big cities reduces (increases) as congestion costs become smaller (bigger), as is seen in table 9 (table 10). The results presented in table 10 represent the total convergence of the urban system: all 50 cities have the same characteristics.

Table 8: Situation 2 (*S*2): $\alpha = 0.75; c = 1.1; B = 4; b = 2; popin = 10; t = 0; g = 0.1$ (ten rounds)

| # of cities | 1 | 1 | 1 | 1 | 6 | 40 |
|---|---|---|---|---|---|---|
| HQ | 32 | 30 | 29 | 9 | 0 | 0 |
| MP | 13 | 13 | 13 | 9 | 2 | 1 |
| Pop | 81 | 79 | 78 | 46 | 16 | 13 |

Table 9: $S2 + g = 0.05$ (ten rounds)

| # of cities | 1 | 1 | 11 | 37 |
|---|---|---|---|---|
| HQ | 51 | 49 | 0 | 0 |
| MP | 21 | 20 | 2 | 1 |
| Pop | 124 | 119 | 16 | 13 |

Table 10: $S2 + g = 0.15$ (ten rounds)

| # of cities | 50 |
|---|---|
| HQ | 2 |
| MP | 2 |
| Pop | 18 |

Even though simulations do not converge when congestion costs are high enough, table 11 suggests that the number of rounds does not modify the results significantly. Comparing tables 9 and 10, it is possible to see that ten and twelve rounds get almost the same results.

Table 11: $S2 + g = 0.05$ (twenty rounds)

| # of cities | 1 | 1 | 10 | 38 |
|---|---|---|---|---|
| HQ | 50 | 50 | 0 | 0 |
| MP | 21 | 21 | 2 | 1 |
| Pop | 121 | 121 | 16 | 13 |

Finally, the total convergence also occurs when a low value of congestion costs is combined with parameters that make fragmentation undesirable (table 12). In this case, firms tend to keep their production spatially integrated. Because of congestion costs, no big city emerges, and production activities turn out to be evenly distributed across cities.

Table 12: $S2 + g = 0.05$ + no delegation or c = 1.4 or $\alpha = 0.4$ (ten rounds)

| # of cities | 50 |
|---|---|
| HQ | 2 |
| MP | 2 |
| Pop | 18 |

## 4. Discussion and final considerations

The first set of results brings the main findings of the work. Under low transport costs, more firms agglomerate their establishments at metropolitan areas in order both to benefit from business services and to avoid internal communication costs, once the cost of reaching distant market is low. Krugman (1991) gets similar correlation. Even though the present model considerably simplifies the market mechanisms, which are incorporated into the insightful general equilibrium model proposed by Krugman (1991), here there is a new reason for firms to agglomerate. Considering (1) that the production process is composed by more than one activity - which can be spatially separated - and (2) that those activities require managerial coordination, it is desirable to keep manufacturing plant and headquarters at the same location so that the owner can control the production process without spending too much on internal communication costs.

Parameter $\alpha$ is also important for the fragmentation process. It can be understood as the room for the controller to deviate from the owner's interest. Thus, parameter $\alpha$ should be a function of the difficulty of specifying in a contract the expected outcome of the controller's tasks. It typically happens to those activities at the ends of "the smile of value creation" proposed by Mudambi (2007, 2008): planning, design, R&D, marketing, etc. Following the same idea, Constantin et al. (2010) justify the migration of some activities of the woodworking-furniture and footwear industries in Europe saying that, "the high degree of standardization of operations, the specific kind of technologies used, and the way the process is organized, allow for the slicing of the production chain into relatively autonomous operation which do not require spatial continuity" (p.830). Additionally, Duranton and Puga (2000) utilize the empirical literature to support the idea that innovations – results of R&D activities - are made in metropolitan areas and that city size has a positive and highly significant effect on innovative output. The model's results fit very well in both the case studies of Constantin et al. (2010) and the stylized fact presented by Duranton and Puga (2000).

Jones and Kierzkowski (2005) explain the fragmentation process pointing out the importance of increasing returns in service-link activities instead of on the factory floor. The authors highlight the profound productivity improvement in services links occurred over the last decades, especially in communication services: "the changes in communication costs have probably been the most significant in lowering the service costs required to co-ordinate spatially separated production fragments" (p. 16). The present model captures the effect of lower communication costs on the managerial strategy of firms, and the results show that reducing them favor the production fragmentation. Differently from the framework of Jones and Kierzkowski (2005), here firms are formed by only two parts. However, Jones and Kierzkowski (2005) model neither the internal organization of firms nor the interaction of firms and its effects on agglomeration forces. In the present paper, a deep fragmentation happens when many firms spatially separate their production, instead of - as in Jones and Kierzkowski (2005) - a single firm that divides its production into many parts.

It is claimed here that the effects of communication costs cannot be understood without incorporating into the framework the processes of learning, coordinating, and negotiating since the flow of information only affects the economy throughout interactions among agents. For this reason, the boundaries of the maximizing black-boxes have to be broken up and Aghion and Tirole (1997) offer an insightful model to do that. When managers can coordinate the production from anywhere, and firms are not seen as maximizing black-boxes, firms can take advantages by placing each establishment and department where they benefit most from immobile resources and markets.

However, the strategy of fragmenting the production is often worth it as long as the decision is delegated to the subordinate. Therefore, for some sets of parameters, a flexible managerial structure is a condition for the fragmentation process. That is the new and most important result of this paper. The intuition explaining the main result goes in the following way: in order to benefit from both (1) agglomeration of business services in the metropolitan area and (2) local market with low competition, firms may have to fragment their production. However, fragmenting the product means positive communication costs. Then, once controlling the production process turns to be costly, owners will have incentive to decrease their effort and, consequently, delegate the final decision to their subordinates.

This model also confirms the findings coming from empirical work such as Arita and McCann (2002) about the positive relationship between decentralization of location and decentralization of decision. Arita and McCann (2002) analyze the electronics and semiconductor industry and conclude that firms whose institutions allow hierarchical systems with a greater degree of decision-making latitude tend to be much more spatially differentiated than a more strict hierarchical system.

Finally, Duranton and Puga (2005) offer an insightful explanation for the fact that some urban areas have become functionally specialized instead of having their activities concentrated on a small number of sectors. This transition, they say, "is inextricably interrelated with changes in firm's organization" (p. 1). Following this idea, the present work tries to formalize a mechanism in which managerial institutions – combined with the development of linking services - is relevant for the process of functional specialization.

The main limitation of the model is the significant simplification proposed for the market mechanisms.

References

Aghion, P.; Tirole, J. (1997) Formal and real authority in organizations. *The Journal of Political Economy*, v. 105, n. 1: 1-29.

Arita, T.; Mccann, P. (2002) The relationship between the spatial and hierarchical organization of multiplant firms: observations from the global semiconductor industry. In: MCCANN, Philip. (Ed.). *Industrial location economics.* Massachusetts: Edward Elgar Publishing limited, p. 319-363

Berry, S. (1992) “Estimation of a Model of Entry in the Airline Industry," *Econometrica*, 60: 889-917.

Bresnahan, T.; Reiss, P. (1991): “Entry and Competition in Concentrated Markets," *Journal of Political Economy*, 99: 977-1009.

Constantin, F., Giusti, G. e Tattara, G. (2010) “Strategies of Italian Firms in Romenia: Evidence from Selected Case Studies”. *Transit Studies Review.* V. 16: 829-847.

David, James C.; J. Vernon Henderson. (2008). “The agglomeration of Headquarters”. *Regional Science and Urban Economics*. 38(5): 445 – 460.

Duranton, G; Puga, D. (2000) Diversity and Specialisation in Cities: Why,Where and When Does it Matter? *Urban Studies,* Vol. 37, No. 3: 533–555.

____________. (2005) From sectoral to functional urban specialization. *Journal of Urban Economics*, v. 57, n. 2: 343-370.

Jones, R.; Kierzkowski, H. (2005) International trade and agglomeration: An alternative framework Journal of Economics Volume 10, Supplement 1: 1-16,

Krugman, Paul. (1991) Increasing return and economic geography. *The Journal of Political Economy*, v. 99, n. 3: 483-499.

Mudambi, R. (2007). “Offshoring: economic geography and the multinational firm”. *Journal of International Business Studies*, 38(1): 206.

Mudambi, R. (2008). “Location, control and innovation in knowledge-intensive industries”. *Journal of Economic Geography*, 8(5): 699-725.

Ota, M.; Fujita, M. (1993). Communication Technologies and Spatial Organisation of Multi-unit Firms in Metropolitan Areas. *Regional Science and Urban Economics,* 23: 695-729.

Silva, C. E. L.; Hewings, G. (2012) Locational and managerial decisions as interdependent choices in the headquarter-manufacturing plant relationship: a theoretical approach. *The Annals of regional Science*, 48: 703-717.

Tabuchi, T.; Thisse, J. (2011) “A New Economic Geography Model of Central Palces”. *Journal of Urban Economics*. 69(2): 240 – 252.