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World City Network Expansion 2000-2004; An appraisal of the determinants of connectivity growth among world cities

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World City Network Expansion 2000-2004. An appraisal of the determinants of connectivity growth among world cities[*]

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Abstract

The term "globalization" has long been vented indiscriminately everywhere with few being capable to either define or measure it. Cities are said to be at the forefront of the "*works of globalization*" by becoming coordinating centers for the transnational activities of multinational corporations. Ultimately, they become tied up to each other, as those activities require information inputs from different regions of the world.

The article uses the advanced corporate service firms' location patterns to measure the linkages between cities. As social, economical, cultural and political information about the cities flow through the firms' network of branch offices, a highly connected city provides better corporate servicing to businessman wanting to do business elsewhere.

By calculating the total connectivity of each city to the rest of the world, as well as total presence of global service firms within these cities, in the years 2000 and 2004, we produce a measure of the connectivity growth in the period. In a second moment, we use a linear regression model to test hypothesis concerning the determinants of connectivity growth in those cities.

Results show us that connectivity growth in a city, in case of firm's network expansion, display a "*rich-get-rich*" behavior on which well connected cities became even more connected. Furthermore, connectivity growth is responsive to competition, agglomeration economies, infrastructure, trade openness, human capital and the overall economic level of the country. Some of the variables behave differently according to the service firms' sector being analyzed. In particular, we scrutinize the role of human capital as a determinant of connectivity growth in the management and banking sector, and interpret the results as a function of whether the sector is skilled-labor intensive (management) or capital intensive (banking).

Keywords: Globalization, World City Network, Interlock Network Model, Global City Model, Economic Geography, GaWC.

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1. Introduction

This research aims at shedding some light on the determinants of connectivity growth among world cities. In the context of this paper, "*connectivity*" is defined as the capability to generate strategic corporate information / knowledge flows. For this study, a city's connectivity is not related to the flow of tourists, commodities, cultural goods, events, the existence of international organizations headquarters or any other possible indicator to the level of city's globalization. For this paper, I consider only the strategic corporate information / knowledge that are "produced" by advanced corporate service firms (i.e. management consultancy, law firms, accounting, insurance, etc) and that flow among their units around the world, generating an extremely wide and rich network of strategic information.

The literature on the subject is broad and extensive, albeit young. It was originated by John Friedmann's "*The World City Hypothesis*" (Friedmann, 1986) paper, suggesting that the participation of the city in the world economy and its role in the new spatial division of labor greatly impacted its prospects for economic development. He also claimed that some key cities in the world were being used as command & control bases for organizing and articulating production and consumption globally, creating a category of cities termed by him as "world cities. Of particular contribution to the world city functions, was the corporate headquarters, international finance, transport, communications and business services. Although the paper was promptly criticized for not having any sound empirical support (Korf, 1987), it became the backbone for much of the research and studies of cities in globalization. It motivated dozens of studies that build on the theoretical framework (Sassen, 1991 and 1994; Castells, 1996) or created methods to measure (and empirically test hypothesis) the global network of cities (Smith and Timberlake, 1995; Taylor, 2004). It also motivated case studies on selected world cities and its alleged functions as command & control centers of the world economy (Sassen et al. 2002; Knox and Taylor, 1995), widening up our knowledge about global cities.

Twenty years of research on world cities generated an enormous sum of point of views and methodological variations on which the theme can be analyzed. The main references for my study consist of the *Global City Model* (Sassen, 1991) and the *Interlocking Network Model* (Taylor, 2004).

Sassen's Global City Model describes the new functions of world cities in the context of globalization, emphasizing their role as (1) command centers for the organization of the world economy; (2) marketplace for financial and specialized corporate service providers; (3) centers for the production of innovations; and (4) market place. (Sassen, 1991, p. 3-4) (Sassen, 1994, p. 4).

> *"These cities now function in four new ways: first as highly concentrated command posts in the organization of the world economy; second as key locations for finance and specialized service firms, which have replaced manufacturing as the leading economic sectors; third, as sites of production including production of innovations, in these leading*

> *industries; and fourth, as markets for the products and innovations produced."* (Sassen, 1991, p. 3-4)

According to Sassen, there was a systematic increase in the geographical dispersion of economic activities in recent years. Those are still integrated globally, as they are realized by gigantic multinational conglomerates. The geographical dispersion, within an integrated scheme of command & control, raises the coordinating activities' importance and complexity, generating demand for corporate services which can operate in a seamless way. Those services have been outsourced systematically by the great conglomerates. In order to be able to operate in an integrated way, advanced corporate service firms are located in large cities and build a global network of affiliated firms spread throughout the world. The cities which are within the network, termed by Sassen as "global cities", is where the services that optimize command & control activities are produced. (Sassen, 2001, xix – xxi)

> *"By central functions I do not only mean headquarters functions; I am referring to all the top-level financial, legal, accounting, managerial, executive, and planning functions necessary to run a corporate organization operating in multiple countries. These central functions are partly embedded in headquarters, but also in good part in what has been called the corporate services complex, that is, the network of financial, legal, accounting, and advertising firms that handle the complexities of operating in more than one national legal system, national accounting system, advertising culture, and so forth and do so under conditions of rapid innovations in all these fields. Such services have become so specialized and complex that headquarters increasingly buy them from specialized firms rather than produce them in-house. These agglomerations of firms producing central functions for the management and coordination of global economic systems are disproportionately concentrated in an expanding network of global cities. This network represents a strategic factor in the organization of the global economy.*
>
> *These global control and command functions are partly embedded in national corporate structures but also constitute a distinct corporate sub-sector. This sub-sector in each city can be conceived of as part of a network that connects global cities across the globe through firms' affiliates or other representative offices, and through the specialized servicing and management of cross-border transactions."* (Sassen, 2002, p.8)

Sassen's global city model can thus be summarized as a relation where territorial dispersal of production plants, especially in the international level, raises demand for advanced corporate producer's services (banking, accounting, advertising, management, legal, etc.). Economic globalization has raised the scale and complexity of international transactions, generating the demand for more services which can help activities related to

the centralized control functions of firms. As cities are key sites for the production of services for firms, we observe "world city" formation.

While production becomes globalized, central functions of firms become more complex and expensive. Firms outsource part of those services by hiring specialized advanced corporate service providers, which have, as a requirement for the kind of operations they perform, branches spread in several other world cities. Those services are seen as a kind of "commodity" that is produced in a more efficient way on world cities, explaining the agglomeration of service firms on those latter.

Although Sassen's work is backed up by some empirical evidence, it is Taylor (2004) who, building up over Sassen's theoretical framework, proposes a method, the *Interlock Network Model*, to measure the world city network. The idea behind the interlock network model is that a pair of cities is connected through the partner offices of the same advanced corporate service provider enterprise. We assume that a pair of cities that have an office of the same corporative service firm is linked up. Throughout the linkage generated by the affiliated offices, vital strategic information / knowledge needed for the coordination of the business of its clients flow. In this way, the Interlock Network Model considers each advanced corporate service office as one node linked to the other offices (nodes). Cities are connected through the aggregate of links, forming a highly dense global network. As it is impossible to measure each one of the existing flows (exchanged e-mails, mobility of employees, common projects among offices, reports, etc.), we measure the institutional structure in which those flows are created and travel around as our best *proxy* to determine the connectivity among the parts.

The interesting feature about the "*interlocking network*" model is that it follows the main theoretical assumptions of Sassen's theoretical "*Global City Model*". In her model, world cities are centers for the production of advanced services, meant to coordinate the geographically dispersed, yet integrated, production of large multinational corporations. Advanced service providers choose to locate on world cities, by their turn, because of cities' knowledge-rich environment and gains of agglomeration. Also, as they are basically dealing with transnational processes (for example, a law firm might have to provide information on the legal system of a country other than that where his client is primary based), their performance is dependent on its geographical presence in several world cities in order to provide the adequate service for their customers. As the "*interlocking network*" relies basically on the aggregate of the location of service firms networks within cities, it captures well the ideas expressed on the "*Global City Model*".

World city network formation is an outcome of global corporate location decision. In other words, cities do not have agency power in this model. They are simply the locus where firms decide to locate their activities. The "*interlocking network*" specification of the world city network enables it to be seen as a social network. Nodes are actors (firms) and links are social relations (informational exchanges within branches from the same service firm). Cities are then, connected through the links formed by firms within the city.

More details about the construction of the Interlock Network Model can be found in Taylor's (2001) original paper, available in the internet[1]. My calculations follow that same methodology.

My objective in this study is to identify the cities characteristics that are able to influence the decision of the advanced corporate service provider enterprise to include a city in its international location strategy. Further than the infrastructure of the city, I also analyze the effect of the country's economy in its cities, the gains (or losses) from agglomeration, in which the concentration of business from complementary or same sector, cause an incentive or disincentive for the firms to expand its activities in that particular city.

2. Data-set

I use the GaWC 100[2] and GaWC 80[3] data sets in my study. The first is a Matrix formed from 100 advanced corporate service firms and 315 cities in the year 2000 and the second is a Matrix formed from 80 advanced corporate service firms in the same 316 cities in the year 2004. Firms were selected based on the criteria that they have offices in at least 15 different cities, including one or more in Northern America, Western Europe and Pacific Asia. Cities comprise capital cities from all but the smallest states plus other cities of economic relevance. For each city, each firm is coded[4] according to its size / presence within the city: 0 – firm is not in the city; 1 – small office; 2 – medium office; 3 – large office; 4 – regional headquarter; and 5 – international headquarter. Finally, firms are also separated according to sector they deal with: banking, management consulting, law offices, accounting, advertising and international insurance. For more details on criteria for generating the GaWC 100 and GaWC 80 data, refer to Taylor, 2003. For a list with all the firms and cities in the data-set, refer to the annex.

With the GaWC 100 and GaWC 80 and using the Interlock Network Model, total connectivity for each city to all the other cities is calculated for 2000 and 2004. This measurement allows for the quantification on how much a city is connected to all the others in the system. Difference between total connectivity of each city in 2004 and 2000 is the connectivity growth of each one of the cities in the period. It is also possible to obtain the growth on the quantity and size of firms on each city in the period.

Other data used in this research refers to the *Air Passenger Traffic* (2000), *Pupil to Teacher Ratio* (1997 - 2002), *Phone Cost* (2000-2002) of an average international call, trade openness (*Trade / GNP* (2002)), all of those in relation to the country where the city is located. I also use data of an interaction term between a dummy variable of the primary city of a country (in population terms) and the countries GNP (*Primary City * GDP* (2000)), the *City Population* (2000 or closest available), *Quality of Life* (2005), *Affiliation to Metropolis* (2006), *Affiliation to UCLG* (2006), number of universities ranked among

[1] http://www.lboro.ac.uk/gawc/rb/rb23.html

[2] ACKNOWLEDGEMENT: The GaWC 100 data-set was produced by P.J. Taylor and G. Catalano and constitute Data Set 11 of the GaWC Study Group and Network (http://www.lboro.ac.uk/gawc/) publication of inter-city data.

[3] ACKNOWLEDGEMENT: The GaWC 80 data-set was produced by P.J. Taylor who kindly allowed me to use it in this study.

[4] For information on the coding criteria, please visit http://www.lboro.ac.uk/gawc/datasets/da11_4.html

the top 500 in the city (*Top University* (2004)), and *Container Traffic* (2002-2006) in the cities port, if there is any. I use country dummies for cities located in the USA, UK, Germany, China, India and Brazil. Those variables are used as control and explanatory variables in this paper. For summary information, description and data source on those variables please refer to the *Table of Source and Description of the Variables* in the annex.

3. Methodology

In order to test my hypothesis, I use two different linear regression models. The first one employs connectivity change (L_{it} - L_{it-1}) as dependent variable. The second one employs growth on the quantity and size of firms in the period (i.e. the quantity weighted by the size of the company) and will be called from now on, following Taylor's notation (2004, p.63), the site service status (SV) and site service status growth (SV_{it} - SV_{it-1}), which is our dependent variable. A straight forward interpretation for L_{it} is the total of links generated by affiliate offices of the same firms that are located in the city "i", or, in other words, its connectivity. A straightforward interpretation for SV_{it} is the quantity and size of those firms in city "i", or, in other words, the capacity of firms, within a city, to provide advanced corporate services.

There is a reason for using the two models. The first one captures the determinants of both quantity of firms in the city (and the effect it causes on the total connectivity) as the size of the network of all the affiliate offices from the firms within the city that are spread over the world (also effecting total connectivity). Because of that, we can not disentangle the effect of quantity of firms and the effect of size of network on connectivity change. This first model gives us a general view on the existing correlations, although it doesn't mean causality, as there are two different mechanisms at play. The second model, however, captures exclusively the determinants for the quantity and size of firms (site service status) within the city. While we lose the broad view on what is happening with total connectivity, we have a clearer view on the causality related to the decision of the firm to move in or out of the city.

Regression Model 1: Total City Connectivity Change as Dependent Variable

$$\mathbf{L_{it} - L_{it-1} = \delta_1 L_{it-1} + \beta_2 X_{1it-1} + \beta_3 X_{2it-1} + \beta_4 X_{3it} + u}$$ (see regression 1 in the annex)

Regression Model 2: Site Service Status Change as Dependent Variable

$$\mathbf{SV_{it} - SV_{it-1} = \delta_1 L_{it-1} + \beta_2 X_{1it-1} + \beta_3 X_{2it-1} + \beta_4 X_{3it} + u}$$ (see regression 4 in the annex)

Where:

L_{it} is the total connectivity in 2004.

L_{it-1} is the lagged dependent variable, total connectivity in 2000.

SV_{it} is the total site service status, c_a, within a city for 2004.

SV_{it-1} is the total site service status, c_a, within a city for 2000.

X_1 is a column vector consisting of country based variables.

X_2 is a column vector consisting of city based variables.

X_3 is a column vector consisting of country dummy variables.

By using the lagged variable L_{it-1}, I intend to control for the effect of connectivity in the previous period so that my coefficients capture the effect of the independent variables without the undesirable effect of a possible "*rich-get-rich*" (returns to agglomeration) or "*rich-get-poor*" (costs of agglomeration) behavior. At the same time, the coefficient $\boldsymbol{\delta_1}$ allow us to check for the existence of those behaviors.

In order to test the robustness of the results and to increase number of observations (some of my independent variables do not have complete observations for all the cities), I use five different specifications for the model. My motivation for doing that is threefold. First, some of my data is related to the country level and assigned to cities within those countries. As there is no variation for country level variables on cities within the same country, it doesn't make sense to use them with country dummies in the same regression. Second, not all my variables are complete for all of the cities, causing a significant change in the amount of observations in the regression, depending on the choice of variables. Third, by using the lagged level of connectivity in the city in 2000 I can effectively check / control for a *rich-get-rich* behavior, but I also would like to compare all the cities without this control. Those are the main motivations that led me to exploit the same model within five wide-ranging specifications in my research.

Below, I proceed with a description of each one of the specifications:

(I) The model is not controlled for the lagged level of connectivity in the city in 2000. If there is any effect of the amount of connectivity on future total connectivity and site service status levels in a city (due to gains/loss from agglomeration, aversion to competition or responsiveness to complementarities from other firms, for example), this specification will not capture / control for it.

(II) The model uses country level variables and no country dummies, and the variable "*Quality of Life*", which is incomplete in several cities, is dropped in order to increase the number of observations. This specification compares cities from countries that have a similar characteristic as captured by country-level variables.

(III) Country dummies are used instead of country-level variables. It allows us to check how the independent variables affect the dependent variable when we compare cities from the same country.

(IV) "*Quality of life*" is dropped in order to increase the number of observations and country-level variables are dropped while country dummies are added. This specification has the largest number of observations.

V) All variables are used, except country-dummies. This specification has the least number of observations.

Besides that, I also run regressions disaggregating the total connectivity change and total connectivity in 2000 for the management and banking sectors. This allows me to search the effect of the presence of rival / non-rival (complementary) firms into firm's network expansion strategy. I do that by calculating the connectivity change derived from only one sector at a time and the lagged total connectivity in a city in 2000, derived from firms of a specific sector. This allows me to find if there is any difference of behavior among the variables if we analyze different sectors. It also provides the model with a better specification to check whether the variables remain robust.

My hypothesis is that firms form same sector regard each other as competitors, avoiding to locate in cities which already have a relatively larger concentration of such firms. There may also be a saturation process in which cities with a larger concentration of such firms experience less connectivity growth derived from that sector just because firms that are already located in the city do not need to expand their activities there. In such a case, I expect to find a negative sign in the coefficient of the independent variable "connectivity in 2000" from the same sector as the dependent variable.

Likewise, I also have the hypothesis in which firms from different sectors (for example: banking and management) regard themselves as complementary industries. In such a case, we would see an agglomeration process in which connectivity derived from a sector would seek cities in which the other sectors are relatively concentrated. In this way, I expect to find a positive sign in the "total connectivity in 2000" from other sector than the one of the dependent variable.

Hence, the disaggregated regression model for the management sector becomes:

$L_{it,man} - L_{it-1,man} = \delta_1 L_{it-1,man} + \delta_2 L_{it-1,bank} + \delta_3 L_{it-1,ins} + \delta_4 L_{it-1,acc} + \delta_5 L_{it-1,law} + \delta_1 L_{it-1,\,adv} + \beta_2 X_{1it-1} + \beta_3 X_{2it-1} + \beta_4 X_{3it} + u$ (this model corresponds to regression 2, in the annex)

Where the subscripts: "man", "bank", "ins", "acc", "law", "adv" stands respectively for management, banking, insurance, accountancy, law and advertising. A similar model with $SV_{it,\,man} - SV_{it-1,\,man}$ (see regression 5, in the annex) and with the banking sector (see regression 3 and 6 in the annex) instead of management was also used.

4. Determinants of Total Connectivity Growth among cities

The results obtained in the regressions can be found in the annex. Some very clear patterns can be noticed. The aggregated analysis (regression 1 and 4) can have problematic results if each one of the sectors behaves in a different way to the variables.

Nonetheless, a general view of the aggregate effect can point us to the variables that *seem* to affect city connectivity more strongly. This suspicion can be confirmed latter with the sector analysis (regression 2 and 4 for management consultancies and3 and 6 for banking).

In the aggregated analysis (regression 1 and 4), variables related to the countries (pupil / teacher relation, phone cost, trade openness) are strong determinants of the connectivity growth. We observe that, in an aggregated way, cities from countries where there are more teachers for each student grew more in terms of connectivity in the period (reg. 1). This correlation, however, is not confirmed when we analyze the change in terms of quantity of firms in the city (reg. 4). This is an indicative that cities from where education is better grow more in terms of connectivity not because they are attracting more global firms, but because firms that are already established there are becoming more global, expanding their networks of affiliated offices to other regions of the world that do not necessarily possess better indicators of education.

There was consistency in the results related to telecommunication (cost of an international call) and trade openness (international trade / GNP). Cities from countries with lower cost of communication and more open for trade attract more global service firms, raising their levels of connectivity.

The variables more related to the city characteristics like *primary city*GDP*, *city population* and *top university*, are statistically significant in the regression 1, although *population* and *top university* are not robust to country dummies (reg. 1 (III and IV). *Top university* is also not significant in the regression 4, indicating that the effect of an elite university to attract corporate service firms could be inexistent.

Finally, we could not find evidence of a "*rich-get-rich*" behavior in the aggregated regressions as the coefficients are not significant in the *own connectivity 2000* variable. This is due to, as we will see ahead, the existence of a saturation effect of rival enterprises and agglomeration gains from firms with complementary activities (under the point of view of the corporative client) located in the same cities. Those two effect respectively disincentives and incentives the expansion of firms in the city.

Bellow, there is a summary of the most interesting results obtained:

	All sectors aggregate	**Management Consultancies**	**Financial Consultancies**
"Rich-get-rich" effect (connect. in 2000)	There is no apparent effect	Firms avoid competition (markets are saturated)	Firms avoid competition (markets are saturated)
Complementary Firms Agglomeration	N/A	Agglomeration gains with accounting firms and, in a lesser degree, insurance firms.	Agglomeration gains with management consulting firms and insurance firms.
Primary City	Result is not robust	There is no correlation	Strong and robust

weighted by countries GNP			correlation
Top University	There is no correlation with the changing in the quantity of firms	Strong and robust correlation	There is no correlation
Phone Cost	Strong and robust correlation	There is no correlation	Strong and robust correlation
Trade / GNP	Strong and robust correlation	Strong correlation, but it is only robust when controlled for quality of life.	

5. Competition and Complementarities as functions of the location strategy of firms

When I disaggregated total connectivity and total quantity of firms within a city by the consulting sector, I use a lagged dependent variable of the year 2000. My objective is to check for the existence of a possible concentration process (rich-get-rich behavior). If, after this control, cities with a higher connectivity in 2000 have a larger raise of connectivity and, specially, in the quantity of firms located in the city in the following years, this would be an evidence of "rich-get-rich" behavior in the accumulation of connectivity in the global cities. The mechanism behind that is that, even though a city with more firms represents more competition, there are also gains from the agglomeration to be reaped, making that a strong case for a firm moving in the city.

This is in accordance with Sassen's (1994) analysis about agglomeration economies. She argues that, with the advance of communication technologies, the tendency would be that firms would choose other places than large cities, as there are other options without the high cost and congestion of large cities. But this doesn't happen. Instead, firms decide to locate in large cities due to the innovative environment and agglomeration economies:

> *"A production process takes place in these services that benefits from proximity to other specialized services. This is especially the case in the leading and most innovative sectors of these industries. Complexity and innovation often require multiple highly specialized inputs from several industries. The production of a financial instrument, for example, requires inputs from accounting, advertising, legal services, economic consulting, public relations, design, and printing. The particular characteristics of production explain the centralization of management and servicing functions that has fueled the economic boom of the early and mid-1980s in major cities (…) Producer services, unlike other types of services, are not necessarily dependent on spatial proximity to the consumers – that is, firms served. Rather, economies occur in such specialized firms when they locate close to others that produce key inputs or whose proximity makes possible joint production of certain service offerings. The accounting firm can service its clients at a distance, but the nature of its*

> *service depends on proximity to specialists, lawyers, and programmers. Moreover, concentration arises out of the needs and expectations of the people likely to be employed in these new high-skill jobs that tend to be attracted to the amenities and life-styles that large urban centers can offer. Frequently, what is thought of as face-to-face communication is actually a production process that requires multiple simultaneous inputs and feedbacks. At the current stage of technical development, having immediate and simultaneous access to the pertinent experts is still the most effective way to operate, specially when dealing with a highly complex product."*(Sassen, 1994, p. 66)

Aiming to capture the firm's preference to locate in cities with agglomeration of other firms and, at the same time, aversion to locate near to competition, I use the lagged connectivity in 2000 disaggregated by sectors. My hypothesis is that all disaggregated regression will have a strong negative correlation to the variable *own connectivity 2000* - the lagged connectivity to the same regression sector (in this case, management and banking). Similarly, I expect a positive significant sign to the lagged connectivity of other sector analyzed, as firms will benefit from agglomeration gains and the complementarities with non-rival firms which serve the same clients at many occasions.

This hypothesis is confirmed at the disaggregated regressions 2, 3, 5 and 6. All of them show a negative correlation for *own connectivity 2000*. I interpret this as a consequence of the saturation of a firm already full of firms from a specific sector and the aversion of the firms to locate near one of their competitors.

At the same time that they seek to escape from competition, firms also seek proximity with non rival firms from other sectors, as this contributes to create an environment where knowledge circulates, generating agglomeration gains. This patter can be observed for some sectors. Management consultancies seem to benefit from proximity with firms from the accounting and banking sectors. The banking sector seems to have higher returns to locate close to clusters of insurance and, at a lower degree, management consultancies. Those results can be seen in the regressions 2, 3, 5 and 6.

6. Human Capital and Financial Power in the Management and Financial Consulting Sectors

The proposal of this work is to shed some light into the determinants of world city formation and in order to do so I choose to scrutinize the Management consultancy and Banking sectors.

The difference between both sectors is that management firms seems to choose to locate on cities which have a high stock of highly skilled human capital (captured here by the "*top university*" variable, which measures the number of top 500 universities within a city) while the banking sector seem to prefer a location on primary cities from rich countries (as captured by the "*primary city*GDP*" variable) with good telecommunication infrastructure (phone cost).

Although human capital and skilled labor is central to both sectors, the main input for the banking sector is capital and for the management sector is skilled labor. In relative terms between both sectors, we can say that banking is capital intensive and management is skilled labor intensive. As such, management firms' location choice strategy takes into account the characteristics of the city which can be related with an easier access to recruitment or continued training of skilled human capital. The banking sector, however, prioritizes locating in the main cities from countries with high GDP, as they need to be near where money circulates the most. For their operations, it is more important to be on financial centers, stock markets and trading centers, which will offset their need for recruiting and training skilled labor in those locations.

Human capital is also important for the banking sector although being located at financial and trading centers is even more so. The way the banking sector deals with it may be explained by the findings of Beaverstock (2005), in his analysis of world city network from a micro level instead of a macro level, as the one carried out on my research.

Beaverstock (2005) analyzes international mobility in the global investment banking industry. By analyzing data from the annual reports, firm world wide web sites and interviews with C.E.O's responsible for international human resources in ten global investments banks in 1999/2000, he found that those firm's human resource policy consistently favored labor mobility among the branch firms (as opposed to locally nurturing its own labor force) as an "*efficient mechanism to make the knowledge structures of world city networks*" (Beaverstock, 2005, p. 1). In other words, he found that "*investment banks transfer knowledge and expertise throughout their international office networks by* ***physically moving*** *staff between world city locations*." (Beaverstock, 2005, p. 2, my bold marks)

If that is so, the banking sector would not need to rely on the city's capability of generating this high skilled labor when deciding where to open / expand their networked branches. It can, instead, develop its human capital strengths at the centre and then transfer to its overseas units, concentrating their location strategy on the proximity with its clients and in financial and trading centers.

Interesting enough, the air passenger traffic variable is statistically significant on the banking sector regression (reg.10), although it is not significant for the remaining sectors (except for the management sector, for the specification which does not account for the lagged connectivity level – reg. 9 (I)). This might be due, among other things, to the labor mobility strategy employed by the banking sector to cope with its need of highly skilled labor.

We could also argue that it makes more sense for the banking sector to employ this coping strategy than the management sector because of the nature of their activities. While management requires an employee with wide knowledge of local specificities (contacts, knowledge of the suppliers, competitors, customers, etc), an employee of the banking sector need relatively less knowledge on those and more on financial instruments

and procedures which are not “place-bound”. The management sector requires human capital that is place-bound: they need to rely on local expertise for their doings. The banking sector, however, requires human capital skilled on financial procedures which are, by nature, not place-bound: they can transfer their employees from elsewhere.

7. Conclusion

If it is true that the recent changes in the structure of the world economy, that is becoming ever more globalized, creating a class of global cities where command & control of the world production and consumption is produced, how do those cities emerge? This question is being repetitively made throughout twenty years of *world city* scholarship. Many contributions were done without ever finalizing the subject. By using the GaWC data-set, the Interlock Network Model methodology and a string of data related to world cities and countries, I arrive at some contributions to the existing debate.

First, as it is the firm, not the city, the main player at the formation of a world city, I identified that firms are attracted to the gains related to the agglomeration of firms from complementary sectors and repelled by the presence of rival companies, indicating an effect of global geographical segmentation in the consulting market. Where there are more competitors, the probability of entrance or expansion of a new firm is less. In the other hand, firms have an incentive to enter / expand in cities that show a larger concentration of firms from different sectors, or else, cities are more competitive to attract consulting firms in the direct proportion of their capacity to produce complementary services to the ones offered by those firms.

Telecommunication infrastructure, trade openness, education and air-traffic levels in a country are determinants of connectivity growth, although different service sectors seem to respond differently to each one of them. Cost of an international telephone call, in particular, seems to be a stronger predictor of connectivity growth.

Skilled human capital formation in a city is a determinant at play for influencing the location strategies of the management sector, but seems to have no impact on the banking sector. My explanation to this pattern is that, even though human capital is important to both sectors, management is skilled labor intensive while banking is intensive in the use of capital. Management firms will thus seek to locate in places where they can easily recruit high skilled personal and keep them up-dated through life-long education. Banking, by its turn, needs to locate where capital flows, near financial centers, stock and commodity markets, on the primary cities of the richest countries. It alleviates its need for human capital by physically moving the staff from the center offices (in cities with a high stock of human capital) to the desired locations.

Local governments’ pretensions to raise a city connectivity level to became a more global city should necessarily aim at creating the conditions to attract a mix of advanced corporate service firms, instead of concentrating in only one segment. Special attention should be given to the skilled human resources formation and telecommunication costs.

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9. **Annex**

List of cities in the GaWC 100 data-base

Abidjan
Abu Dhabi
Accra
Addis Ababa
Adelaide
Ahmadabad
Alexandria
Algiers
Almaty
Amman
Amsterdam
Ankara
Antwerp
Arhus
Asuncion
Athens
Atlanta
Auckland
Baghdad
Baku
Baltimore
Bandar Seri
Begawan
Bandung
Bangalore
Bangkok
Barcelona
Basel
Batam
Beijing
Beirut
Belfast
Belgrade
Belo Horizonte
Bergen
Berlin
Bern
Bilbao
Birmingham
Bogoto
Bologna
Bonn
Bordeaux
Boston
Bratislava
Brasilia
Brazzaville
Brisbane
Bristol
Brussels
Bucharest
Budapest
Buenos Aires
Buffalo
Bulawayo
Cairo
Calcutta
Calgary
Canberra
Cape Town
Caracas
Cardiff
Casablanca
Charlotte
Chennai
Chicago
Christchurch
Cincinnati
Cleveland
Cologne
Colombo
Columbus
Conakry
Copenhagen
Cuidad Juarez
Curitaba
Dakar
Dalian
Dallas
Damascus
Dar Es Salaam
Denver
Detroit
Dhaka
Djibouti
Doha
Dortmund
Doula
Dresden
Dubai
Dublin
Durban
Dusseldorf
Edinburgh
Edmonton
Essen
Frankfurt
Freetown
Gaborone
Geneva
Genoa
Georgetown
Glasgow
Gothenburg
Grenoble
Guadalajara
Guangzhou
Guatemala
Guayaquil
Hamburg
Hamilton
Hannover
Hanoi
Harare
Hartford
Havana
Helsinki
Ho Chi Minh City
Hobart
Hong Kong
Honolulu
Houston
Hyderabad
Indianapolis
Islamabad
Istanbul
Jaipur
Jakarta
Jeddah
Jerusalem
Johannesburg
Kabul
Kampala
Kansas City
Karachi
Kawasaki
Khartoum
Kiev
Kingston
Kinshasa
Kobe
Krakow
Kuala Lumpur
Kuwait
Kyoto
La Paz
Labuan
Lagos
Lahore
Las Vegas
Lausanne
Leeds
Leipzig
Liege
Lille
Lima
Limassol
Linz
Lisbon
Liverpool
Ljubljana
Lome
London
Los Angeles
Luanda
Lucknow
Lusaka
Luxembourg
Lyon
Macau
Madrid
Mainz
Malacca
Malmo
Managua
Manama
Manaus
Manchester
Manila
Mannheim
Maputu
Marseille
Medan
Medellin
Melbourne
Mexico City
Miami
Milan
Minneapolis
Minsk
Mombasa
Monrovia
Monterrey
Montevideo
Montreal
Moscow
Mumbai
Munich
Nagoya
Nairobi
Nanjing
Naples
Nassau
New Delhi
New Orleans
New York
Newcastle
Nicosia
Norwich
Nottingham
Nuremberg
Omaha
Osaka
Oslo
Ottawa
Palermo
Palo Alto
Panama City
Paris
Penang
Perth
Philadelphia
Phoenix
Pittsburgh
Plymouth
Port Louis
Port Moresby
Port Of Spain
Port-Au-Prince
Portland
Porto Alegre
Prague
Pretoria
Pusan
Pyongyang
Quebec
Quito
Rabat
Rawalpindi
Refice
Reykjavik
Richmond
Riga
Rio De Janeiro
Riyadh
Rochester
Rome
Rotterdam
Ruwi
Sacramento
Salvador
San Diego
San Francisco
San Jose (CA)
San Jose (CR)
San Salvador
Sanaa
Santiago
Santo Domingo
Sao Paulo
Sarajevo
Seattle
Seoul
Seville
Shanghai
Sheffield
Shenzhen
Singapore
Sofia
Southampton
St Louis
St Petersburg
Stockholm
Strasbourg
Stuttgart
Suva
Sydney
Taipei
Tallinn
Tampa
Tashkent
Tbilisi
Tegucigalpa
Tehran
Tel Aviv
The Hague
Tianjin
Tijuana
Tirana
Tokyo
Toronto
Trieste
Tripoli
Tunis
Turin
Ulan Bator
Utrecht
Valencia
Vancouver
Venice
Vienna
Vilnius
Warsaw
Washington
Wellington
Wilmington
Windhoek
Winnipeg
Xiamen
Yangon
Yaonde
Yerevan
Yokohama
Zagreb
Zurich

List of firms in the GaWC 100 data-base

ACCOUNTANCY

Ernst & Young
Arthur Andersen**
Macintyre Sträter
International (MSI)*
IGAF: International Group of Accounting Firms
AGN International
BDO International*
Grant Thornton International
Horwath International
KPMG
Summit International + Baker Tilly
RSM International*
Moores Rowland International*
HLB International*
Moore Stephens International Network
Nexia International
PKF International*
Fiducial International*
PricewaterhouseCoopers

ADVERTISING

Impiric
TMP Worldwide
Hakuhodo Inc.
Draft Worldwide
Young &Rubicam Inc.*
D'Arcy Masius Benton & Bowles*
FCB
Saatchi & Saatchi*
Ogilvy & Mather Worldwide Inc.
BBDO Worldwide
McCann-Erickson WorldGroup*
J Walter Thompson
Euro RSCG
CMG. Carlson Marketing Group
Asatsu DK

BANKING/FINANCE

WestLB (Westdeutsche Landesbank Girozentrale)
Dresdner Bank
Commerzbank
Deutsche Bank
Chase Hambrecht & Quist*
BNP Paribas
ABN-AMRO Holding NV
Credit Suisse First Boston
Rabobank International*
UBS AG
ING Bank
Barclays
Fuji Bank
Bayerische HypoVereinsbank
Bayerische Landesbank Girozentrale
SDI (Sakura+Dellsher Bank)*
Sumitomo Bank
Sanwa
J. P. Morgan*
Bank of Tokyo-Mitsubishi
Dai-Ichi Kangyo Bank*
HSBC
CitiGroup (Citibank + SSBCiti Asset Management)*

INSURANCE

Allianz Group
Skandia Group
Chubb Group
Prudential
Reliance Group Holdings*
Winterthur
Fortis
CGNU
Liberty Mutual
Royal and Sun Alliance
Lloyd's

LAW

Latham and Watkins
Morgan Lewis
Baker and McKenzie
Clifford Chance
Jones Day
Freshfields Bruckhaus Deringer
Allen and Overy
Dorsey and Whitney
Linklaters–Alliance
White and Case
Cameron McKenna
Morrison and Foerster LLP
Lovells Boesebeck Droste
Skadden, Arps, Slate, Meagher, and Flom LLP
Sidley and Austin
Coudert Brothers

MANAGEMENT CONSULTANCY

Towers Perrin
Logica Consulting
Watson Wyatt Worldwide
Sema Group
CSC
Hewitt Associates
IBM*
Mercer Management Consulting
Boston Consulting Group*
Deloitte Touche Tohmatsu
Booze, Allen & Hamilton
A.T. Kearney
McKinsey & Company
Bain & Company
Compass
Andersen Consulting
Cap Gemini Consulting

Note:

* Firms that were dropped from the analysis because data collected in 2004 was considered unfit for comparision purposes.

** Arthur Anderson bankrupted in 2002 due to the Enron scadall . As change of connectivity of cities due to Arthur Anderson demisse was not a result of Arthur Anderson's location strategy, I dropped it from my analysis

Table of Source and Description of the Variables

Variable	Description	Source
Air Passenger Traffic	Air transport, passengers carried - 2000	The World Bank – World Development Indicators 2004 5.9 Transport infrastructure p.286
teachratio	Pupil-teacher ratio, primary – latest available data 1997/2002	The World Bank – World Development Indicators 2004 2.10 Education inputs p. 74
Phonecost	Telephone average cost of call to US (US$ per three minutes) - latest data available 1997/2002	The World Bank – World Development Indicators 2004
Trade / GNP	Trade (% of GDP) – 2000	The World Bank – World Development Indicators 2004 6.1 Integration with the global economy p.308
GDP	GDP Current Price in 2000	International Monetary Fund World Economic Outlook Database, April 2006 http://www.imf.org/external/pubs/ft/weo/2006/01/data/index.htm
Primcity*GDP		Interaction between GDP Current Price in 2000 and a dummy for whether the city is a primary city (the city with the highest population within the country) (1) or not (0).
City Population	City population using total metropolitan population and, where this is not available, city population. (per 100,000) (closest available year to 2000)	United Nations Statistics Division - Demographic Yearbook 2003: Population of capital cities and cities of 100 000 and more inhabitants: latest available year Available at: http://unstats.un.org/unsd/demographic/sconcerns/densurb/densurb2.htm#DYB (August, 2006)
Quallife2005	Index for Quality of Life in the city for the year 2005	Mercer Index for Quality of Life, 2005 and 2006 Mercer Human Resource Consulting, Quality of Life Press Release, 14th March 2005 (www.mercerhr.com)
Affiliation to Metropolis	Affiliation to the "Metropolis" network of Local Governments in 2006	Metropolis home page[5]
Affiliation to UCLG	Affiliation to the "UCLG" network of Local Governments in 2006	United Cities and Local Governments (UCLG) home page[6]
Top University	Quantity of universities ranked as top 500 located in the city.	Ranking from Institute of Higher Education, Shanghai Jiao Tong University[7].
Container Traffic	Container Traffic in the port (TEUs, 000s)	American Association of Ports Authorities[8] and various website from cities port authorities

[5] http://www.citymayors.com/gratis/metropolis.html (as of September, 2006)
[6] http://www.cities-localgovernments.org/uclg/index.asp (as of September, 2006)
[7] Available at: http://ed.sjtu.edu.cn/rank/2004/top500list.htm
(as of September, 2006)
[8] http://www.aapa-ports.org/pdf/WORLD_PORT_RANKINGS_2004.xls
http://www.aapa-ports.org/pdf/CONTAINER_CENTRAL_SOUTH_AMERICA.xls
http://people.hofstra.edu/geotrans/eng/gallery/Container%20Ports.xls (as of September, 2006)

Regression 1. Robust Linear Regression for Overall Connectivity Growth

Dependent Variable: Connectivity Growth	(I)	Beta Coef.	(II)	Beta Coef.	(III)	Beta Coef.	(IV)	Beta Coef.	(V)	Beta Coef.
OWN CONNECTIVITY 2000			-0.004 (-0.17)	-0.02	*0.03* *(0.78)*	*0.11*	*0.04* *(1.51)*	*0.15*	-0.01 (-0.16)	-0.02
*PRIMARY CITY * GDP*	0.09 (0.78)	*0.04*	0.25 (2.49)**	*0.10*	*0.25* *(2.22)***	*0.11*	*0.29* *(2.71)****	*0.11*	0.09 (0.78)	0.04
CITY POPULATION	18.20 (3.98)***	*0.34*	13.99 (2.53)**	*0.25*	*6.37* *(1.12)*	*0.11*	*2.74* *(0.53)*	*0.05*	18.73 (3.41)***	0.35
QUALITY OF LIFE	-7 (-0.5)	*-0.06*			*19* *(1.67)**	*0.20*			-6 (-0.4)	-0.06
AFFILIATION TO METROPOLIS	290 (0.79)	*0.06*	194 (0.64)	*0.04*	*-60* *(-0.16)*	*-0.01*	*-63* *(-0.2)*	*-0.01*	302 (0.81)	0.07
AFFILIATION TO UCLG	24.72 (0.07)	*0.01*	106.45 (0.36)	*0.03*	*-83.39* *(-0.21)*	*-0.02*	*132.65* *(0.46)*	*0.03*	28.65 (0.08)	0.01
TOP UNIVERSITY	246.80 (2.69)***	*0.22*	187.33 (1.91)*	*0.15*	*119.05* *(1.08)*	*0.10*	*137.12* *(1.41)*	*0.10*	258.42 (2.31)**	*0.23*
CONTAINER TRAFFIC	-0.03 (-0.43)	*-0.03*	-0.10 (-1.6)	*-0.10*	*0.03* *(0.62)*	*0.04*	*0.02* *(0.31)*	*0.02*	-0.03 (-0.42)	-0.03
AIR PASSENGER TRAFFIC	6.97 (1.12)	*0.09*	5.98 (1.23)	*0.08*					6.65 (1.04)	0.08
PUPIL TO TEACHER RATIO	-33.44 (-1.81)*	*-0.16*	-19.76 (-1.54)	*-0.10*					-33.52 (-1.81)*	-0.16
PHONE COST	-329.74 (-4.17)***	*-0.33*	-191.33 (-2.99)***	*-0.21*					-331.80 (-4.06)***	-0.33
TRADE / GNP	12.27 (2.7)***	*0.22*	7.41 (1.85)*	*0.14*					12.45 (2.76)***	0.23
USA DUMMY					*-1935* *(-4.08)****	*-0.31*	*-986* *(-3.05)****	*-0.19*		
UK DUMMY					*836* *(1.9)**	*0.05*	*1056* *(2.23)***	*0.11*		
GERMANY DUMMY					*-578* *(-0.79)*	*-0.06*	*-423* *(-0.9)*	*-0.05*		
CHINA DUMMY					*-138* *(-0.17)*	*-0.01*	*-301* *(-0.44)*	*-0.03*		
INDIA DUMMY					*174* *(0.17)*	*0.01*	*46* *(0.07)*	*0.00*		
BRAZIL DUMMY					1157 (1.41)	0.09	110 (0.18)	0.01		
Constant	1235 (0.79)	.	540 (0.93)	.	-1067 (-1.34)	.	199 (1.03)	.	1204 (0.77)	.
Observations	121		220		153		260		121	
R-squared	0.3738		0.2111		0.2376		0.1474		0.3739	
Adjusted R2	0.3106		0.1694		0.1603		0.1024		0.3044	
Note: absolute t-values in parentheses. *numbers with ***, ** and * are statistically significant at 1%, 5% and 10% significance level respectively.*										

Regression 2. Robust Linear Regression for Connectivity Growth in the Management Sector

Dependent Variable: Con. Growth (MAN)	(I)	Beta Coef.	(II)	Beta Coef.	(III)	Beta Coef.	(IV)	Beta Coef.	(V)	Beta Coef.
OWN CONNECTIVITY 2000			-0.27 (-3.61)***	-0.48	*-0.32* *(-3.27)****	*-0.64*	*-0.29* *(-4)****	*-0.53*	-0.25 (-2.34)**	-0.50
CONNECTIVITY ACC 2000			0.15 (5.8)***	*0.51*	*0.09* *(2.42)***	*0.35*	*0.16* *(6.69)****	*0.58*	0.10 (2.13)**	0.35
CONNECTIVITY INS 2000			0.22 (3.56)***	*0.36*	*0.20* *(2.41)***	*0.36*	*0.21* *(3.24)****	*0.35*	0.16 (1.81)***	0.29
CONNECTIVITY ADV 2000			-0.06 (-1.17)	*-0.13*	*-0.08* *(-1.39)*	*-0.18*	*-0.08* *(-1.51)*	*-0.16*	-0.07 (-1.1)	-0.15
CONNECTIVITY BANK 2000			-0.01 (-0.24)	*-0.03*	*0.03* *(0.76)*	*0.13*	*-0.01* *(-0.18)*	*-0.03*	0.04 (0.9)	0.17
CONNECTIVITY LAW 2000			0.01 (0.09)	*0.01*	*0.10* *(0.76)*	*0.09*	*0.09* *(0.8)*	*0.07*	-0.002 (-0.02)	-0.002
*PRIMARY CITY * GDP*	0.07 (1.34)	0.10	0.04 (0.95)	*0.05*	*0.08* *(1.58)*	*0.11*	*0.04* *(0.86)*	*0.04*	0.06 (1.07)	0.10
CITY POPULATION	3.05 (1.91)*	*0.18*	2.57 (1.91)**	*0.14*	*0.47* *(0.24)*	*0.03*	*-0.29* *(-0.2)*	*-0.01*	2.23 (1.28)	0.13
QUALITY OF LIFE	7.13 (1.8)*	*0.22*			*9.69* *(2.31)***	*0.32*			5.21 (1.04)	0.16
AFFILIATION TO METROPOLIS	82 (0.81)	*0.06*	-13 (-0.15)	*-0.01*	*23* *(0.23)*	*0.02*	*-20* *(-0.24)*	*-0.01*	6.3 (0.06)	0.004
AFFILIATION TO UCLG	-119 (-1.1)	*-0.09*	-41 (-0.51)	*-0.03*	*23* *(0.2)*	*0.02*	*83* *(0.98)*	*0.06*	-110 (-1.02)	-0.08
TOP UNIVERSITY	45 (1.08)	*0.13*	51.88 (1.16)	*0.12*	*46.22* *(1.01)*	*0.13*	*86.54* *(2.11)***	*0.20*	37.34 (0.61)	*0.11*
CONTAINER TRAFFIC	-0.01 (-0.52)	*-0.03*	-0.04 (-3.05)***	*-0.12*	*-0.02* *(-1.25)*	*-0.07*	*-0.02* *(-1.51)*	*-0.06*	-0.03 (-1.6)	-0.10
AIR PASSENGER TRAFFIC	4.00 (1.73)*	*0.16*	2.69 (1.34)	*0.12*					3.38 (0.96)	0.14
PUPIL TO TEACHER RATIO	-10.56 (-1.91)*	*-0.17*	-11.42 (-2.7)***	*-0.18*					-9.15 (-1.66)*	-0.14
PHONE COST	-22 (-0.88)	*-0.07*	-9.66 (-0.5)	*-0.03*					-20.53 (-0.72)	-0.07
TRADE / GNP	1.34 (0.81)	*0.08*	0.05 (0.04)	*0.00*					0.22 (0.13)	0.01
USA DUMMY					*134* *(0.6)*	*0.07*	*122* *(0.95)*	*0.07*		
UK DUMMY					*405* *(1.71)**	*0.07*	*32* *(0.17)*	*0.01*		
GERMANY DUMMY					*34* *(0.19)*	*0.01*	*55* *(0.38)*	*0.02*		
CHINA DUMMY					*172* *(0.65)*	*0.05*	*162* *(0.98)*	*0.05*		
INDIA DUMMY					*388* *(1.19)*	*0.10*	*286* *(1.41)*	*0.08*		
BRAZIL DUMMY					168 (0.57)	0.04	63 (0.3)	0.02		
Constant	210 (0.49)	.	382 (1.63)	.	-434 (-1.85)*	.	67 (0.84)	.	87 (0.21)	.
Observations	121		220		153		260		121	
R-squared	0.3421		0.3735		0.4058		0.3313		0.4182	
Adjusted R2	0.2757		0.3241		0.3209		0.2814		0.3221	

Note: absolute t-values in parentheses.
*Numbers with ***, ** and * are statistically significant at 1%, 5% and 10% significance level respectively.*

Regression 3. Robust Linear Regression for Connectivity Growth in the Banking Sector

Dependent Variable: Con. Growth (BANK)	(I)	Beta Coef.	(II)	Beta Coef.	(III)	Beta Coef.	(IV)	Beta Coef.	(V)	Beta Coef.
OWN CONNECTIVITY 2000			-0.35 (-7.08)***	-1.09	*-0.27* *(-4.51)****	*-0.88*	*-0.31* *(-6.14)****	*-0.98*	-0.31 (-5.29)***	-1.03
CONNECTIVITY ACC 2000			0.03 (0.71)	*0.07*	*0.08* *(1.31)*	*0.20*	*0.05* *(1.39)*	*0.14*	0.09 (1.19)	0.22
CONNECTIVITY MAN 2000			0.13 (1.19)	*0.18*	*0.32* *(2.15)***	*0.45*	*0.25* *(2.09)***	*0.33*	0.12 (0.89)	0.18
CONNECTIVITY INS 2000			0.29 (3.2)***	*0.35*	*0.11* *(0.86)*	*0.15*	*0.25* *(2.75)****	*0.30*	0.18 (1.42)	0.24
CONNECTIVITY ADV 2000			-0.05 (-0.58)	*-0.08*	*-0.12* *(-1)*	*-0.18*	*-0.10* *(-1.04)*	*-0.15*	-0.05 (-0.51)	-0.08
CONNECTIVITY LAW 2000			0.12 (0.65)	*0.07*	*-0.05* *(-0.25)*	*-0.04*	*0.07* *(0.41)*	*0.04*	-0.01 (-0.03)	-0.01
*PRIMARY CITY * GDP*	0.051 (0.76)	0.1	0.13 (2.5)***	*0.12*	*0.17* *(2.72)****	*0.17*	*0.18* *(3.19)****	*0.15*	0.10 (1.6)	0.11
CITY POPULATION	2.68 (0.82)	*0.12*	8.72 (3.67)***	*0.34*	*5.78* *(2.11)***	*0.23*	*3.79* *(1.42)*	*0.14*	9.07 (3.66)***	0.40
QUALITY OF LIFE	5.27 (0.9)	*0.12*			*5.99* *(1.23)*	*0.14*			5.26 (0.77)	0.12
AFFILIATION TO METROPOLIS	-74 (-0.4)	*-0.04*	192 (1.44)	*0.09*	*-32* *(-0.21)*	*-0.02*	*59* *(0.48)*	*0.03*	233 (1.3)	0.12
AFFILIATION TO UCLG	13 (0.07)	*0.01*	-85 (-0.72)	*-0.04*	*-105* *(-0.62)*	*-0.05*	*-49* *(-0.42)*	*-0.03*	-8 (-0.05)	-0.004
TOP UNIVERSITY	-38 (-0.76)	*-0.08*	1.35 (0.03)	*0.00*	*-68* *(-1.16)*	*-0.13*	*-35* *(-0.65)*	*-0.06*	13.1 (0.23)	*0.03*
CONTAINER TRAFFIC	0.01 (0.28)	*0.03*	-0.01 (-0.53)	*-0.03*	*0.06* *(2.42)***	*0.17*	*0.04* *(1.35)*	*0.11*	0.02 (0.71)	0.04
AIR PASSENGER TRAFFIC	0.29 (0.1)	*0.01*	5.94 (2.78)**	*0.19*					5.66 (1.57)	0.17
PUPIL TO TEACHER RATIO	7.12 (0.73)	*0.08*	1.36 (0.25)	*0.02*					8.33 (1.06)	0.10
PHONE COST	-118 (-3.18)***	*-0.27*	-91 (-3.66)***	*-0.21*					-132 (-3.9)***	-0.31
TRADE / GNP	2.79 (1.31)	*0.12*	3.10 (1.58)	*0.13*					6.64 (3.16)***	0.28
USA DUMMY					*-917* *(-3.3)****	*-0.33*	*-460* *(-2.72)****	*-0.19*		
UK DUMMY					*1139* *(3.94)****	*0.14*	*788* *(6.19)****	*0.18*		
GERMANY DUMMY					*14* *(0.05)*	*0.003*	*27* *(0.16)*	*0.008*		
CHINA DUMMY					*-336* *(-1.3)*	*-0.07*	*114* *(0.41)*	*0.02*		
INDIA DUMMY					*-485* *(-0.87)*	*-0.09*	*261* *(0.75)*	*0.06*		
BRAZIL DUMMY					581 (3.23)***	0.10	316 (1.9)*	0.06		
Constant	-1164 (-1.78)*	.	-326 (-1.19)	.	-794 (-2.47)**	.	-265 (-2.64)***	.	-1369 (-2.11)**	.
Observations	121		220		153		260		121	
R-squared	0.1087		0.3617		0.3289		0.3263		0.3713	
Adjusted R2	0.0188		0.3113		0.2330		0.2760		0.2675	
Note: absolute t-values in parentheses. *Numbers with ***, ** and * are statistically significant at 1%, 5% and 10% significance level respectively.*										

Regression 4. Robust Linear Regression for Overall Total Site Service Status Growth

Dependent Variable: SV Change	(I)	Beta Coef.	(II)	Beta Coef.	(III)	Beta Coef.	(IV)	Beta Coef.	(V)	Beta Coef.
CONNECTIVITY IN 2000			0.0001 (0.61)	0.0648	*0.0002 (1.33)*	*0.1692*	*0.0002 (2.24)***	*0.2120*	0.0001 (0.57)	0.0820
*PRIMARY CITY * GDP*	-0.0002 (-0.34)	-0.0234	0.0004 (0.55)	*0.0392*	*0.0012 (1.94)**	*0.1194*	*0.0014 (1.65)**	*0.1172*	-0.0003 (-0.4)	-0.0267
CITY POPULATION	0.072 (2.7)***	*0.280*	0.055 (1.97)**	*0.216*	*0.008 (0.3)*	*0.030*	*0.001 (0.03)*	*0.003*	0.063 (2.09)**	0.245
QUALITY OF LIFE	-0.01 (-0.13)	*-0.02*			*0.06 (1.02)*	*0.12*			-0.02 (-0.34)	-0.05
AFFILIATION TO METROPOLIS	0.37 (0.2)	*0.02*	-0.03 (-0.02)	*0.00*	*-0.50 (-0.28)*	*-0.02*	*-0.26 (-0.17)*	*-0.01*	0.18 (0.1)	0.01
AFFILIATION TO UCLG	2.38 (1.23)	*0.11*	1.47 (1.06)	*0.08*	*1.47 (0.77)*	*0.07*	*1.30 (1)*	*0.07*	2.31 (1.18)	0.11
TOP UNIVERSITY	1.15 (2.3)**	*0.22*	0.72 (1.31)	*0.13*	*1.26 (0.52)*	*0.07*	*1.12 (0.91)*	*0.07*	0.95 (1.5)	*0.18*
CONTAINER TRAFFIC	0.0005 (0.64)	*0.0964*	-0.0001 (-0.09)	*-0.0119*	*0.0004 (1.25)*	*0.1080*	*0.0002 (0.73)*	*0.0633*	0.0004 (0.61)	0.0932
AIR PASSENGER TRAFFIC	0.07 (1.91)*	*0.19*	0.05 (2.1)**	*0.15*					0.08 (2)**	0.21
PUPIL TO TEACHER RATIO	-0.04 (-0.46)	*-0.04*	-0.02 (-0.41)	*-0.03*					-0.04 (-0.42)	-0.04
PHONE COST	-1.24 (-3.09)***	*-0.26*	-0.63 (-2.11)**	*-0.15*					-1.20 (-2.89)***	-0.25
TRADE / GNP	0.07 (3.13)***	*0.28*	0.04 (1.81)**	*0.16*					0.07 (3.01)***	0.27
USA DUMMY					*-9.22 (-4.12)****	*-0.32*	*-4.46 (-2.98)****	*-0.20*		
UK DUMMY					*6.63 (2.87)****	*0.08*	*4.17 (2.56)***	*0.10*		
GERMANY DUMMY					*-1.05 (-0.3)*	*-0.02*	*-1.36 (-0.73)*	*-0.04*		
CHINA DUMMY					*6.80 (1.21)*	*0.13*	*4.71 (1.2)*	*0.10*		
INDIA DUMMY					*3.13 (0.67)*	*0.05*	*2.06 (0.76)*	*0.05*		
BRAZIL DUMMY					1.01 (0.29)	0.02	0.03 (0.01)	0.00		
Constant	-2.7535 (-0.37)	.	-2.2347 (-0.78)	.	-4.8458 (-1.38)	.	-1.0887 (-1.37)	.	-2.2961 (-0.31)	.
Observations	121		220		153		260		121	
R-squared	0.35		0.20		0.27		0.18		0.35	
Adjusted R2	0.29		0.16		0.20		0.13		0.28	

Note: absolute t-values in parentheses.
*Numbers with ***, ** and * are statistically significant at 1%, 5% and 10% significance level respectively.*

Regression 5. Robust Linear Regression for Total Site Service Status Growth in the Management Sector

Dependent Variable: SV. Change (MAN)	(I)	Beta Coef.	(II)	Beta Coef.	(III)	Beta Coef.	(IV)	Beta Coef.	(V)	Beta Coef.
OWN CONNECTIVITY 2000			-0.002 (-5.88)***	-0.93	*-0.002 (-5.12)****	*-0.96*	*-0.002 (-6.29)****	*-0.90*	-0.002 (-4.57)***	-0.95
CONNECTIVITY ACC 2000			0.0004 (3.64)***	*0.34*	*0.0003 (1.86)**	*0.24*	*0.0005 (4.72)****	*0.43*	0.0003 (1.4)	0.22
CONNECTIVITY INS 2000			0.0006 (1.66)*	*0.21*	*0.0005 (1.08)*	*0.19*	*0.0007 (2.05)***	*0.25*	0.00002 (0.04)	0.01
CONNECTIVITY ADV 2000			-0.0002 (-0.54)	*-0.07*	*-0.0003 (-0.89)*	*-0.13*	*-0.0003 (-1.1)*	*-0.14*	0.00001 (0.02)	0.00
CONNECTIVITY BANK 2000			0.0003 (1.63)	*0.28*	*0.0004 (2.05)***	*0.42*	*0.0003 (1.59)*	*0.26*	0.0005 (2.04)**	0.44
CONNECTIVITY LAW 2000			0.0001 (0.08)	*0.01*	*-0.0002 (-0.2)*	*-0.03*	*0.0002 (0.37)*	*0.04*	-0.0002 (-0.27)	-0.05
*PRIMARY CITY * GDP*	-0.0002 (-0.74)	-0.08	-0.0003 (-1.09)	*-0.08*	*-0.00003 (-0.1)*	*-0.01*	*-0.0001 (-0.4)*	*-0.03*	-0.0005 (-1.38)	-0.14
CITY POPULATION	0.02 (1.88)*	*0.22*	0.02 (2.61)***	*0.26*	*0.01 (0.53)*	*0.07*	*0.004 (0.38)*	*0.04*	0.02 (2.52)**	0.30
QUALITY OF LIFE	-0.004 (-0.18)	*-0.02*			*0.03 (1.87)**	*0.22*			0.03 (1.11)	0.16
AFFILIATION TO METROPOLIS	0.14 (0.21)	*0.02*	-0.56 (-1.24)	*-0.08*	*-0.20 (-0.4)*	*-0.03*	*-0.31 (-0.75)*	*-0.05*	-0.32 (-0.56)	-0.05
AFFILIATION TO UCLG	-0.42 (-0.7)	*-0.06*	0.10 (0.26)	*0.02*	*0.35 (0.62)*	*0.05*	*0.51 (1.3)*	*0.08*	-0.17 (-0.3)	-0.02
TOP UNIVERSITY	0.17 (0.68)	*0.10*	0.52 (2.23)**	*0.27*	*0.52 (1.92)**	*0.29*	*0.53 (2.43)**	*0.27*	0.70 (2.15)**	*0.41*
CONTAINER TRAFFIC	0.00 (1.15)	*0.11*	0.00 (-0.78)	*-0.06*	*0.00 (-0.71)*	*-0.05*	*0.00 (-1.14)*	*-0.07*	0.00 (0.2)	0.02
AIR PASSENGER TRAFFIC	0.04 (2.81)***	*0.34*	0.01 (1.47)	*0.14*					0.02 (1.08)	0.17
PUPIL TO TEACHER RATIO	-0.01 (-0.42)	*-0.04*	-0.03 (-1.52)	*-0.10*					-0.01 (-0.49)	-0.04
PHONE COST	-0.10 (-0.82)	*-0.06*	0.004 (0.05)	*0.00*					-0.07 (-0.52)	-0.05
TRADE / GNP	0.02 (2.23)**	*0.23*	0.01 (1.25)	*0.10*					0.02 (2.12)**	0.21
USA DUMMY					*-0.18 (-0.17)*	*-0.02*	*0.11 (0.19)*	*0.01*		
UK DUMMY					*4.64 (4.18)****	*0.17*	*0.67 (0.71)*	*0.05*		
GERMANY DUMMY					*0.49 (0.42)*	*0.03*	*0.14 (0.2)*	*0.01*		
CHINA DUMMY					*3.93 (3)****	*0.23*	*3.07 (3.23)****	*0.19*		
INDIA DUMMY					*1.93 (1.31)*	*0.10*	*1.67 (1.85)**	*0.11*		
BRAZIL DUMMY					0.47 (0.32)	0.02	0.04 (0.05)	0.00		
Constant	-0.74 (-0.35)	.	-0.76 (-0.69)	.	-2.78 (-2.77)***	.	-0.97 (-3.15)***	.	-3.70 (-1.81)*	.
Observations	121		220		153		260		121	
R-squared	0.23		0.30		0.38		0.29		0.40	
Adjusted R2	0.15		0.25		0.30		0.23		0.30	

Note: absolute t-values in parentheses.
*Numbers with ***, ** and * are statistically significant at 1%, 5% and 10% significance level respectively.*

Regression 6. Robust Linear Regression for Total Site Service Status Growth in the Banking Sector

Dependent Variable: SV Change (BANK)	(I)	Beta Coef.	(II)	Beta Coef.	(III)	Beta Coef.	(IV)	Beta Coef.	(V)	Beta Coef.
OWN CONNECTIVITY 2000			*-0.0011* *(-4.71)****	*-0.87*	*-0.0008* *(-2.84)****	*-0.60*	*-0.0010* *(-4.01)****	*-0.73*	-0.0010 (-3.46)***	-0.74
CONNECTIVITY ACC 2000			*0.00* *(0.78)*	*0.08*	*0.00* *(1.53)*	*0.23*	*0.0002* *(1.39)*	*0.15*	0.00 (1.31)	0.24
CONNECTIVITY MAN 2000			*0.0005* *(0.98)*	*0.16*	*0.0016* *(2.21)**	*0.49*	*0.0011* *(2.05)**	*0.35*	0.0004 (0.6)	0.14
CONNECTIVITY INS 2000			*0.0013* *(3.07)****	*0.38*	*0.0005* *(0.76)*	*0.13*	*0.0009* *(2.27)**	*0.26*	0.0010 (1.75)*	0.30
CONNECTIVITY ADV 2000			*-0.0001* *(-0.26)*	*-0.04*	*-0.0005* *(-0.86)*	*-0.17*	*-0.0003* *(-0.73)*	*-0.13*	-0.0001 (-0.27)	-0.05
CONNECTIVITY LAW 2000			*0.0005* *(0.55)*	*0.08*	*-0.0005* *(-0.5)*	*-0.08*	*0.0005* *(0.5)*	*0.07*	-0.0002 (-0.23)	-0.04
*PRIMARY CITY * GDP*	0.0007 (1.86)*	0.17	*0.00094* *(3.54)****	*0.21*	*0.00117* *(3.66)****	*0.26*	*0.0012* *(4.01)****	*0.23*	0.0008 (2.54)**	0.22
CITY POPULATION	0.01 (0.85)	*0.12*	*0.026* *(2.38)**	*0.24*	*0.012* *(0.9)*	*0.10*	*0.01* *(0.61)*	*0.06*	0.02 (1.98)*	0.24
QUALITY OF LIFE	0.03 (1.11)	*0.14*			*0.01* *(0.26)*	*0.03*			0.01 (0.26)	0.04
AFFILIATION TO METROPOLIS	-0.10 (-0.12)	*-0.01*	*0.75* *(1.2)*	*0.09*	*-0.12* *(-0.17)*	*-0.01*	*0.39* *(0.67)*	*0.04*	0.73 (0.89)	0.09
AFFILIATION TO UCLG	0.50 (0.66)	*0.06*	*0.04* *(0.07)*	*0.00*	*-0.26* *(-0.34)*	*-0.03*	*-0.08* *(-0.15)*	*-0.01*	0.37 (0.45)	0.04
TOP UNIVERSITY	0.08 (0.3)	*0.04*	*-0.02* *(-0.07)*	*-0.01*	*-0.30* *(-0.99)*	*-0.12*	*-0.26* *(-0.98)*	*-0.10*	0.07 (0.24)	*0.03*
CONTAINER TRAFFIC	0.00 (0.1)	*0.01*	*0.00* *(-0.53)*	*-0.04*	*0.00031* *(1.91)**	*0.19*	*0.00* *(1.18)*	*0.12*	0.00 (0.06)	0.01
AIR PASSENGER TRAFFIC	0.01 (0.42)	*0.03*	*0.020* *(2.12)**	*0.15*					0.030 (1.8)*	0.20
PUPIL TO TEACHER RATIO	0.04 (1.07)	*0.11*	*0.03* *(1.16)*	*0.07*					0.05 (1.26)	0.12
PHONE COST	-0.51 (-3.43)***	*-0.27*	*-0.35* *(-3.16)****	*-0.20*					-0.53 (-3.67)***	-0.28
TRADE / GNP	0.02 (1.84)*	*0.18*	*0.013* *(1.32)*	*0.13*					0.029 (2.78)***	0.28
USA DUMMY					*-4.06* *(-3.59)****	*-0.32*	*-1.95* *(-2.76)****	*-0.19*		
UK DUMMY					*5.40* *(2.51)**	*0.15*	*2.61* *(4.03)****	*0.14*		
GERMANY DUMMY					*0.64* *(0.4)*	*0.03*	*-0.60* *(-0.66)*	*-0.04*		
CHINA DUMMY					*-1.50* *(-1.01)*	*-0.06*	*0.28* *(0.21)*	*0.01*		
INDIA DUMMY					*-2.53* *(-0.98)*	*-0.10*	*0.77* *(0.53)*	*0.04*		
BRAZIL DUMMY					1.39 (1.39)	0.05	0.97 (1.26)	0.05		
Constant	-5.31 (-1.89)*	.	-1.98 (-1.55)	.	-1.97 (-1.37)	.	-1.04 (-2.24)**	.	-5.23 (-1.76)*	.
Observations	121		220		153		260		121	
R-squared	0.19		0.25		0.27		0.22		0.32	
Adjusted R2	0.11		0.19		0.17		0.16		0.21	

Note: absolute t-values in parentheses.
*Numbers with ***, ** and * are statistically significant at 1%, 5% and 10% significance level respectively.*