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Periurbanisation in Tamil Nadu: a quantitative approach

Sébastien Oliveau

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ABOUT THIS OCCASIONAL PAPER

This Occasional paper is the second volume of a series of three on **Peri-urban dynamics**. The first volume proposed a review of concepts and general issues (CSH Occasional Paper No. 14, edited by Véronique Dupont) and the third volume will present case studies in Chennai, Hyderabad and Mumbai.

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This paper restates some of the results of a doctoral thesis submitted to the University Of Paris 1 Panthéon-Sorbonne on the spatial dimensions of modernisation in Tamil Nadu. I should first express my gratitude to Denise Pumain, who agreed to supervise my Ph.D., and all the *Geographie-cités* team (CNRS, Paris - France). The French Institute of Pondicherry (Population & Space Programme) provided funding, office space and staff support for my work. It was also sponsored by the *Laboratoire Population-Environnement-Développement* (IRD, Marseille - France), the French ministry of education and research, the French ministry of foreign affairs. The University of Madras (Chennai - India) welcomed me in the French and Geography Department.

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INTRODUCTION[1]

Our study of periurbanisation is in the nature of a general regional analysis. We believe that the differences observed at the regional level are the result of various types of changes. One of these changes, namely urban expansion, is of a singular nature and is particularly important as much for its social as for its spatial dimension. If urban expansion is seen as a dynamic phenomenon when analysing the relationship between the cities and the countryside, it can be interpreted as a phenomenon responsible for innovation (Berry, 1973). In a synchronic study of urban expansion where its kinetic dimension is not taken into account, it is preferable to use a centre-periphery model. Such a model envisages a social or spatial organisation (and in geography, often as the transfer of the first to the second) where the centre dominates the periphery. Periurban space is then said to be dominated by the city, while rural space is not (or no longer) dominated by it.

Periurbanisation can hence be understood as a specific phase of urban expansion. It is then possible to discern the social dimension or, to put it briefly, the transformation of the habitus and modes of production as well as the geographical dimension seen as the projection of social issues in space. This projection is directly visible while studying the landscape, particularly in the changes in the settlement pattern that it brings about, but also indirectly while analysing the characteristics of the population units. What

[1] This paper seeks to convey a view of periurbanisation based on French documentation and experiences. French geographers have shown a great deal of interest in the relationship between cities and rural areas from the early twentieth century and have faced the problem of periurbanisation as far back as the 1950s. Furthermore, the population in France is relatively concentrated around well-defined cities, a situation very similar to India's, especially in Tamil Nadu. Finally, l'INSEE (National Institute for Statistics and Economic Studies, Paris - France) has done significant work in this field and has contributed to the classification of rural areas in France in order to highlight their diversity.

particularly interests us is the latter dimension, which can be understood through statistical and cartographic analyses.

However, urban expansion does not systematically give rise to the phenomena of periurbanisation. Thus, there may be instances where there is a continuous spread of the urban population (suburbs), as well as the spread of urban ideology to rural areas, which is often described as modernisation, but which could also be called social urbanisation.

Thus the structure of suburbanisation differentiates it from periurbanisation. Similarly, rural entities assume urban characteristics like the development of secondary (industry) and especially tertiary (services) activities, an increase in the level of education and the appearance of new services and businesses. More inhabitants have contacts with the city (due to greater accessibility and mobility). The major difference between suburbs and periurban villages lies in their physical links with the city. Suburbs are the continuation of the built-up area from the main city and tend to administratively merge with the city in the long run, whereas periurban spaces are still physically separated from the city by agricultural land and /or natural open spaces (there is no continuity with the build-up area of the city).

Finally, the phenomena of change often affects rural non-periurban spaces or, in other words, they may transform the way of life even though there may not be any change in the general (spatial or architectural for example) characteristics of the villages. Thus, the advent of the media in the form of newspapers, radio or television changes the villagers' perception without necessarily changing the village itself. Furthermore, there is no change in the access to the city. We thus find ourselves in the presence of modernisation, whose geographical consequences are not necessarily visible or are too minor to be taken into consideration. Regarding this last point, we find that when a change affects society as a whole, with the same

force and at the same time, it does not lead to spatial differentiation, as the existing equilibrium is not disturbed. So, though it is easy to differentiate between the suburbs and periurban spaces, the difference between periurbanisation and the modernisation of the rural environment is much more blurred.

It is from this point of view that we have conducted this study. This paper is divided into two main parts. The first is more concerned with methodology; it places our approach in the right perspective and describes the tools used to obtain the results presented in the second part, which shows how the city exerts its influence on villages, first by emphasising the relationship between cities and rural areas and then by drawing attention to the real dimension of periurbanisation. Finally, we will question the role of accessibility, which will enable us to propose in our conclusion a more refined model of the periurban setup.

A. Cities and Rural Areas

The study of the relationship between cities and rural areas in France can be traced back to the writings of Georges Chabot in 1931 on "zones influenced by cities" (Dugrand, 1963). Studies on this subject increased after World War II with research being conducted in the different regions of France (see, for example, Kayser, 1960, Dugrand, 1963).

In India too, there have been a number of studies on cities and rural areas (see, for example, Berry & Rao, 1968). However, there was a decline in the 1980s. Sopher's book (1980) constitutes the high point of this research, especially the chapter by Sharma (1980) focusing on the relationship between the major cities and the rural hinterland in eastern Gujarat and north-west Andhra Pradesh.

Kundu offers an explanation for this decline in his work on the links between cities and rural areas; he says that since

researchers were not able to find zones of influence around Indian cities as obvious as those seen in the West, they gave up this field of study (Kundu, 1992). It is also possible that the tools and data available at that time did not allow them to proceed further with their investigations. The development of information technology, which has made it easier to process large quantities of data, and the availability of a wider variety of data, have given rise to new research in this field. The most recent example is the exploration of different forms of periurbanisation by Kundu and others with the help of data from NCAER (National Council of Applied Economic Research) and census reports (Kundu *et al.*, 2002).[2]

1. Dichotomy or Continuum?

The city as the home of modernity is the opposite of the village, which stands for tradition. At least in India, this was the view held by Gandhi, because for him the city was the symbol of colonisation and he believed that the "real" India lived in its villages. Ambedkar, on the contrary, described the village as "a sink of localism and a den of ignorance and narrow mindedness and communalism" (Ambedkar, 1948). The cliché persists even today. But this opposition is not fiction for "perceptive experience makes the difference between urban and rural environments very obvious" (Schmitt, Gofette-Nagot, 2000: 42). That is precisely why these two categories are so clearly differentiated in our interpretation of this phenomenon.

a) Non-acceptance of antagonism

It is generally acknowledged that the city is a centre of innovation bringing together rare services (Charrier, 1998: 34-35; Guillain, Huriot, 2000). We may refer to Bairoch's explanatory model to understand this phenomenon: when the population of a place

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[2] We have already pointed out the limitations of this approach in Guilmoto, Oliveau *et al.* (2005).

increases, the absolute number of individuals engaged in non-agricultural activities goes up. This increase leads to a rise in the specialisation and diversification of activities (Bairoch, 1985: 47). This model is in accordance with Christaller's theory of central places, which explains the presence of an urban hierarchy by differentiating functional levels (Christaller, 1933). This diversity is therefore one of the elements in the innovative power of cities as compared to villages. We may add the role of density and the greater freedom enjoyed by individuals.

Innovators need to interact, and to interact they must meet. In addition, interaction between individuals depends on their proximity (Pini, 1992). So the greater the density, the more the general proximity. The increase in density is thus accompanied by a greater probability of interaction between individuals (Pumain & Robic, 1996). Since there is more density in cities, there is also more interaction (Pumain & Saint Julien, 2001). This is the "density effect" described by Guillain and Huriot (2000).

Moreover, change is often the result of sharing different experiences and therefore requires social, cultural and/or economic diversity. Almost by definition, the city is a place where there is not only economic diversity (Pumain, 1992a), but also social and cultural diversity, because it is a place where there is relative freedom.

As a matter of fact, and this is especially true of India, the city is a place where there is least social pressure and this allows individuals to act with fewer constraints, finding themselves paradoxically sheltered by the 'group within the crowd'. They can free themselves from some of the established rules of behaviour (Srinivas, 1996a) as they are sheltered from the critical eyes of others and from what could be called the "village effect". Once behaviour is freed from the restraints imposed by tradition, it can change more easily. This aspect of the city encourages and

attracts the forces of social change and individuals whose inclination is not to conform to the norm.[3]

There is thus a tendency to oppose these two categories (city/modernity and rural/tradition) according to a binary logic that simplifies analysis. The antagonism between a modern urban object and a rural object, which is not modern, is stressed by Kundu *et al.* (2002). They stress that there is an absence of continuum in the space surrounding urban centres and defend the idea of a dichotomy by underlining the fact that socio-economic indicators do not decrease gradually from the cities to the surrounding countryside.

As for us, we prefer to interpret these results as a sign of non-linear continuity. If the indicators decrease abruptly, it is because cities do not have a significant disseminative capacity. Nevertheless, the continuity cannot be denied. This continuity is one of the reasons why the dichotomous approach opposing the city to the country in black and white terms has progressively lost its significance and has now been practically abandoned.[4] This abandonment must be considered in the context of changes which may be different but leads to the same conclusions, as indicated by studies in the developing countries and the so-called Western countries (on this subject, see Hugo *et al.*, 2003).

The former have brought to the forefront the close relations that rural migrants in cities continue to maintain with their native villages. All studies on migrants in India confirm this, whether it

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[3] It may also be pointed out that the bigger the city, the more migrants it attracts from afar who make the population more heterogeneous.

[4] It is interesting to note that the ancient Indian texts say that the city and the countryside are like two points of a continuum (Kundu, 1999 – on the basis of B.D. Chattopadhaya's book (1997), "The City in Early India: Perspectives from Texts", *Studies in History*, Jawaharlal Nehru University, New Delhi).

is the rural areas of Karnataka (Racine 1994) or the homeless population of Delhi (Dupont, 1999). The latter even go so far as to recreate their villages in the slums of the metropolis, "importing" their rural value systems into the heart of the world's largest metropolises, Bombay's Dharavi slum being an excellent example (Saglio-Yatzimirsky, 2002). Besides, the inhabitants of cities and rural areas in developing countries move from one to the other and use the resources provided by these spaces, often keeping "one foot in and one foot out", as Chaléard and Dubresson (1989) have said about Abidjan, the capital of Ivory Coast.

Ramachandran (1989: 99), whose outlook is a more cultural one, emphasises the continuity between urban and rural spaces. India being a country that is socially stratified by religion (and *jati*), ethnic groups and linguistic differences, the pattern of living is more closely linked with the social group(s) to which a person belongs than with the place where he/she lives. Social practices (extended families, rules regarding marriage and commensalism, etc.) do not change (or change very little) irrespective of the place or the size of the population unit. Even though the city allows much more freedom, many values remain common to the village and the city.

The introduction of rural customs into cities in the developing countries is comparable to the extension of urban culture to rural areas in the western countries. In the latter, the development of mass media has spread urban ideas to the rural world, thus effacing the major part of the differences between the inhabitants of these two spaces. Today, some people in France would like to eliminate the differences between the city and the countryside, considering that all lifestyles are similar to the urban lifestyle. However, this typically western attitude needs to be qualified. Even if all patterns of living become alike, there would still be differences whose importance should not be underestimated, because people do not live in the same way in a village in central

France as in the central districts of Paris, irrespective of the social stratum to which they belong.

The same processes are at work in the North and in the South and the media play the same role (depending, of course, on their presence in these areas). Urban and rural cultures influence each other and it becomes clear that proximity makes this exchange easier. Besides, this adds force to Chaléard's and Dubresson's observation (1999: 12) in their introduction to *Villes et campagnes dans les pays du Sud*: "The most dynamic rural areas are often those that are the most closely connected with cities, while enclosed spaces or more distant urban agglomerations are generally those that are the most affected by poverty and depopulation." As these writers suggest, it is advisable to give up this dichotomous view and alleged antagonism to affirm the continuity of the two spaces, retaining the terms urban and rural only "for the sake of linguistic convenience [to describe] the two extremes of a gradient representing the intensity of the change" (Auriac, Rey, 1998: 30), because the distinction between these two types of population is useful (Pumain, 1992a: 445).

b) Multiplicity of rural areas

It therefore follows that one cannot have the countryside on one side and the city on the other in opposition to each other. There are in fact rural areas that are economically and socially heterogeneous within the same region and geographers have made no mistake about it. The multitude of terms that exist to describe these different phenomena says it all. Thus, there are several words to describe the zones around cities and those lying further away: "hinterland" is used in one international version[5] and "umland" in another (though both are derived from German, *um* means around while

[5] This term is common to German, English and French geographers.

hinter means behind)[6]. The term "decay" is more technical and used in the field of spatial analysis.

If there are so many terms, it is because the grasp of the phenomenon and of its numerous forms can vary in space and change with time. The richness of the terminology reflects the numerous and multiple patterns of settlement that are found**,** urging each writer to qualify this notion. The most recent studies on the western world use new terms like "periurbanisation"[7] which seeks to describe the urbanisation of the countryside on the periphery of cities. The term « rurbanisation » is also used to emphasise the social transformation of rural areas, that is to say their integration into the urban value system (a phenomenon that is still very western but is gradually spreading to the societies of the South), mainly due to the migration of the urban population to rural areas as a return to one's roots or migration to more salubrious lands. The term "counterurbanization" has been proposed to describe this phenomenon of city-dwellers settling down in the countryside.

We will now concentrate on the phenomenon of periurbanisation and focus on the view proposed by INSEE through its nomenclature of French communes. This nomenclature introduces a geographical dimension in the classification by distinguishing between two types of spaces: "spaces that are predominantly urban" and "spaces that are predominantly rural". Thus predominantly urban spaces – divided into an urban area, an urban pole, a periurban ring, multi-polarised communes and periurban communes – are opposed to predominantly rural spaces, where it is possible to make a distinction between rural areas where the urban influence is negligible, rural poles, their periphery and finally isolated rural areas (Hilal, Schmitt, 1997). The

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6 Kundu (1992: 101) remarks that the two terms are sometimes interchangeable.

7 The periurban concept itself has several interpretations. As Jean & Calenge (1997: 391) remind us, "each writer stresses on one aspect, which results in a variable terminology, reflecting the vagueness of space."

geographical dimension is reintroduced in this manner in the socio-economic analysis of spaces.

This very precise division reminds us of an essential element in the study of the relationship between cities and rural areas: the dichotomy is artificial, the division is not very clear and the rural-urban continuum remains. "It is indispensable to differentiate rural spaces according to their distance from the city and the intensity of their relations with the latter. In fact, being close to the city allows the rural areas to partly benefit from the advantages of the city." (Goffette-Nagot, Schmitt, 1998: 175).

It is however advisable to point out that rural space is always defined as opposed to the city: "defining space amounts in this case to agreeing on a definition of what is urban" (Schmitt, Gofette-Nagot; 2000: 43). The definition of urban generally forms the centre of the study and rural is defined as its opposite (Hugo *et al.*, 2003). Though this scientific attitude is sometimes criticised (Thomsin, 2001), it is justifiable and it is difficult to get rid of it.

If we look at it from a historical perspective, rural space seems to be the foundation on which cities developed. So there must be an earlier undefined space from which the city, a new geographical object, emerged. Every city is born of a village[8]. The rural precedes the urban[9]. However, this new object stands out and is the subject of a special definition.

2. Defining the City

It therefore seems necessary to propose a definition for the urban fact before proceeding any further. But though the city may be "a fact that cannot be ignored, an indisputable proof, one does not

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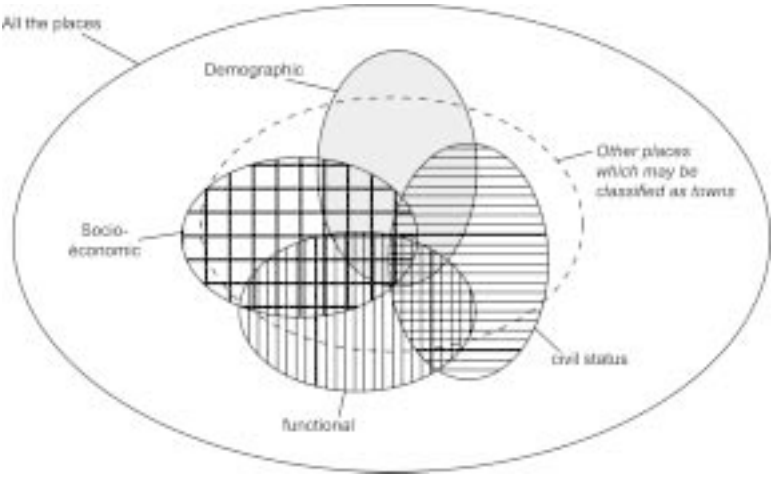
[8] There are certainly cities that were created *ex nihilo* (Chandigarh is a good example in India), but these cities appear nonetheless in a space that was earlier classified as rural.

[9] This is shown for example by Champakalakshmi (1996) with reference to South India.

know how to define it, at least completely, that is to say in a manner encompassing all the manifestations of the term, and nothing but these manifestations, and that this definition should be acceptable to all." (Derycke *et al.*, 1996: 324).

The impossibility of finding a single definition of the city has been pointed out many times (Pumain, Robic, 1996; Beguin, 1996) and is due mainly to its universal character. The city is present everywhere and each society builds it in its own way. This universal character has made it multiform. To describe it, we must use criteria that are simultaneously social, demographic, historical and spatial (Pumain, 1994). This multiplicity of criteria rules out any permanent definition. As Le Gleau, *et al.* wrote about Europe, "cities are objects that are too rich and too diverse for only one definition or a single concept to be able to describe them" (Le Gleau, *et al.*, 1996: 10).

Figure 1 : Different definitions of urban[10]
(according to Moriconi-Ebrard, 1994: 52)



[10] For definitions of the city, we will refer to Bairoch (1985: 29) who estimates that by taking up "systematically all the criteria suggested by various writers, we may probably reach 25 to 30 [definitions]."

That is why Moriconi-Ebrard (1994: 52) suggests "the lowest common denominator" of urbanity at the crossroads of different approaches (zone shown in black in Figure 1). He tries to explain the complexity of the phenomenon by proposing a definition that is intentionally too restrictive because his approach has a precise aim, namely to arrive at an international comparison. In the case of non-global approaches, we must redefine our object. It is necessary to take into account the local specificity of the urban fact, particularly the way the city is perceived and experienced.

For this, we must envisage different definitions of urban areas before choosing the ones that are most suited to our study. It is advisable to think of what makes the city what it is in general and then compare this definition with what the city represents in the space that interests us, namely Tamil Nadu.

a) Cities and rural areas, agriculture and services

The first cities were born when man became capable of producing an agricultural surplus that enabled other men to devote themselves to other productive activities (economic, political or spiritual). These new forms of production called for the exchange of products with other units of population. This led to the creation of market-places, which sometimes expanded to become centres of exchange, as distinguished from areas of agricultural production (Bairoch, 1985; regarding South India: Champalakshmi, 1996).

This hypothesis on the emergence of the first cities has moulded our way of looking at the urban-rural opposition and the town/city is often defined as a living space where the industrial and services sectors are over-represented. Besides, this definition very often corresponds to reality, and if we were to "look for a purely economic definition, the city would be a place the majority of whose inhabitants earn their living from industry or trade, and not from agriculture. […] It is necessary to add one more criterion: the variety of practical knowledge and professions." (Weber, 1982: 18).

This definition is undoubtedly relative and agricultural activity may still represent a large part of urban activity, as was the case until the second half of the 20th century in Europe or even today in many towns all over the world (Charrier, 1988). On the other hand, there are instances of villages where agricultural activity is almost absent. Rural industries have existed from ancient times in Europe as well as in India and activities like tourism and teleworking provide new opportunities today in rural areas.

The first interpretation of the city as a place having the least agricultural activity is therefore frequently complemented by another trait, namely the strong presence of rare activities. Actually, what differentiates the city from the countryside is the presence of specific services, commercial or otherwise (formerly the postal service and later the telephone before its spread to rural areas, some administrative services like tax collection, trade in luxury goods, etc.). What constitutes the singularity of urban areas is also used to classify cities among themselves and is correlated to the difference in their size as shown by Christaller (Pumain et Robic 1996: 117).

In Tamil Nadu, urban entities have overall a very small percentage of workers from the agricultural sector: 11% of the totality of urban workers (the average rate of agricultural workers per city is 26 %, which suggests a large difference between various types of urban units). Table 3 (on page 18), shows the low rate of primary activiti..es in the urban sphere.

b) Redefining the city in Tamil Nadu

If we can agree on a universal definition of the city, it is necessary to choose a definition that will allow us to work. Adopting an existing definition may be practical. The Indian census proposes one, and we must see if it corresponds to our requirements: What constitutes a town or city according to the census? Can we use the definition for our study of periurbanisation in Tamil Nadu?

1) The town according to the census

The Indian census defines in very precise terms what the town represents for it and treats non-urban units as villages. It also distinguishes between two kinds of towns.

"Statutory towns" are a collection of localities recognised as urban on account of their nature. They are towns having a local government in the form of a municipal corporation or a municipal board, a military cantonment and other notified areas. It is an administrative (and therefore arbitrary) definition that is found in many countries (e.g. Egypt to give but one example).

In addition to these statutory towns, there are what are known as census towns whose definition is based on statistics. To be classified as a "town", the unit of population must satisfy three criteria. Firstly, it should have a minimum population of 5000 inhabitants. Then, it should have a minimum density of at least 400 persons per square kilometre. Finally, its active male population engaged in an agricultural activity should be less than 25% of the total active population (the active female population is a very fluctuating figure in the census (Kurien, 1981: 118), which is why the figures of the active male population are used).

Apart from these two categories of towns, the Director of Census Operations (based in Chennai for the whole of Tamil Nadu) may, after consultation and in agreement with the state government and the Census Commissioner, include places having "urban characteristics". Such marginal cases were not present in Tamil Nadu in 1991 when there were 111 statutory towns and 358 census towns that is to say a total of 469 urban units.

In addition to these distinctions between urban and rural units, since 1901 the census distinguishes Indian towns on the basis of their size and divides them into 6 categories. Thus Class I cities have more than 100,000 inhabitants, Class II or "intermediate

towns" have 50,000 to 100,000 inhabitants, Class III or "medium towns" include units of 20,000 to 50,000 inhabitants, Class IV towns are those having 10,000 to 20,000 inhabitants, Class V or "small towns" have 5,000 to 10,000 inhabitants and, finally, Class VI consists of towns with less than 5,000 inhabitants[11].

A distinction is often made between cities having a population of more than one million called "metropolitan cities" and those having a population of more than 100,000 called "one-lakh cities". Moreover, with the emergence of Class I cities (there were 35 cities having a population of more than one million in 2001), the census published in 2001 separate statistics for what it calls the "million plus cities". This data was published in the year following the census, while it was necessary to wait for two years to obtain the first data about the urban world in general and three years for details about the rural sphere.

One last distinction refers to the civic status of the town. It is easier to understand it if one starts with the basic unit, i.e. the village. The Census Commission, when carrying out the census, depends on information available with the Revenue Department and the records of "revenue villages". The latter may consist of several "hamlets", which are treated as one administrative unit. When a revenue village generates a certain amount of tax, it can be considered a town and classified as a "Town Panchayat". When an urban unit acquires the status of Town Panchayat (T.P.), the way the local tax is administered changes (for example, its inhabitants acquire the right to obtain housing loans). Nevertheless, even after the classification of a unit as T.P., it continues to maintain areas considered as agricultural land, which are administered as

[11] In an article published in 2003, in which he analyses the urbanisation trends in India on the basis of the first published data relating to the 2001census, Kundu points out the role of these towns which constitute a "special class", because most of them are industrial townships or pilgrimage centres (Kundu, 2003: 3082).

such. A T.P. still has a Village Officer. When the population of a T.P. increases and especially if the revenue collected by the tax department goes up, the town panchayat becomes a municipality. Municipalities do not include agricultural land and are therefore essentially urban. Finally, Urban Agglomerations (U.A.) are defined by the census as a continuum of several towns or just one Class 1 city and its outgrowth[12].

In addition to these different statuses that are commonly used, one also comes across denominations like "MTS" and "PTS". These terms, which are used to designate 8 towns in Tamil Nadu, have not been defined in the publications of the Census Commission. After making enquiries in the Census Office, first in Pondicherry and then in Chennai, we obtained the desired information in the form of a typed document: MTS stands for "Municipal Township" and PTS for "Panchayat Township" (Census of India, date not mentioned). Nonetheless, the exact meaning of these denominations is not explained anywhere and the difference between the 4 units mentioned under each designation discouraged us from including them in our study.

However, the classification into Town Panchayats, municipalities and urban agglomerations is useful as it takes into account not only the size of the town but also its importance in the region. In Tamil Nadu, U.As have on average 387,000 inhabitants as compared to 64,000 in the municipalities and 17,000 in town panchayats.

2) A Pragmatic Approach

To determine the urban factor in our study, we had to rely upon the definition of the urban framework provided by the census. As we

[12] These *outgrowths* are basically urban units – according to the definition of status given above – which are found in villages bordering the towns or cities under consideration.

have just seen, the census uses as its base criteria size, density and economic activity. Nevertheless, "the town by definition is a zone having a high population density and economic activities as well as a diversity of activities" (Guillain and Huriot, 2000: 184). The census seems to follow a consistent approach, similar to that seen in other parts of the world, according to a consensus on the administrative definition of the town (Chaudhuri, 2001). Further, the simplicity of the definition is the only way of making interregional comparisons. In fact, if the definition is too complex, particular instances and regional nuances are likely to make any comparison impossible.

Nevertheless, one correction is necessary because artificial divisions are sometimes created by the administrative structure. To understand the impact of the urban area on its hinterland and to highlight periurbanisation, it seemed more prudent to us to aggregate different urban units whenever they were contiguous. Therefore, we first divided them into groups based on the criteria of belonging as defined by the census. Thus, the smallest units (viz. village panchayats classified as urban, town panchayats, etc.) were incorporated into larger adjacent units. Out of the 459 urban units defined by the census, 262 constituted distinct urban zones. We then physically inspected these 262 urban units to identify the final inconsistencies: e.g. a town spread over several taluks or districts would be considered as several administrative entities, two towns that had expanded, one adjacent to the other, would constitute two distinct units, etc. After this, we proceeded with a second agglomeration based on the observed geographical continuity of these urban spaces to finally obtain 225 towns and urban agglomerations[13] (see Table 1 & 2).

[13] It should be remembered that "there is no scientifically perfect definition of agglomerations" (Pumain, Saint Julien, 1995: 7) because these units are in a perpetual state of change (due to expansion in the majority of cases), which is not conducive to a uniform definition and makes comparisons more complicated.

Table 1: Classification of 225 Towns and Urban Agglomerations in Tamil Nadu

Class	I	II	III	IV	V	VI
Number of Urban Units	31*	39	64	62	24	5
Average Population	441,753	69,949	31,142	14,887	7,596	4,025

* *There are 3 cities with a population of more than one million among the Class 1 cities*

Without looking too closely at this table, we note that there are only 5 towns with a population of less than 5,000 (Class VI) and therefore they have only marginal importance in the entire system. On the contrary, towns having more than 10,000 inhabitants (those retained according to the criteria given in the Moriconi-Ebrard database) constitute 87 % of the total number of towns. For purposes of comparison (as France and Tamil Nadu have approximately the same number of inhabitants), we may point out that there are 134 urban units having more than 20,000 inhabitants[14] as against 232 in France during the same period (Pumain, Saint Julien, 1995: 7).

Table 2 : Status and Population of Towns in Tamil Nadu

	Urban Areas	Municipalities	Municipal Townships	Panchayat Townships	Town Panchayats	Village Panchayats
Census Data						
Number	35	66	4	4	122	30
Average Population	368,262	61,193	20,510	47,708	16,935	8,963
Transformed Data						
Number	34	66	4	4	105	12
Average Population	387,481	63,540	20,510	47,708	17,315	6,815

[14] For Berry, 20,000 inhabitants is the basic figure for defining a town (1971). Tiwari too points out the minor role of towns with less than 20,000 inhabitants in Tamil Nadu (Tiwari, 1996: 71 and later publications).

We note that in Table 2 some towns are classified as village panchayats. This apparent paradox is the result of the difference between the definition of a place as urban by the Census (or the regional administration) and the definition of its status defined according to the rules laid down by the Tax Department. If a place does not yield enough taxes to be classified as a town panchayat, but has all the Indian urban characteristics (more than 5,000 inhabitants, a density of more than 400 per square kilometre and more than 75 % of its active male population engaged in non-agricultural activities), it will be classified as a town while retaining its status of a village panchayat.

The small number of towns classified as villages and those classified as MTS and PTS, in terms of urban population (354,652 inhabitants in all or less than 2 % of the urban population), impelled us to withdraw them from most of the analyses (e.g. in Table 4, page 26) as the results obtained were not representative.

To understand fully how the urban system in Tamil Nadu is organised, we have classified towns according to their general economic specialisation. It must be remembered in fact that "the town's specialised activity and the salaried jobs associated with it are good indicators of the dynamics of its economic and social base" (Pumain, Saint Julien, 1995: 48). Therefore, we decided to create a system for classifying the different types of towns in Tamil Nadu on the basis of their dominant economic activity.

To create this system of classification, we could have used a classification based on an ascending order, as is the common practice. This method, which is statistically effective, sometimes gives rise to groups whose boundaries are arbitrary and unintelligible. We therefore preferred to use a personal classification system that can be understood more easily. So, to determine the predominant activity, we chose a level corresponding to 50 % of the active population engaged in an

activity (a qualified majority). We were thus able to distinguish 7 kinds of towns on the basis of the dominant and secondary economic sectors, reflecting fairly accurately the geography of towns in Tamil Nadu.

Towns having a dominant agricultural sector: more than 50 % of the active population is engaged in an agriculture-related activity (including plantation workers and fishermen).

Towns having a dominant industrial sector: more than 50 % of the active population is engaged in an industrial activity or a craft.

Towns having a dominant services sector: more than 50 % of the active population is engaged in services, trade, transportation, etc.

Towns that are both agricultural and industrial: the proportion of active population engaged in each category is lower than 50 % and the total number of active persons in both the sectors taken together is higher than 70%.

Towns having dominant agricultural and services sectors: the proportion of active population engaged in each sector is lower than 50 % and the total number of active persons in both the sectors taken together is higher than 70 %.

Towns having dominant industrial and services sectors: the proportion of active population engaged in each sector is lower than 50 % and the total number of active persons engaged in both sectors taken together is higher than 70 %.

Mixed towns: towns that do not satisfy any of the preceding criteria and where the proportion of the active population engaged in each sector is lower than 40 %.

Table 3: Types of Towns in Tamil Nadu (absolute numbers and percentages)

Mixed Towns	Towns with a dominant agricultural sector	Towns with dominant agricultural & services sectors	Towns with dominant agricultural & industrial sectors	Towns with a dominant industrial sector	Towns with dominant Industrial & services sectors	Towns with a dominant services sector
8 (4 %)	31 (14 %)	48 (21 %)	9 (4 %)	22 (10 %)	28 (12 %)	79 (35 %)

It is not surprising that Table 3 reveals that the town is first and foremost a centre of services in Tamil Nadu because more than two-third towns specialise in the service sector. Specialisation in agriculture takes second place with 39% towns. Only 26% towns stand out because of the importance of industries.

Table 4: Administrative Status and Urban Functions in Tamil Nadu

Mixed Towns	Towns with a dominant agricultural sector	Towns with dominant agricultural & services sectors	Towns with dominant agricultural & industrial sectors	Towns with a dominant industrial sector	Towns with dominant Industrial & services sectors	Towns with a dominant services sector
TP						
7 %	17 %	34 %	4 %	9 %	9 %	21 %
M						
2 %	8 %	14 %	5 %	2 %	15 %	56 %
U.A.						
0 %	6 %	6 %	0 %	24 %	21 %	44 %
All Towns						
4 %	**14** %	**21** %	**4** %	**10** %	**12** %	**35** %

Table 4 shows the relation between the status of a town and its predominant activity. Town Panchayats stand out due to the over-representation of agricultural activities, while municipalities concentrate on the services sector. Urban agglomerations have a mixture of services and industry. It is thus possible to arrange them

in a hierarchical order according to their respective roles: T.Ps are rural towns while municipalities act as administrative intermediaries and urban agglomerations are real full-fledged towns. It is nevertheless necessary to qualify this statement by recalling the spatial markers of economic specialisations, especially industrial activities, which form regional clusters (for detailed maps of Tamil Nadu, see Oliveau, 2003).

The major industrial zones in Tamil Nadu are well known. First, there is the Coimbatore plateau (stretching from Coimbatore to Salem), the Palar valley (with Vellore at its centre), the Sivakasi zone (to the south of Madurai and stretching to the west of Tirunelveli) and, to a lesser extent, the town of Neyveli to the south-west of Pondicherry. Similarly, the towns spawned by plantations in the Ghats dot the border with Kerala. There are many small predominantly agricultural towns all over the Cauvery delta. Besides, agriculture is often accompanied by the services sector giving these rural towns an intermediary role. Finally, all over the state there are towns dominated by the services sector, whose geographical distribution is generally correlated with population density.

3. From Towns to Rural Areas

Space has been integrated in economic thought from ancient times. It has always been difficult to accept it, especially because the integration of space in classical economic models ultimately raises more problems than it can solve (Derycke, 1994).

Nevertheless, the spatial dimension of uneven development has already been the subject of much thought. Thus the "core-periphery" model has been borrowed from economics (on this point, see Krugman, 2000), and subsequently reinterpreted in geographical space. Both geographers and economists study the notions of "core" and "centrality". Conceptual exchanges between economic geography and spatial economics are common. Thus the spatial distribution of innovations, which is an old geographical

concept, has been borrowed to reinterpret the growth pole theory in spatial terms.

Sociologists too are concerned with the urban factor though their methods are different from those of geographers. The latter always play a role of prime importance, focusing on space even when social, economic or cultural issues are involved.

The town is a multidisciplinary object that has interested, among others, sociologists, economists and geographers who continue to study it intently. Geographers are quite logically interested in the spatial dimension of the change from urban to rural and several explanations can be suggested to understand the forms and reasons for this gradual shift.

a) Towns and rural areas: core and periphery?

In 1973, in his book *Le développement inégal* (Uneven Development), Samir Amin, concerned about the uneven economic development in the world, used the core-periphery binomial to describe the opposition between developed and developing countries. This association of terms was then considered in an economic context akin to Marxism where the core is the exploiter and the periphery is exploited. The spatial dimension is secondary and is used more in a metaphorical sense. But this idea leads to a more comprehensive view of the relations between societies (and spaces) that are dominant and dominated, giving rise to a shift from the social to the spatial dimension.

This pattern can be applied to different scales and this is one of its advantages. Thus, while it expresses the antagonism between developed and developing countries, it can also be adapted to understand the opposition (still considered in terms of domination) between the town (centre) and the rural areas (periphery). This dialectic opposition was taken up by geography because of its strong evocative power. Furthermore, its ability to describe the observed phenomena

in binary terms on any scale is very advantageous. Nonetheless, this approach is now obsolete. It is known that a part of the centre's population (and even a part of its space) may be dominated and that the periphery need not consist only of social outcasts.

In a wider context, the centre-periphery phenomenon may be treated as a peculiar and Manichean example of the concept of centrality. Centrality is a subjective perception of space. It can be used to define a point as being specific and different from the other points around it (Huriot, Perreur, 1994a). This point is then called the centre. It serves as a reference for structuring space. For example, this is how von Thünen creates his pattern: he starts with a village that he takes as the centre and looks at the spatial agricultural structure surrounding it according to its distance from this centre. So it is the central point that organises its surroundings in relation to itself. This pattern, originally envisaged for an "isolated state", becomes more complex as the number of points increase. Let us not forget that centrality is neither absolute nor total. On the contrary, it is relative and contextualised: depending on the scale, it is relative to a given space; it is contextualised because the central point is defined by the nature of the study. In this context, Christaller's theory of central places can be understood as a set of hierarchically arranged centres whose centrality is related to the level of observation (which defines the level of centrality) and dependent on the context (i.e. in its study of urban functions).

To explain the creation of centres, one can refer to the economic theory of agglomeration economies. In brief, this theory considers an agglomeration as an economic element, having a relative advantage as compared to non-agglomerated zones[15]. In this

[15] Krugman (2000: 50), said that we should not however leave ourselves open to jibes like the one made by the physicist who said, "So economists believe that companies agglomerate because of agglomeration economies". Economic geography should therefore try to explain the forces of concentration in terms of more fundamental motivations.

way, an agglomeration, by differentiating itself from non-agglomerated zones, defines itself as a core. Further, this core then presents itself as a rival object competing with other objects, and this enables it to strengthen its position by becoming more attractive. This is what Huriot and Perreur call "the attractiveness of centrality" (Huriot, Perreur, 1994a: 50). This idea, which owes its origin to economics, can also be adapted to understand both social and cultural aspects.

Though the core attracts, it cannot however accommodate everything and this leads to the creation of a hierarchical order of objects at the core (Thisse, 2002), with the other objects organising themselves around this core, but not necessarily in a concentric manner because they can be influenced by other factors. The core then redistributes a part of the objects around it and thus increases its role in the geographical organisation of space. This redistribution can have two effects. We have a spill-over effect when the redistribution is positive and a backwash effect (Myrdal, 1957) when the concentration at the core brings about an economic deterioration at the periphery. It is this latter situation (where the most polluting enterprises start colonising the rural spaces to free the town, which is more of a rejection than a redistribution) that led Kundu to speak of "degenerated peripheries" (Kundu, 2003).

However, the core, apart from its function of attracting, can also act as a starting point. This is the "distribution centrality" defined by Huriot and Perreur (*Ibid*.). In fact, the core is also at the core of the spatial distribution of innovations (we are evidently referring to the work done by Hägerstrand, 1967). Therefore, when an innovation appears at a given point, this point distinguishes itself from the others and, according to the definition, constitutes a core. This core will then transmit the innovation (or information) to other points (the spill-over effect).

It is this perception of the distributive core that constitutes the basis of the growth pole theory. During the 1950s, F. Perroux explained that "growth does not appear everywhere at the same time; it is seen only at some points, or growth poles, and its intensity varies; it spreads through diverse channels and the end effects are different for the whole economy" (quoted by Manzagol, 1992: 496). One of the crucial ideas of the growth pole theory is that of propulsive industry: an enterprise introduces an innovation in a particular point of space and its development leads to the growth of the surrounding enterprises (through an increase in local consumption) and also of the enterprises it deals with (through an increase in the demand for production). This theoretical model was applied in the 1970s through the medium of various decentralisation policies, particularly in India.

One of the criticisms of this theory is that it depends on the point of view that is adopted. In fact, contrary to the idea that industrialisation encourages urbanisation by attracting people to industries, it is possible that populated areas give rise to new industries (Cassidy, 1997). This also explains the failure of the new industries set up in existing industrial zones (particularly in Africa), because the growth pole has not yet had a spill-over effect on the sparsely populated hinterland.

Nevertheless, all said and done, like Berry (1973), we feel that the growth pole theory is only one instance of the spread of innovation (Hägerstrand). That is why we are going to stress the influence of innovation on towns and rural areas.

b) Distance: "The first attribute of a spatial system"

One of the basic elements necessary to understand spatial distribution is distance. As a matter of fact, it defines the field of action of a transmission centre (the core) and makes it possible to measure the progression of innovations in space over a period of time.

1) Distance as a Connecting Factor

"Distance, the spatial dimension of separation, is a fundamental geographical property, influencing location and movement." (Goodall, 1987: 134).

The word "distance" was borrowed (*circa* 1175) from a derivative of the Latin *distantia*, which actually means "stand apart" and also "difference" in the figurative sense. It is composed of the Latin prefix *dis*, which expresses the idea of separation, and the verb *stare* meaning "to stand". This led Roger Brunet (Brunet, Ferras, Théry 1997) to remind us that Herodotus reported that the Persians had more respect for people who were closer to them. Though the writer may see in this a sign of ethnocentricity, we would prefer to point out that this semantic mixture of distance and difference, leads to the connection between near and similar that supports the idea of spatial auto-correlation.[16]

The present definition of the word still refers to this notion of separation but in a sense that is essentially spatial: « the length that separates one thing from another" (Rey-Debove, Rey 1996), in other words, an "interval between two points" (Brunet, Ferras, Théry 1997). Distance allows the measurement of the space separating two objects. However, while doing this, it creates a link between the objects[17]. Therefore, it is finally a connecting factor. It figures at the root of the geographical inquiry because "it is the only thing that can identify the location of a phenomenon in space and measure the difference in relation to the location in the geometric space of another phenomenon of the same type or even of a different type."

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[16] "The literal meaning of spatial autocorrelation is *self-correlation* (autocorrelation) *attributable to the geographic ordering of data* (spatial)" (Griffith, 1992: 2). In other words, spatial autocorrelation is the dependence between the attributes of statistical individuals that are adjacent in space (Charre 1995).

[17] For an anthropological opinion on the role of distance as a link between individuals, we will refer to Edward T. Hall's classic work (1966).

(Chamussy, Chesnais, 1978:161). This is what makes distance "the first attribute of a spatial system" (Grataloup, 1996: 105).

If distance is the measurement of what separates or connects, the method of measurement can follow different paths, but we are only interested here in what is called "mathematical" distance (De Smith's thesis, 2003, examines the question of distances). Mathematical distance is a special function that can be defined on the basis of the work done by Huriot and Perreur (1990: 200):

"Any set of places; a real function d defined on L is a **distance** or **metric function**, if and only if it satisfies the following 4 conditions, whatever a, b and c belonging to L may be

(c1) non-negativity $d(a,b) \geq 0$

(c2) identity $d(a,b) = 0 \Leftrightarrow a = b$

(c3) symmetry $d(a,b) = d(b,a)$

(c4) triangular inequality $d(a,b) \leq d(a,c) + d(b,c)$

The real number d(a, b) is called the **distance** from a to b."
The distance function is then defined by:

$$d_p(A,B) = [(x_{AB})^p + (y_{AB})^p]^{1/p}, \text{ with } x_{AB} = |x_A - x_B|;\ y_{AB} = |y_A - y_B|; \text{ et } p \geq 1$$

The terms x_A and x_B are the longitudes of points A and B (the distance between which we wish to calculate), and y_A and y_B are their latitudes. The coefficient *p* is either higher than or equal to 1. For "p=1" we obtain a rectangular (or rectilinear) distance, which is also called "the Manhattan distance". This distance is used to simulate urban movements because it is better suited than

the distance "as the crow flies" to assess the length[18]. The "distance as the crow flies" is a popular nomenclature of Euclidian distance. It is the most intuitive distance: the shortest route between two points. Its coefficient *p* is equal to 2.

When distance is expressed in this manner, it acquires two properties of mathematical models: it is ahistorical and spatially universal (Husain, 2001: 360). The ahistoricity of this factor is its unique value in time. If a point is at a distance of 10 km from another, that holds true for yesterday, today and tomorrow. Distance conceived in this manner is not dependent on time. This is also true of space: 10 km means the same thing whether one is in France, in the United States or in India. Distance is therefore a spatially universal factor.

These two elements are not inconsequential. Because of this ahistoricity and spatial universality it is in fact possible to make comparisons in time and in space. Mathematical distance does not have its own value, as it is objective. It can be easily expressed in the form of an equation and hence the use of mathematical tools for comparing, for example, the spatial distance of a town between one date and another or between different towns. The criterion for comparison is objective and it is mathematically formulated.

Nevertheless, this apparent objectivity should not conceal the problems raised by this approach. The first question is to find out what represents distance and if it can be used to explain social phenomena. Thus, although distance is an important explanatory factor for understanding the spatial structure of many phenomena, it remains just a structural characteristic of a situation.

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[18] This has been summarised very effectively by Pierre Dumolard (1999) in this pertinent question: "Has anyone ever seen birds flying straight from a starting point to the point of arrival?"

2) The Meaning of Distance in Tamil Nadu

Let us recall that "the intervention of distance lends itself to multiple interpretations" (Pumain, Saint Julien, 2001: 24). But we may agree that distance expresses first and foremost the "roughness of space" (Helle, 1993). Crossing distance, that is to say moving, implies a cost in terms of time in the first place: "distance is time" (Grataloup, 1996: 86); and also in financial terms. We find that the distance-time and distance-cost mentioned above are actually distortions of mathematical distance. In other words, "they are the weighting of raw distance according to criteria which are exogenous to space in order to express the interaction between theoretical aspects and physical constraints" (Lemay, 1978: 151). Though these distances often improve the understanding of phenomena, they are much more difficult to include in a model.

The friction of distance (imposed by the "roughness of space") constitutes a constraint on human movement. In societies where the level of technology is low, this friction is very strong, which leads Paul Bairoch to speak of the "tyranny of distance" (Bairoch, 1985: 33). Because, though distance is universal as far as its measurement is concerned, crossing it is extremely contextual. Movement depends both on the nature of the terrain to be crossed and on the technical means available.

Therefore, in Tamil Nadu in 1991, we were able to distinguish three main forms of movement: walking, riding and public transport. Each of these means has its own speed, which can be estimated at about 5 km/h for walking, about 10 km/h for a bicycle and 30 to 40 km/h for a bus. This range of speeds is important to understand periurbanisation.

If one considers that an individual is not usually prepared to spend more than one hour to reach his or her place of work, it is possible to prepare a model of the average interaction with the nearest town

in the following manner: the poorest individuals living more than 5 km away visit the town very rarely. Individuals possessing a bicycle will be limited by a distance of about ten kilometres. As for public transport, only some individuals can afford it, but not for a distance of more than 30 to 40 km.

c) Choosing one's distance

For our study, we had to define the metric function and the specific distance we used. We opted for Euclidian distance because it provides the best information suited to the scale of our study, rectilinear distances being more suited to intra-urban studies and spherical distances to calculations on a smaller scale. Peeters and Thomas have shown that in the absence of a major obstacle, i.e. in Euclidian spaces, Euclidian distance is a good approximation. They also remind us that the use of a non-Euclidian distance means working in non-Euclidian spaces (Peeters and Thomas, 1997: 66). We chose to measure the distance keeping in mind the town's administrative boundary as defined by the census and not in relation to its centre.

Measurement in relation to the centre posed two major problems. The first was related to the definition of the centre in a country where towns are often polycentric. The second problem was related to the result we wished to obtain. We wanted to know the impact of the town and not the influence of the distance to the centre. We have therefore looked at towns as homogenous entities, which begin to influence rural spaces from their border and not from their centre. We therefore opted for a calculation based on the administrative border as defined by the census. Though this border, like all information provided by census maps, is suspect, it is not more so than the centre, which has been determined on the same basis. Comparisons between census maps and other maps of the cities of Chennai and Pondicherry however proved to be quite satisfactory. Further, this measurement takes into account the shape of the towns and improves the calculation of the distance (see diagram). All the

results that are presented are therefore the distances of villages to the border of the nearest town. It may also be noted that during calculation, the identity of the nearest town is given, which makes it possible to assign villages to towns. This will be very useful for differentiating the urban impact according to the characteristics of the towns.

Figure 2 : Should the measurement be taken from the centre or from the town's border ?

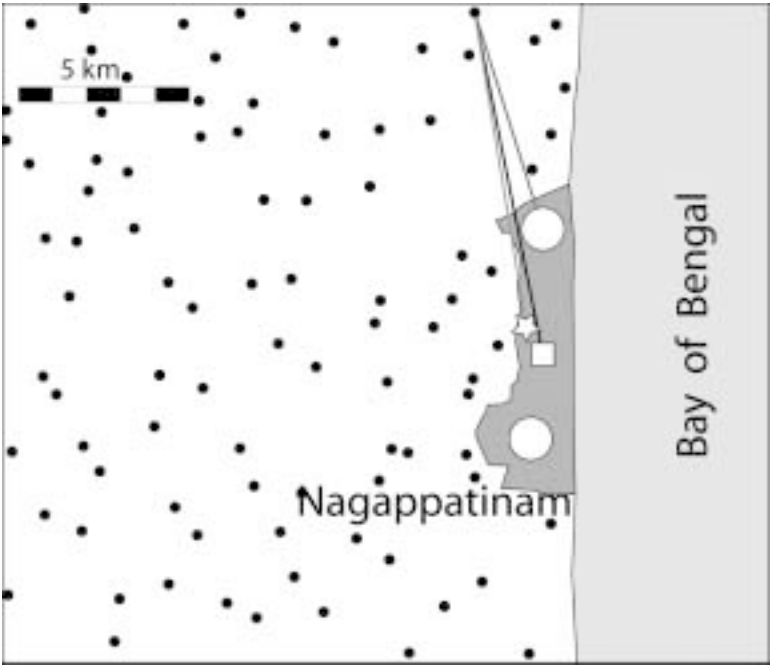


Figure 2 shows the difficulties quite clearly and the implications of the initial choice for calculating the distance of villages (black dots) to the nearest town (Nagappatinam, in dark grey for this example). The centroïd indicated by the GIS[19] (White Square with

[19] GIS means Geographic Information System.

black border) does not correspond to the object's (white star with black border) centre of gravity and even less to the historical centres[20] (white circles with black border). One can see two centres in Nagappatinam (as in many towns in Tamil Nadu). The town's outer boundary is thus a good compromise since it is always the minimum distance to the town (Table 5).

Table 5: Differences in distance according to the point of reference in the town

Point of reference	Distance
Centroid indicated by the GIS	9.8 km
Centre of gravity	10.5 km
Historical centre	6.6 km
Second historical centre	13 km
Town border	5.8 km

Table 6: Presentation of the axes of the principal components analysis

axe	Eigen value	Explained variance	Total explained variance
1	2,88	0,22	0,22
2	1,53	0,12	0,34
3	1,33	0,10	0,44
4	1,05	0,08	0,52
5	1,00	0,08	0,60
6	0,97	0,07	0,67
7	0,83	0,06	0,74
8	0,72	0,06	0,79
9	0,69	0,05	0,85
10	0,61	0,05	0,89
11	0,55	0,04	0,94
12	0,51	0,04	0,98
13	0,32	0,02	1

[20] Historical centres are based on a map published by Spate (1954: 75).

Figure 3: Projection of axes 1 and 2 of the principal components analysis

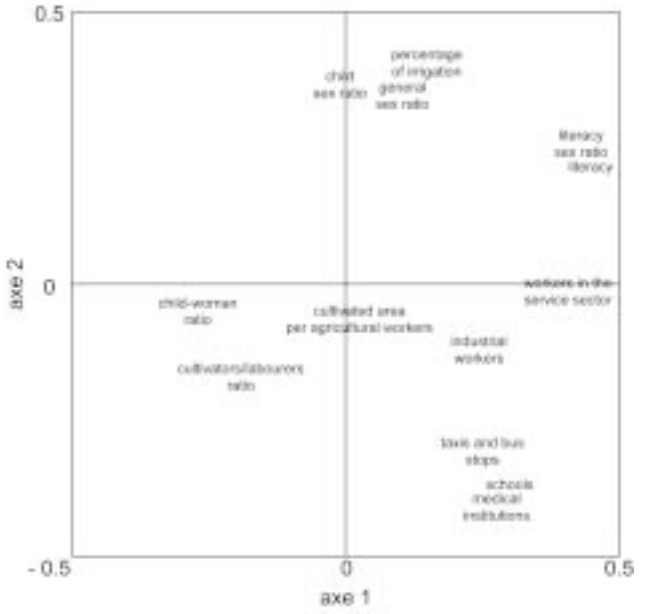
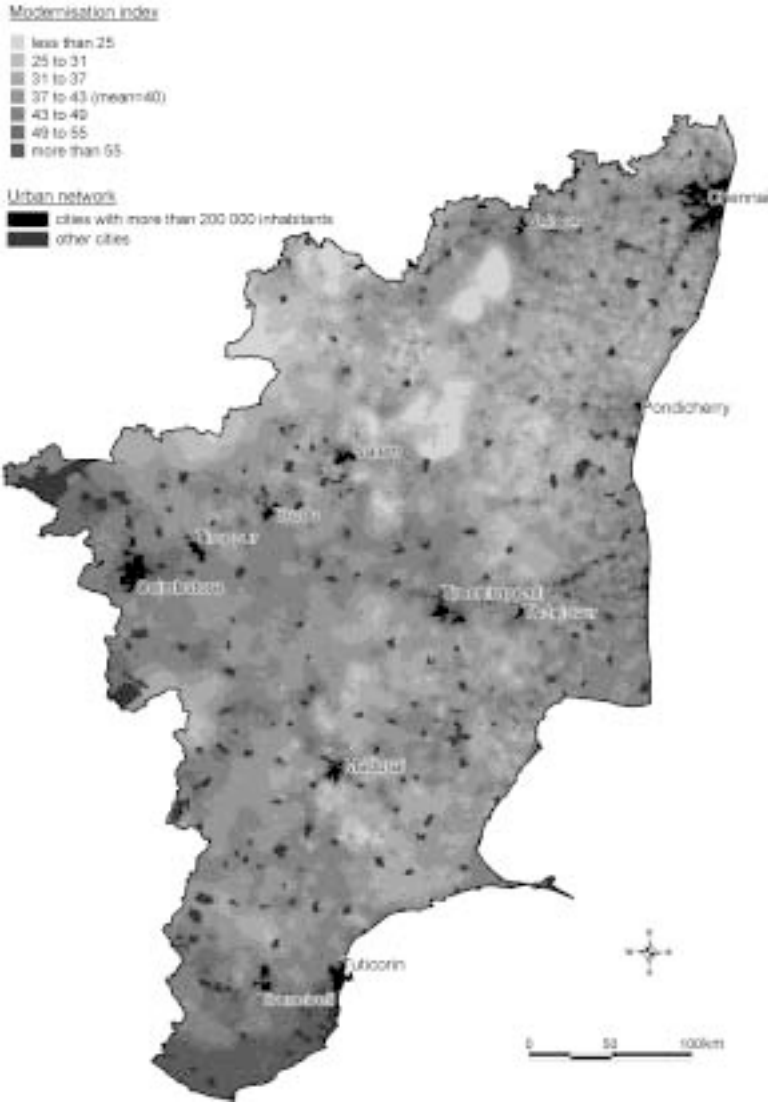


Table 7:Correlation of variables with the two principal axes of the analysis.

Variable	**Axe 1**	**Axe2**
Schools	0,30	-0,39
Medical institutions	0,28	-0,41
Taxis and bus stop	0,25	-0,31
General sex-ratio	0,10	0,35
Child sex-ratio	0,00	0,36
Child-woman ratio	-0,27	-0,06
Literacy	0,46	0,21
Literacy sex-ratio	0,42	0,25
Workers in the service sector	0,41	-0,02
Industrial workers	0,24	-0,19
Cultivators/Labourers ratio	-0,19	-0,18
Percentage of irrigation	0,16	0,40
Cultivated area per agricultural worker	0,024	-0,07

Figure 4: Modernisation of rural areas in Tamil Nadu



B. Urban Influences in Tamil Nadu

To assess the urban influence in Tamil Nadu, an index was created with the census data available at the village level. Some

indicators – relating to the different aspects of village modernisation (social, economic, infrastructural) – have been selected and then computed through an analysis of the principal components (see table 6). The first factor of this principal components analysis is used to determine what we call our "modernisation index" (see figure 3[21]).

The map (see Figure 4) shows the layout of modernised areas on a two-dimensional plane. It may be observed that the highly modernised pockets seem to be generally concentrated in the towns while the less modern zones are characterised by the relative absence of urbanisation. But the limitations of this visual approach are obvious as the eye is easily misled by the choice of classes, colours, etc. Further, the eye generally sees only what it wants to see. The relation between two variables can be sensed, but to compare their variation efficiently, the use of statistics is more appropriate without being too complicated.

We have statistical tools at our disposal that enable us not only to formalise spatial relationships but also to synthesise this relationship between the town and the level of modernisation of the village. We will first have to highlight the relationship between the level of modernisation and the distance to the town. We will then try to bring out the nuances of this general approach by dividing the towns into different types and then integrating the elements that enable us to assess their real accessibility.

We will not take up again the measurement of distance as it has already been dealt with (cf. page 25). It is more a question of seeing how the role of this geographical variable attached to each village can be isolated statistically from other factors influencing

[21] For further details, please refer to Oliveau (2004)

the level of modernisation of rural areas and in what way it can be integrated into mathematical formulae.

1. A Statistical Approach to Urban Influence

The object of mathematical formulisation is to propose an integral and comprehensive view of the relationships maintained by towns and rural areas by analysing the spatial tendencies[22] between these two spaces. Several methods are available for this purpose and descriptive statistics can provide the tools for the initial approach.

Calculating the correlation coefficient as well as the linear regression between two variables is an effective way of describing their relationship. It should be remembered that these methods of calculation do not provide any proof of causality or of the influence of a variable over another; they only indicate that the variations in the values of one variable depend on the values of the other. The researcher's job is to develop these hypotheses in order to explain this related variation.

The correlation coefficient first provides an integral view of the co-variation of data. Its value is 0.34 for measuring the correlation between the modernisation index and the distance to the town, which means that there is a linear relation between the two variables. It should be remembered, by the way, that the analyses cover more than 16,000 items of data and the correlation coefficient of 0.3 is therefore significant.

A correlation of this order means that the variation of a little more than 11.5 % is explained by distance. This is really important for the 16,085 villages involved and above all indicates a strong

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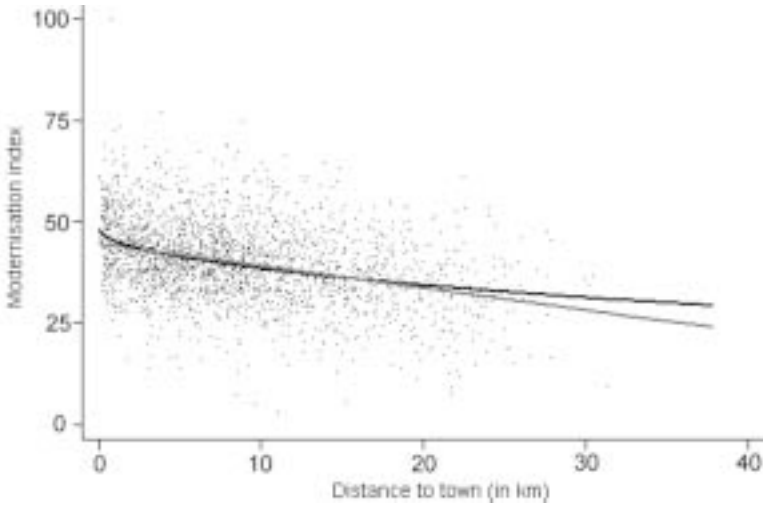
22 "The analysis of spatial tendencies consists of detecting the gradient(s) of the variation of a phenomenon in space" (Lemay, 1978: 152).

tendency towards spatial organisation. This means that other factors can explain the variation in modernisation levels. We will try later to replace this by comparing it with other factors, particularly the accessibility of the town.

This linear relation between the data can be interpreted as the influence that the towns' proximity has on the modernisation level of villages. The linear fitting explains 11.5% of the variance. It assumes the following form: "y = -0.54 x + 44.75" with "y" as the modernisation index and "x" the distance to the town. The further one moves from the town, the lower is the modernisation index as shown in Figure 5.

Figure 5: Modernisation of the village and the distance to the town (square root function)



In grey: fitting with the linear function of the distance.
In black: fitting with the square root function of the distance

This kind of fitting, which refers to a point of origin and takes distance as the 'x' axis, is called "spatial regression" (Charre,

1995: 72). Charre points out that "a linear function cannot explain the relation […]. Either the distance should be changed, or [the index] or both of them." We therefore have to consider other functions of distance to fit our index: square function, square root, logarithm, etc.

Of all these different functions of distance, only the square root function gives better results than the distance function by accounting for a variance of 11.9 %. Though this variance is not much higher (0.4 points), the fact that a square root function is better suited when there is spatial regression, indicates nonetheless that the gain in modernisation due to proximity is higher in the case of the closest objects. It should be noted that the logarithmic function is interpreted in a similar manner, but more emphatically. In other words, villages that are closer to towns are proportionately better-placed than villages that are further away. This also means that the difference in modernisation between a village situated 1 km away from the town and a village situated 2 km away from it is more than the difference in modernisation between a village situated 9 km away and a village situated 10 km away from the town.

a) Going step by step

To understand our results better, we decided to break up the distance to the town in order to study the decrease of the modernisation index for each step of the distance. This solution has the advantage of providing more organised information than a scattering of points, without summarising this information as a straight line of linear fitting.

Table 8: Number of villages for each step of distance.

Distance to the Town	Number of Villages in the category
less than 1 km	1089
1 to 2 km	1088
2 to 3 km	1051
3 to 4 km	1161
4 to 5 km	1145
5 to 6 km	1072
6 to 7 km	1080
7 to 8 km	1100
8 to 9 km	976
9 to 10 km	835
10 to 11 km	787
11 to 12 km	659
12 to 13 km	604
13 to 14 km	508
14 to 15 km	489
15 to 16 km	383
16 to 17 km	342
17 to 18 km	312
18 to 19 km	285
19 to 20 km	226
20 to 21 km	191
21 to22 km	151
22 to 23 km	142
23 to 24 km	110
24 to 25 km	91
25 to 26 km	64
26 to 27 km	55
27 to 28 km	39
28 to 29 km	20
29 to 30 km	14
More than 30 km	16

Average distance for villagers to the town → 7 to 8 km

Average distance of villages to the town → 8 to 9 km

50 % of villages

893 villages

0.1 % of villages → More than 30 km

We decided to divide the distance into steps of 1 km each. There are many reasons for this choice. The first is geography, the second is statistics and the last is didactic. As we have already

stressed when presenting the database, the preciseness of location of geographical units is about 250 metres, going up to 500 metres in the worst case. By taking a step of 1 kilometre as the basis of this division, it is possible to avoid errors related to measurement or at least reduce them sufficiently. Thus this division into steps of 1 kilometre allows us to obtain fairly large figures for each of them making it possible to create sub-groups within the existing categories, without losing statistical robustness. Finally, the step of 1 kilometre is a measurement known to the reader and it simplifies the understanding of these phenomena.

The results of this division, presented in Table 8, show that each of the first eight categories consists of more 1,000 villages. This number decreases rapidly from the 9th kilometre and only 893 villages (less than 6 %) are located more than 20 kilometres from a town – 893 villages, i.e. less than in each of the first 8 kilometres. It should finally be noted that only 16 villages (0.1%) are located more than 30 km from a town, which justifies their inclusion in one category.[23]

It will be noticed that the average distance of villages to the town is 8.5 km and the average distance of rural communities to the town is 7.8 km (i.e. the average distance to the town from villages weighted by the number of villagers). Finally, it may be remembered that half the villages are located less than 7.3 km from a town. The reader should not forget that we use distance as the crow flies and not road distance. This means that the real distance to the town can be longer.

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[23] For some calculations, where villages are divided into several sub-groups (see page 38 onwards), the last category will be constituted by putting together the villages located at more than 20 kilometres.

Figure 6: Number of villages per step of distance (differentiated in relation to the urban population)

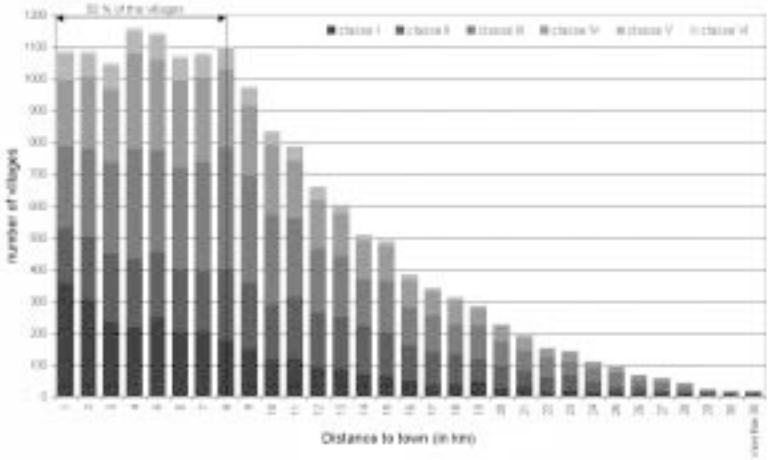
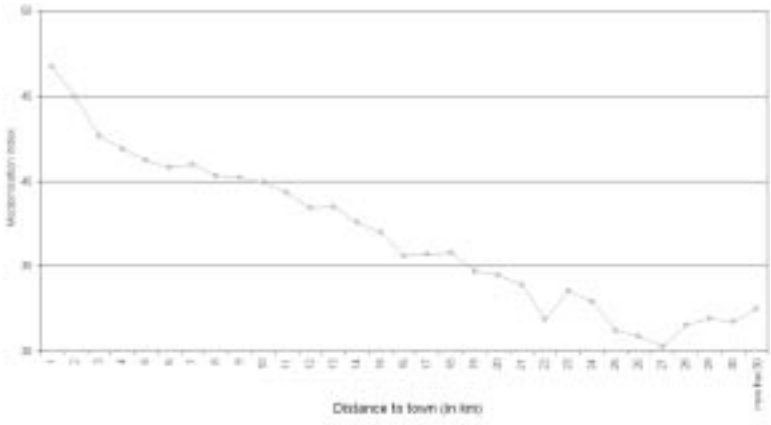


Figure 6 takes up the data in Table 8 and adds further information, e.g. the division of villages according to the size of the nearest town. For the first few kilometres, the number of villages for each class of town usually exceeds 200 (except for Class V and VI towns). It thus becomes evident that understanding the urban impact according to the step of distance provides us reliable data, even if the last villages (more than 30 km away, but occasionally less) have to be re-aggregated into a single category. It should also be noted that all towns do not have the same potential range, because Class I and Class II towns have villages only at a distance of more than 17 and 27 km respectively (for more details, refer to page 35 and following pages).

Figure 7 presents a cross-section of the modernisation level of villages according to their distance to the town. It is seen that the relation between modernisation and distance is not quite linear. The level of modernisation decreases rapidly in the first few kilometres, at a pace that is close to an exponential decrease, only to become much more linear after the 5th kilometre.

Figure 7: village modernisation and distance to town (seen as a cross-section)



a) Playing with hypothesis: Interpreting the Graph

There are several ways of interpreting the graph representing the change from the urban world to the rural world. Thus, one can envisage a horizontal graph. This means that the space is socially isotropic or at least that the towns are not elements of polarisation. The structure of the phenomenon under study would then be determined by another factor or it could just be random.

The second hypothesis envisages a graph whose appearance would be irregular, sometimes going upwards and sometimes downwards, without any apparent order. This could be due to an absence of the effect of the town on the surrounding rural areas. The rural space too is not always homogeneous and is subject to irregular variations in the index level or to variations caused by an element other than urban polarisation. This type of result is possible, for example, when the definition of the scale is not suitable for the study of the phenomenon in question or the central units are not properly defined.

The third case will be illustrated by a graph that decreases as it moves away from the urban centre and ends on a rural plateau. Two spaces can then be distinguished and the intermediate zone can be described as a transitional space.

The last hypothesis envisages a continuous drop in the index from the centre towards the peripheral units. In such a case, strictly speaking, there would not be two distinct spaces but two ends joined by a multitude of intermediate situations, polarised by the town.

This is only a theoretical case and in real life there are more complex situations, like variations in the graph's rhythm or threshold. These changes should be analysed separately because they cover as many specific sub-spaces.

So, when looking at the graph in Figure 7, one can see that first there is a slight decline, which slows down to reach an irregular plateau a few kilometres before its end. It is not a case, as envisaged in the third instance, of two clearly separated spaces. As a matter of fact, the number of villages covered by this plateau is much less than the number of villages making the transition. Though the transition is more important than the phenomenon itself, it is necessary to reinterpret it.

The graph can then be reinterpreted to distinguish a first zone going up to the 5th kilometre, where urban polarisation is very strong. We can then envisage a slower transitional space ending on an irregular plateau or three distinct rural sub-spaces, to which we shall return later. For the present, we will conclude that there is no dichotomy between urban and rural spaces. In fact, if we only take into account urban space, we find 4 distinct spaces linked to one another in a continuous fashion. Yet there is no continuum as such because we are not in the presence of "something that changes in character gradually or in very slight

steps without any clear dividing points" (definition in the *Cambridge International Dictionary of English - 1995*). The fact that it is possible to distinguish several spaces makes us view it as a gradient from one end to the other, passing through more or less rapid phases of change.

b) A step-by-step approach to modernisation

Before going deeper into the modalities of the urban impact on the rural environment, we wanted to study the variation in the indices that constitute our modernisation index to understand how they react individually in relation to the distance to the town. There are two reasons for this. The first reason is to ensure that all the variables change effectively according to their distance to the town; the second is to see how our index reacts in comparison to the variables that constitute it.

To verify the relation of different variables to the distance to the town (or a function of the distance), we conducted correlation tests. The results were varied (see Table 9): variables like the sex-ratio of children or the area under cultivation are not correlated with the distance to the town (and are therefore not shown in the table). Then, the first series of variables is only slightly correlated with distance. The general sex-ratio and the child-woman ratio, on the one hand, follow a more regional pattern. On the other hand, the data regarding the infrastructure (taxis and bus stops, medical institutions and schools) is not very correlated with the distance to the town, but is more correlated with the population of the villages. It is therefore a question of variables relating more to the centrality of the villages than to urban influence.

Finally, there are variables whose correlation (negative) with the distance to the town is very strong: literacy and the sex-ratio in literacy, the services sector and industries. Similarly, the cultivators-labourers ratio, which reflects the level of

modernisation of agricultural institutions, is negatively correlated with the distance to the town. This means that the town exerts considerable influence.

We will first consider the interpretation of Table 9 according to which the different functions of distance can model the relationship between the town and the countryside in an optimal manner in accordance with the variables under consideration. We then see that the differences in the correlation level of variables according to the distance function are quite low (except in the case of the exponential function). Lastly, we notice that the modernisation index has a higher correlation coefficient than the constituent variables. This fully confirms that the analysis of the principal components has produced new information. It is thus possible to deduce that our index is a valuable contribution to the study of modernisation in Tamil Nadu, and can justify – if the need arises – a comprehensive approach rather than an index by index approach.

Figure 8 shows us that the projection of the values of variables in relation to the distance to the town tells us more than their correlation coefficients. What we have just said about correlation also applies to it except that we have reintroduced the spatial dimension. We thus see that it is possible to distinguish several groups of variables in relation to the variation of the distance to the town.

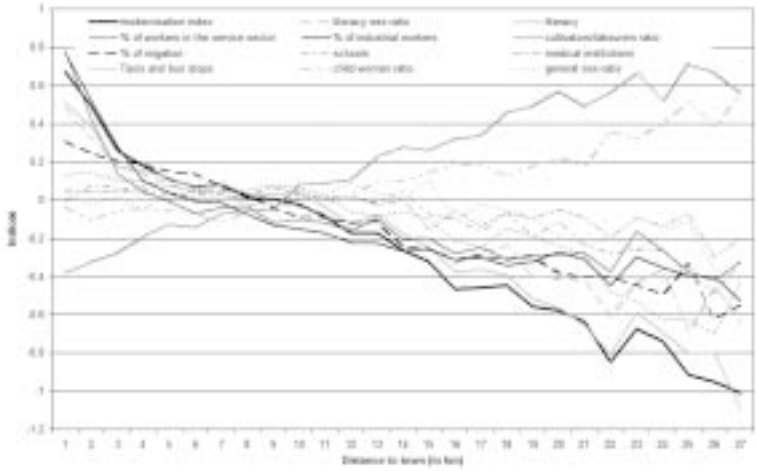
Table 9: Correlation between modernisation factors and different functions of the distance to the town

Variables	Distance (in km)	Square root of the distance	Square of the distance	Logarithm of the distance	Exponential of the distance
General sex-ratio	-0.04	-0.03	**-0.05**	-0.02	-0.00
Child-woman ratio	0.12	0.10	**0.13**	0.08	0.01
Literacy	**-0.29**	-0.29	-0.28	-0.27	-0.02
Literacy sex-ratio	-0.23	**-0.23**	-0.20	-0.23	-0.01
Percentage of workers in the service sector	-0.21	-0.24	-0.16	**-0.27**	-0.00
Percentage of industrial workers	-0.26	-0.29	-0.20	**-0.31**	-0.00
Taxis and bus stops	-0.14	-0.13	**-0.15**	-0.11	-0.00
Medical institutions	**-0.05**	-0.04	-0.04	-0.04	-0.00
schools	-0.07	-0.06	**-0.08**	-0.04	-0.00
Cultivators/ labourers ratio	**0.27**	0.26	0.24	0.24	0.00
% of irrigation	**-0.21**	-0.21	-0.19	-0.19	-0.01
Modernisation Index	-0.34	**-0.34**	-0.31	-0.33	-0.02
Population of villages[24]	-0.09	**-0.10**	-0.07	-0.09	-0.00

The maximum value obtained for each variable is shown in bold type.

[24] This variable is not a part of the variables included in the index, but it seemed interesting for our study.

Figure 8: Variation of indices constituting the modernisation index according to the distance to the town



The child/woman ratio does not seem to depend on the distance to the town for the first 10 kilometres, but later it increases with the distance. This is certainly a reflection of the strong regional component of fertility (see Guilmoto, Rajan, 2001). Similarly, but in inverse proportion, the general sex-ratio of the population seems to have little to do with the town, but it increases beyond a certain distance.

The infrastructure-related data decreases as we move away from the town. Nevertheless, the decrease is slow. The distance to the town is certainly not the most discriminating factor for explaining the presence of schools or health facilities in villages. On the other hand, it may be noted that being far from a town greatly reduces the chances of getting public transport, thus increasing their isolation.

The relation between the town and data related to agriculture is much less ambiguous: nearer to the town, agriculture is much more developed and modern: the share of agricultural labourers in

agricultural activities and percentage of irrigation decreases progressively as one moves away from the town.

There are finally four variables following the same trends: a sharp decrease during the first few kilometres around the town followed by a more continuous linear decrease beyond a distance of approximately 5 kilometres. This is due to the literacy level and the low literacy among women, and especially the importance of the services and industrial sectors in employment, four elements that can be described as urban.

The distance to the town brings out the relation between the rural and urban worlds. Even though the urban influence is sometimes not visible in the first few kilometres, being far away from the town is a real handicap and distance is a factor that explains the variation between social as well as economic and cultural indices. Nevertheless, every bit of data has a particular relationship with the urban world, which finds expression in singular types of reduction.

It is now necessary to refine this approach and try to see how the role of distance varies according to different types of towns.

2) The Effect of Different Types of Towns

Though our leitmotif is the differentiation of rural areas according to the distance to the town, it should be remembered that all towns are not the same. It is possible to differentiate between them according to their size as well as their administrative status or their dominant economic function. Each of these aspects is likely to influence the level of the urban impact on the rural environment.

a) The importance of the "one lakh cities"

The population of a town represents a synthesis of several dimensions of the urban phenomenon. Our hypothesis is that urban influence should increase according to the size of the urban

population. The more populated the town, the greater its spatial influence. An initial survey indicated that the correlation between the size of the nearest town and the level of village modernisation is 0.12. This level, though quite low, is significant. As it often happens in the case of analyses linked to the size of a populated unit, the logarithm of the population is better able to explain the disparities between towns. However, in our example, the correlation between the logarithm of the population rises by 0.01 point and reaches 0.13. The increase in the percentage of the variance explained is only 0.3 % and it is insignificant.

Three hypotheses are therefore possible. The first hypothesis assumes that the size of the town does not affect the level of modernisation of the surrounding villages. All towns would have a similar impact, or at least their impact would not depend on their size. Nevertheless, it is difficult to imagine that a town with a population of 6 million like Chennai does not have greater influence on its hinterland than a rural town having only 5,000 inhabitants. The second hypothesis assumes that the relation between modernisation and the population of the nearest town is not linear. It therefore follows that correlation and regression are not efficient tools. Further, if the smallest towns have no influence, or if the urban influence is not felt until the towns reach a critical mass, results can be confusing and the effect of the size of the urban population played down.

The last hypothesis assumes that if the town's size influences the level of village modernisation, its role can be concealed by the role played by the distance to the town, which is not included in this calculation. Therefore, if the most populated towns have greater influence than smaller towns, then they would influence villages that are the furthest, which are, as we have seen, the least modern. The relation between the town's size and the modernisation of the village would then be distorted by the distance to the town. The big cities would then not have more influence on all the villages

that they serve than the smaller towns surrounded by a few villages at a short distance.

We have therefore decided to reintroduce the distance to the town as a factor, after having divided the towns according to their population. For this, we have used 6 categories of size defined by the Census (cf. p. 13), which enabled us to obtain 6 samples whose modernisation level was measured separately in relation to the distance to the town. A synthesis of the results is given in Table 10.

The first line of the table indicates the number of towns in each class. This first indication allows us to immediately note the insignificance of towns with less than 10,000 inhabitants in the entire sample. As for those villages that are closest to an 'n' class town, their number is sufficiently high to ensure the robustness of the results obtained while calculating the averages (lines 4 and 5) and also when calculating the regression (line 6).

So the average number of villages per town for each class is presented quite logically in line 3. This figure gives a first glimpse of the extent of influence exerted by towns. In fact, the area of influence is defined as the entire zone in which one is nearer to one town than to another.[25] It is not therefore a question of the true area of influence, which would mean prejudging the real influence of the town zone, but a potential zone of influence.

The relation between the town's size and the extent of its influence is marked. Cities have on an average 95 villages around them, while towns with less than 5,000 inhabitants have only 20. It is thus possible to get an idea of the number of villages "dependent" on each town.

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[25] From a cartographic point of view, it is the surface of Thiessen polygons whose centres represent towns.

This figure should be compared with the average distance to the town. We then find that except for cities, there is a linear relation between the average distance to the town and the average number of villages. This means that the distribution of villages is even and that the extent of influence exerted by a town depends on its size. However, cities with a population of more than 100,000 behave differently, because they have a larger number of villages situated on an average at a shorter distance. It can then be concluded that the density of villages is higher around the bigger cities.

In addition to the average distance to the town, we have indicated distance of the most distant village (line 8) which corresponds to a town's maximum influence. If the interpretation of this type of figure is difficult, it can nonetheless be remarked that the maximum influence of towns having less than 10,000 inhabitants is much less than others, thus emphasising their marginal role even more.

As for the modernisation index, it is seen that there is a great deal of uniformity in the average index level irrespective of the type of town (see line 4), with the exception once again of Class 1 cities. Thus, irrespective of the town's size, the index average seems to be the same in its surrounding area. This is partially explained by the average distance, which decreases when the town becomes smaller, taking into account fewer distant villages (having lower indices). In other words, the relatively low indices of villages around smaller towns are compensated by a smaller area of influence, which does not take into account villages whose index is even lower. This has been confirmed by the analysis of the average index in the first 5 kilometres around a town (line 5). This figure can be interpreted as the average of the fitted index of the structural effect related to the differences in the distance to the town. The results enable us to confirm all that has been observed earlier, namely the peculiar nature of cities with more than 100,000 inhabitants, which stand out as having more

influence than the others as well as the marginal role of towns with less than 10,000 inhabitants whose influence is almost nil.

Finally, the last observation is about the different roles played by the distance to the town according to the type of town. All through this study, we will use the coefficient of determination of the linear fitting (i.e. the share of the variance that the model explained) by a distance function to evaluate the impact of towns on the rural areas surrounding them. In fact, when the coefficient is higher, the distance to the town as an explanatory factor is more important. We can thus deduce that the town is an element that determines the levels of modernisation in the surrounding areas. Thus, a town without any influence does not change the level of modernisation in the surrounding villages according to its nearness. The coefficient is then close to 0. On the contrary, if the town has a strong influence, it has an effect on the villages around it, which results in an increase in the coefficient of determination. The latter is 0.12 for all the towns, which would serve as a reference value for other fittings.

This measurement by the coefficient of determination puts the first observations made on the basis of average index values in a proper perspective. It is clearly visible here that the coefficient decreases with the class of the town. Only Class I cities have a coefficient higher than 0.12, and it comes down to 0.03 for Class V and Class VI towns. Therefore, this confirms our hypotheses. Though the modernisation level of villages does not depend on the size of the nearest town, being far from a town makes a bigger difference depending on its size. The more populated a town, the higher the level of modernisation in the surrounding villages falling within its sphere of influence.

Table 10: Average level of village modernisation around towns according to the class of town

	Class I	**Class II**	**Class III**	**Class IV**	**Class V**	**Class VI**
Number of towns in the class	31	39	64	62	24	5
Number of villages whose nearest town belongs to class…	2955	3506	4945	3676	902	101
Average number of villages for each town *	95	90	77	59	38	20
Average modern-isation index of villages*	43	39	39	40	40	41
Average modern-isation index in the first 5 kilometres*	46.9	43.1	41.6	42.9	41.2	42.8
Coefficient of determination of the regression of the modernisation index according to the distance to the town **	**0.16**	**0.12**	**0.09**	**0.09**	**0.02**	**0.03*****
Average distance to the town (average influence of towns)*	7 km	9.6 km	9 km	8.3 km	6.9 km	5.2 km
Maximum influence of towns*	34 km	30 km	32 km	38 km	27 km	17 km

** Only villages whose nearest town belongs to the class mentioned have been taken into account.*
*** By using the square root of the distance, the significance changes little, except for Class I, where it reaches 0.19*
**** Significant at 5%*

Figure 9: Modernisation and the distance to the town according to the population of the nearest town.

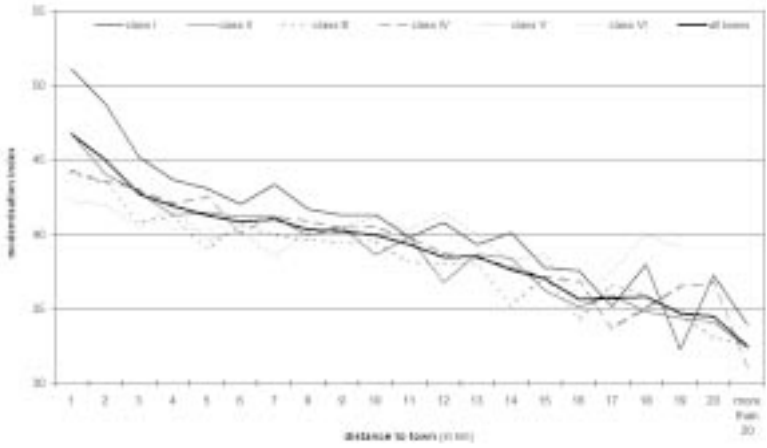

Figure 9 presents these results in the form of a graph. As in Figure 7, the distance to the town from the villages is found on the 'x' axis and the level of the modernisation index on the ordinate. However, the curves here are differentiated according to the size of the nearest town (the reference value constituting all the towns is shown as a dotted line).

It is observed that Class I cities have a strong and widespread modernising influence. It is at their level that the effect of a town's size is clearly visible. These cities with more than 100,000 inhabitants have a strong impact on the surrounding rural areas, which confirms the observations made by Kundu as far back as in the 1980s (Kundu, 1992) and recently repeated on the basis of the analysis of the first data of the 2001 Census (Kundu, 2003: 3082). This is in addition to the analysis done by Berry (1971), which described cities with a population of more than 100,000, as regional capitals.

The action of Class II towns is close to the average and their role is therefore also quite significant. The action of Class III and Class

IV towns is almost identical: their influence is still remarkable but weaker. Class V and Class VI towns, i.e. towns having less than 10,000 inhabitants, have practically no influence on the spatial organisation of the surrounding countryside. It should be remembered that Moriconi-Ebrard had chosen this threshold to define the town at the world level (1994: 86). It appears that in India's case, this definition is more in tune with reality than the present threshold of 5,000 inhabitants chosen by the Census.

We may therefore conclude that if the size of the nearest town is not a direct factor for explaining the modernisation level of villages, it continues to be distinctive at the extremes and the centrality (in the Christallerian sense) of Class I cities is visible. These cities have a strong influence on the organisation of the surrounding space. On the other hand, Class V and Class VI towns do not seem to have the power to organise the rural areas around them.[26]

b) Urban status, a reflection of urban hierarchies

In addition to these 6 categories of towns divided on the basis of their population, we found it judicious to explore another urban dimension defined by the civic status of the units: town panchayats, municipalities and urban agglomerations. The three other categories present in our database, MTS, PTS and village panchayats[27], have not been taken into account. In fact, they do not represent categories of clearly defined towns and are also very few in number. This means that only 459 villages (less than 3% of our database) have been left out of our calculations.

It may be thought that this classification will bring out differences that are more clearly demarcated than those based on different classes of population for two reasons. The first reason is statistical:

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[26] We must however keep in mind the shakiness of the statistics in this regard due to the small numbers expressed by very variable results.

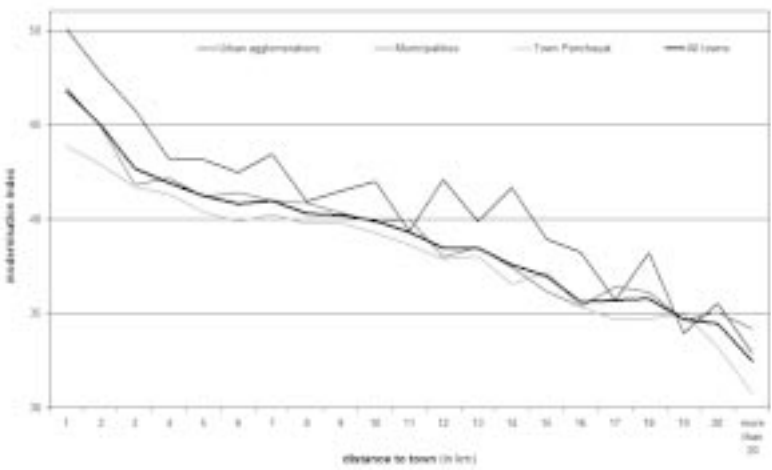
[27] See page 13 and the following pages.

we have moved from 6 to 3 categories, which has the effect of increasing the number of villages classified according to the distance, and this makes our results more reliable. The second reason is based on the significance attached to these categories: they are not justified by quantitative data (population) but by a criterion defining their urban character.

One would expect the effect of urban agglomerations to be greater than that of municipalities, which are more influential than town panchayats. Figure 10 shows quite clearly that the action of urban agglomerations is higher than the average action of towns. Their influence is greater, irrespective of the distance, except beyond 18 kilometres or so, a distance at which the number of villages per class is no longer sufficient to obtain significant results. On the other hand, town panchayats constitute a lower level of the urban hierarchy. Between the two, municipalities have an action that is almost similar to that of the average town.

It must be made clear that the average position of municipalities is not the results of a statistical bias. In fact, it is possible that if one of the categories consists of villages that are much superior to those in other categories, the average of its villages will tend to be closer to the general average of towns, because it contributes a great deal to them. The question does not arise here because the number of villages according to the categories is as follows: 2854 villages are in the immediate neighbourhood of an urban area (18 %), 5711 are very close to a municipality (37 %) and 7061 near a TP (45 %). This means that the similarity between the curve representing municipalities and the average curve is not due to the excessively high contribution of the first to the second (because it contributes only about 1/3). We may thus conclude that this classification of towns according to their status clearly reflects the urban reality in Tamil Nadu.

Figure 10: village modernisation and distance to town, according to its urban status.



It will be noticed, in addition, that the appearance of a curve representing the modernisation level of villages whose nearest town is a town panchayat is more linear than others as it does not include a section of faster decrease near the town. Further, a linear fitting by a square root function of the distance does not produce better results for town panchayats while it increases the coefficient of determination by 0.5 point for municipalities (rising from 9.3 to 9.8 %) and by more than 1.5 points for urban agglomerations (rising from 14% to 15.7 %).

c) Economic functions of towns

The dominant urban economic function is another factor that helps to understand the influence of a town on its hinterland. It is possible to consider that the economic orientation of a town is correlated with that of the villages nearest to it if there is interaction between them. Table 11 presents the result of the fitting of the modernisation index by a linear function of the distance according to the dominant economic sector in the towns.

Table 11: village modernisation and distance to town according to the urban economic function.

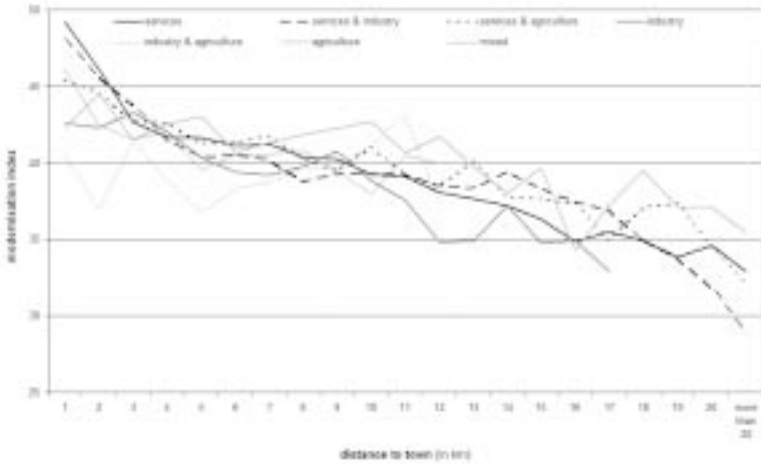
	Services & industry	**Services**	**Services & agriculture**	**Industry**	**Industry & agriculture**	**Agriculture**	**Mixed**
Number of villages	**2143**	**7848**	**2955**	**882**	298	**1513**	446
Coefficient of determi-nation*	**0.15**	**0.14**	**0.10**	**0.08**	n.s.	**0.03**	n.s.
Slope of the fitting curve	**-0. 65**	**-0. 59**	**-0. 51**	**-0. 53**	n.s.	**-0. 31**	n.s.
Constant	**45.4**	**45.3**	**44.7**	**43.3**	n.s.	**43.7**	n.s.

** fitting with the square root of the distance gives the best results only for the "services and industry" and "services" categories. The coefficient of determinations rise respectively to 0.16 and 0.15 while they fall for the other categories.*
n.s.: not significant

The table firstly shows that the results given by the two categories of towns are not significant. These are towns that have dominant industrial and agricultural sectors and so-called mixed towns. On the contrary, the tendencies shown by other towns are quite clear. On the one hand, towns where the services sector predominates have a greater impact on the villages around them and, on the other, towns where agricultural activity is more dominant show the opposite tendency by playing a weaker role. Towns where the industrial sector is dominant, moderately influence the level of modernisation in the villages around them, while towns where industry is mixed with the services sector are the ones that have the greatest effect on the modernisation of the rural space.

We may thus conclude from the above, and as the projection of values in the graph clearly shows (cf. Figure 11), that the level of modernisation of villages closest to towns is influenced by them. Towns with a dominant services sector are certainly important vectors for the modernisation of rural areas. The presence of an industry in a town, if it does not constitute the major or only activity, is a positive factor. On the other hand, agricultural towns have little influence on the surrounding countryside.

Figure 11: village modernisation and distance to town according to the urban economic function



3. What type of towns for what type of rural areas?

However, we have shown that urban functions are not equally divided between towns with different types of administration (cf. Table 4, p. 18). We must therefore cross-link these two pieces of information to understand more clearly the influence of towns on rural areas. That is what Table 12 purports to do. The columns show the dominant economic function and the lines show the information regarding the relation between the modernisation index of villages with the nearest town differentiated according to the town's civil status.

d) At the top: urban agglomerations and strong services sector

The number of villages is meant to inform us about the size of the categories presented in the table. We thus see that some categories do not exist (urban agglomerations with dominant industrial and agricultural sectors and mixed towns) while the numbers of the others are too small to provide data that can be interpreted without bias (urban agglomerations with dominant services and agricultural sectors and industrial municipalities). Finally, some categories produce results that are not significant (marked n.s.). Only the significant results are given in bold type. We have therefore shown only the coefficient of determination of the linear fitting between the modernisation index and the distance to the town, as well as the two data that will enable us to measure it: the slope of the fitting curve and the constant of the equation of this straight line.

Table 12: A categorywise approach to the modernisation of villages according to the type of town.

	Services & industry	**Services**	**Services & agriculture**	**Industry**	**Industry & agriculture**	**Agriculture**	**Mixed**
Urban agglomerations							
Number of villages	**1581**	**737**	139*	**362**	35	-	-
Coefficient of determi-nation*	**0.10**	**0.22**	0.22	**0.12**	n.s.	-	-
Slope of the fitting curve	**-0.64**	**-0.86**	-0.76	**-0.7**	n.s.	-	-
Constant	**48.7**	**48.4**	50.9	**43.8**	n.s.	-	-

	Services & industry	**Services**	**Services & agriculture**	**Industry**	**Industry & agriculture**	**Agriculture**	**Mixed**
Municipalities							
Number of villages	**4034**	**671**	**630**	135**	151	73	17
Coefficient of determi-nation*	**0.10**	**0.05**	**0.06**	0.10	n.s.	n.s.	n.s.
Slope of the fitting curve	**-0.49**	**-0.38**	**-0.40**	-0.79	n.s.	n.s.	n.s.
Constant	**44.5**	**44**	**43**	42.9	n.s.	n.s.	n.s.
Town Panchayats							
Number of villages	**2156**	**682**	**2162**	290	**1135**	207	429
Coefficient of determi-nation*	**0.11**	**0.12**	**0.11**	n.s.	**0.03**	n.s.	n.s.
Slope of the fitting curve	**-0.48**	**-0.53**	**-0.53**	n.s.	**-0.28**	n.s.	n.s.
Constant	**41.5**	**42**	**44.8**	n.s.	**43.4**	n.s.	n.s.

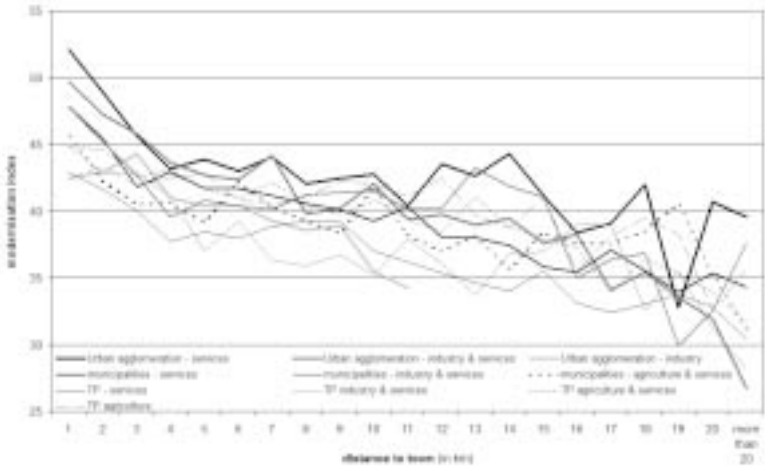
** The results are biased because the 139 villages are situated around Tondi and Tiruchendur. Around Tiruchendur, the index level is very high (62 on an average) and villages are very near (1.6 km on an average). Around Tondi, the average value of the index is 39 and the average distance is 12 km.*

*** This refers to villages around the town of Aruppukkottai (35 km to the south of Madurai)*

As in the case of the results presented in Table 11, the categories of mixed towns and those having dominant industrial and agricultural sectors do not produce significant results. We are then tempted to resort to a hierarchical break-up to understand the influence of towns on the rural areas.

Figure 12 shows the indices of the village modernisation, which will be useful for qualifying the comments on Table 12. We have only shown the significant values in this table.

Figure 12: village modernisation and distance to town according to their economic orientation and urban status.



Urban agglomerations where the service sector is significant or predominant have a very strong structuring role, which can be seen by the importance of the constant (the modernisation level is high at their periphery) and the slope is quite significant: moving away from the town brings about a sharp drop in the modernisation level and the graph shows it quite clearly. In contrast, specialisation in the industrial sector in the case of towns of the same size does not seem to be a positive sign as modernisation is lower than the average in the surrounding area.

Municipalities follow almost the same general pattern but with a lower level of modernisation (about average for all the towns) and a lower diffusion capacity.

Town panchayats present a different model. We have seen that their role is significantly less important and it varies according to another model. In fact, if the services sector still has a role to play, it does so only when it is combined with another dominant sector, generally industrial, but particularly agricultural. Town panchayats are therefore even more influential when they present economic diversity.

In the end one finds a hierarchy of towns according to their status or their dominant economic function. The largest centres will be the driving force in their region especially since they themselves are involved in modern activities like the services sector. While lower down in the urban hierarchy, the diversity of economic functions is dominant. Figure 12 completes the results of Table 12 by assimilating the index variations according to the distance to the town, kilometre by kilometre. This pattern is clearly visible in the table. We also observe the steep incline of the graphs showing service-related activities in the first 5 kilometres, and we will certainly compare it with the data presented in Figure 8.

From this exploration of relations maintained by rural areas with the urban world, one conclusion can be drawn namely that, all else being equal, the closer a village is to a town, the more modern it will be. Moreover, the size of the town's population as well as its civic status will have a positive influence on the modernisation level of villages, which will be further strengthened if the town is engaged in a service-oriented economic activity.

d) Periurbanisation

After having studied in detail the nature of the urban influence exerted by different types of towns, it seems important to

return to the peculiar form that the curve representing the modernisation index according to the distance to the town sometimes assumed. In fact, as we have already observed in the first few lines of this chapter, the curve of the modernisation index has an exponential type of pace in the first few kilometres in the case of all towns before it follows a much more linear slope. This is why fitting with a square root function of the distance would give better results. We realised later that this square root function also gives a better approximation around Class I cities, urban agglomerations and, finally, around towns having a dominant services sector or an industrial and services sector (cf. Table 11). By the way, this last point should be related to the form assumed by the curve representing the percentage of active persons in the services sector and the curve showing the percentage of industrial workers as shown in Figure 8.

By separating the data into two groups, the first group containing villages situated less than 10 kilometres from a town and the second containing the others, we obtain different results when we fit our index according to the distance function. Thus, the first group is better represented by a curve based on a logarithmic function of distance, while the second is represented by a linear function. So this confirms what we had anticipated from Figure 9. By refining our approach, we can finally isolate the first 5 kilometres, which are characterised by a sharp decrease in the index (between 1.5 % and 5.1 % per kilometre).

Figure 13: From the urban to the rural in Tamil Nadu: differentiated spaces.

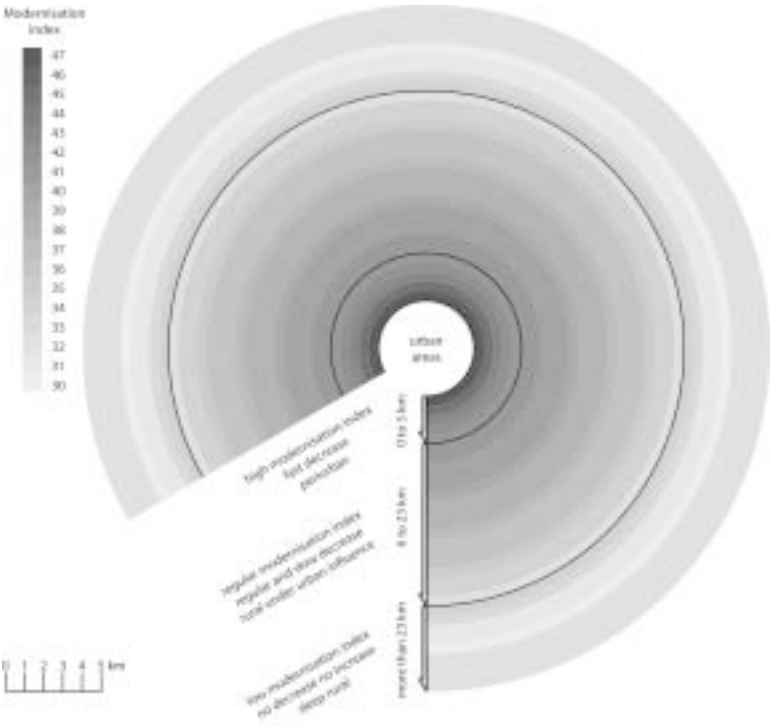


Figure 13 proposes a synthesized diagram representing the organisation of rural space around the towns in Tamil Nadu. We actually see around the town a first ring covering the first 5 kilometres that we will call “periurban space”. Without being able to verify the frequency of individual interactions with the urban centre, which would enable us to validate our hypothesis regarding the existence of a periurban zone, we could nonetheless assume it. In fact, the movements of pedestrians, cyclists and two-wheeler riders can be anticipated daily over such distances – about 5 to 6 km for pedestrians, about 10 km for cyclists and 20 km for riders. Beyond this zone, the relation would be more linear because only one mode of transport would be able to cover

the distance, namely motorised vehicles (buses, cars and motorcycles having almost the same speed) and the number of interactions would then be proportionate to the distance. This 17 km ring can be described as "a rural area under urban influence", because the modernisation level continues to be dependent on the distance to the town. Finally, a fringe situated more than 23 kilometres from the centre experiences a low level of modernisation in general without showing any explicit tendency. The rural area is no longer polarised by the town and these zones will be qualified as "deep rural areas".[28]

3. Accessibility of towns

As we can see, a periurban space stands out clearly, but we must question this visible link. Actually, if transport has a role in the break-up of space, it should also create inequalities within periurban space. It was therefore tempting to go deeper into this aspect of our work. Consequently, it is not the distance to the town that is evaluated, but the town's accessibility.

a) Roads, as an avenue of modernisation

To reach the town, it is usually necessary to go by road. The distance to the town can thus be fine-tuned/nuanced by including the notion of accessibility in our study. It is not a question of calculating the actual distance by road, whose Euclidian distance gives a good approximation, but of indicating for each village the distance to be covered to reach a road, which will then take a person to the town.

Our hypothesis here is that the proximity to a road should increase the modernisation level by increasing the interaction between villages and towns. In his study of the Vellore district, Wanmali also draws attention to the possibility that the existence of a service

[28] We have intentionally used INSEE terminology, presented on page 9 and in the following pages.

in a village may be dependent on its access to the road (Wanmali, 1992). To make sure, we resorted to the regression of our index of the distance to the road. This explains 11 % of the variance, that is to say almost as much as the distance to the town. All else being equal, the further a village is from a road, the less modern it is. It should be noted that just as in the case of the distance to the town, it is the square root function of the distance that allows the best fitting for the modernisation index with a coefficient of determination of 0.12. This function, as we have seen earlier, expresses the greatest benefit obtained by villages situated close to the infrastructural facilities, as compared to those situated further away. The relative loss of the advantages of the nearness of the road decreases as one moves further away from it. This relation between the distance from all other population units and the modernisation level seems to confirm what we had observed in the case of distance to the most important units, namely the cities. As Philippe and Geneviève Pinchemel reminds us, “Even during the time the course of a road is being plotted, it introduces in space a great inequality comparable to the polarisation of centres, but having linear effects.” (Pinchemel, 2002: 101).

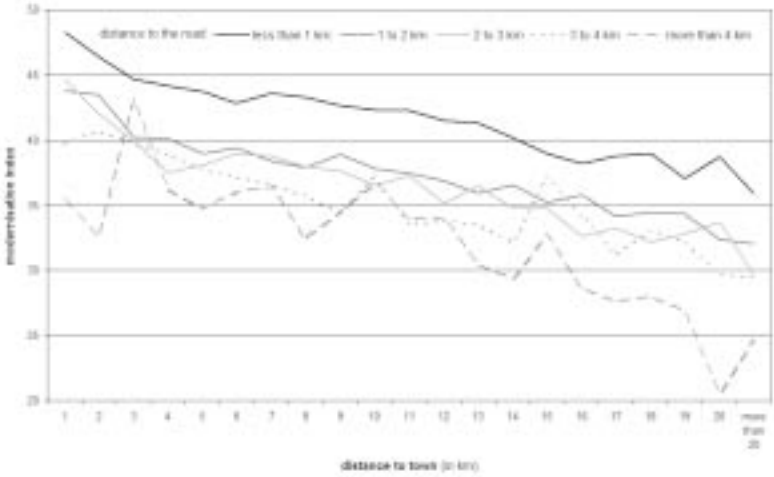
However, it is even more interesting to see that the effect of the distance to the road is added to the distance to the town. These two effects, though similar as far as their action is concerned, are distinct and cumulative. Thus, the fitting of the index according to the distance to the town and the distance to the road explains 19 % of the variance. It is even possible to optimise the model by using a square root function of the distance to the town and the road. We then obtain the following fitting, which explains 21 % of the variance of our index:

equation 1 : $I_m = 53{,}52 - 2{,}72\sqrt{D_v} - 5{,}83\sqrt{D_r} + \theta$

where D_v is the distance to the town, D_r the distance to the road, and θ the part not explained by the model.

The beta coefficients of each factor are -0.29 for the distance to the town and -0.28 for the distance to the road. Figure 14 gives a graph of these results. In this graph, the 'x' axis represents the distance to the town and the ordinate the level of modernisation. The curves represent the modernisation level of the villages according to their distance to the nearest road.

Figure 14: village modernisation and distance to town according to the distance to the road network.



The results are quite clear and we see that the villages situated less than a kilometre from a road, that is to say having direct access to the road, have a higher level of modernisation than others, all else being equal, as regards their distance to the town. Hence, it appears that the effect of the accessibility to the road is added to the distance to the town, or more exactly an effect of the relative isolation of the villages.

So it is advisable to see if the type of road used has an impact on the overall accessibility to the town. A simple means of doing this is to distinguish the type of road that serves the village. The hierarchy of roads indicates the speed and the capacity of movement that they permit.

There are three categories of roads in Tamil Nadu: national highways, major roads and other roads. The national highways have two carriageways on which three (sometimes four) vehicles can move side by side. It is thus possible to move quite fast and overtake vehicles without much difficulty. According to our estimates[29], the average speed did not exceed 40 km/h during the 1990s. The major roads are often less wide, less maintained and the speed on these roads is therefore that much less. As for other roads, they are badly maintained and users are forced to drive slowly. The average speed does not go beyond 30 km/h. This gradation of speeds directly influences the time taken to reach the town and must therefore be added to the distance effect.

Table 13 confirms our hypothesis. It shows that the average level of village modernisation depends on the type of the nearest road. In more general terms, the modernisation level is higher in the vicinity of highways and lower in the areas near secondary roads. We also notice, and this is visible in Figure 15, that the modernisation level falls more sharply in the case of villages near national highways than in the case of other villages, so much so that it is more advantageous to be near a major road and even a smaller road when the distance is beyond 12 kilometres. There are two reasons for this. The first is statistical: the classes of villages nearest to a national highway are fewer than 34 after the thirteenth kilometre and are therefore not very significant, as shown by the alternation of strong and weak values in the graph. The second reason is that the villages situated more than 13 km from a national highway do not get any direct benefit because they are in any case too far from it to access it easily.

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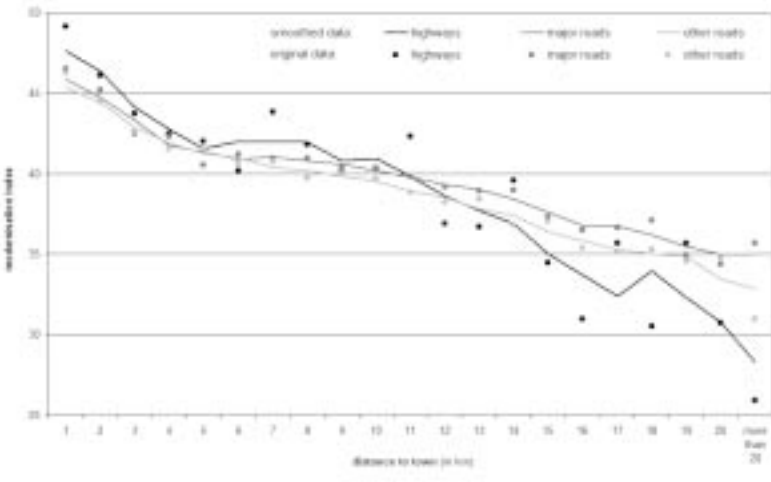
[29] Due the unavailability of measurements or estimates made by others, we have estimated this speed according to the present speeds of movement. Thus, it takes almost 7 hours by car to cover a distance of 300 kilometres from Pondicherry to Bangalore on national highway 66, or less than 45 km/h on average. On the other hand, on the new highway connecting Pondicherry to Madras (about 160 km) it takes 2½ hours corresponding to an average speed of more than 60 km/h. This is the fastest road in Tamil Nadu. However, these estimates are for cars as buses are generally slower.

Table 13: Relation between distance to road and village modernisation

Nearest Road	National Highway	Major Road	Other Road
Average modernisation index of villages	42.2	40.9	39.5
Average distance of villages to the road	1.3	1.2	1.4
Coefficient of determination of the regression	0.16	0.08	0.13
Coefficient of the fitting curve	-0.85	-0.45	-0.56
Constant	47.3	44.5	44.6

Figure 15: village modernisation and distance to town according to the type road



Real values are represented with dots.
Curves represent the mobile average of the values.

b) The train, a town extension

Because roads have an impact on the modernisation level of villages, the train too is expected to play an important role for two reasons. Firstly, railway lines in South India were designed to pass through the most populated districts and pilgrimage centres (Hunter, 1908, Vol. 3: 400), which tends to increase the centrality of the zones they

cover. Further, the availability of a communication link opens new possibilities of movement, especially to more distant places, which means more interactions and of a more diverse nature.[30]

Thus, the villages situated along a railway line are likely to be more modern than those situated away from it. But the scale of distance is not the same because the village furthest from a railway line is 52 kilometres away. So we must expect a different kind of relation from that of the distance to the road with a decrease in the index during the first few kilometres before reaching a plateau where the distance to the railway line does not influence the level of modernisation.

Firstly, the distance to the railway line explains only 3.5 % of the variance of the modernisation index.[31] The relation is thus weak. On the other hand, it increases by 1.7 points if we use a logarithmic function of the distance. This means that the decrease is higher in the first few kilometres than later. The railway line thus has a strong impact over a short distance that decreases rapidly and finally disappears. Figure 16 shows more clearly the impact of the railway line on the modernisation level of villages. We have shown the average of the modernisation index in steps of 1 kilometre up to the 40th kilometre (only 37 villages are situated beyond this distance). It is quite clear that the advantage of proximity to the rail network falls rapidly. At the 8th kilometre, we cross the average index value

[30] As a matter of interest, we would like to recall what Hunter wrote almost a century ago about the effects of the train on the "morals" of people in India: "It is less easy to gauge the moral influence which railways have exercised on the habits and customs of the people. It is often said that they are helping to break down caste; but it is doubted by many, whose opinions are entitled to respect, whether there has been any weakening of caste prejudices among the orthodox. There can, however, be little doubt that increased travel, and the mixing of all castes in carriages which railway travel necessitates, must produce greater tolerance, if it does no more." (Hunter, 1908, Vol 3: 388).

[31] The distance to a railway station would be interesting, but this information was not available, and collecting it, though possible, did not appear to be relevant to us because it would not have indicated the importance of the station and the existing rail traffic. We therefore preferred to use basic but robust statistics.

(40). The fall of the index becomes more linear and more irregular after the 10th kilometre and we reach an irregular plateau marking the end of the impact of the rail network after the 15th kilometre.

Figure 16: village modernisation and distance to rail network.

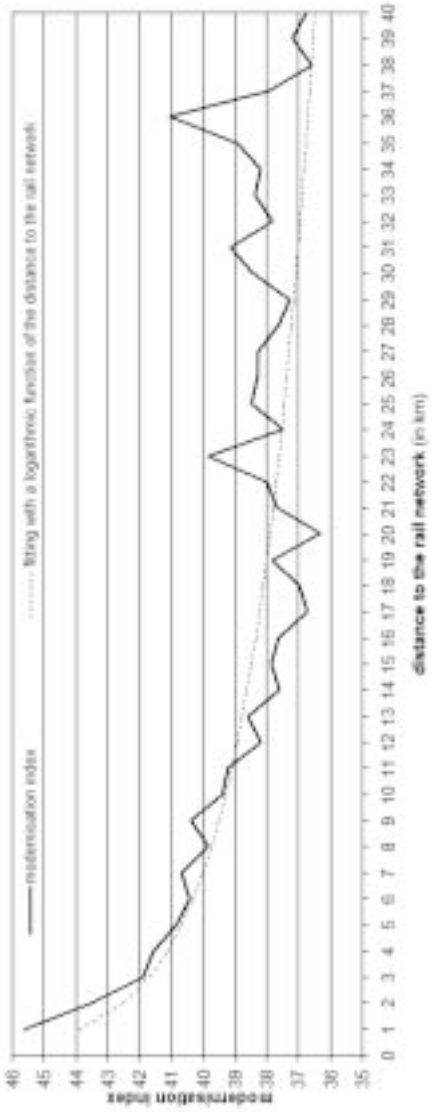


Figure 17: village modernisation and distance to town according to the distance to the rail network.

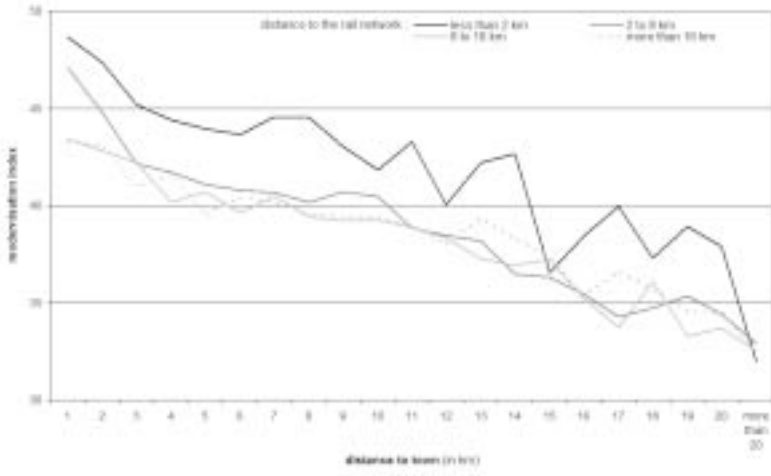


Figure 17 cross-links the impact of the distance to the town with the impact of the distance to the railway network. We chose the steps of distance in order to optimise the differences. We thus see that immediate proximity to a railway line is advantageous and that this influence decreases rapidly.

The fitting of the modernisation index through a square root function of the distance to the town and a logarithmic function of the distance to the rail network gives us an idea of the relation between the modernisation level and the rail network:

equation 2 : $I_m = 49{,}41 - 2{,}71\sqrt{D_v} - 1{,}04\ln(D_t) + \theta$

where I represents the modernisation index, D_v the distance to the town, D_t the distance to the rail network and the part that is not explained by the model.

This model explains only 13 % of the variance of the modernisation index. Hence, apart from the low impact of the rail network, this

impact is related to the impact of the town. We notice in fact that the correlation coefficient between the distance to the town and the distance to the railway line is 36. This can be understood by studying the retrospective effect of the relation between the railway line and the town. Railway lines are built to connect towns that develop on their own thanks to the railway. Therefore, the road seems to be a vector better suited to the spread of modernisation and the railway seems to be more an attribute of the town and its extension into the rural world.

c) Modernisation and access to town

We begin to see more clearly the influence exerted by the town on the level of modernisation of the surrounding villages. The impact is direct and it is increased by the presence of roads and, to a lesser degree, by the presence of a railway network. These three elements explain 21.5 % of the variance of our index. This seems to confirm the hypothesis regarding the spread of towns towards the countryside through the use of the usual means of communication: mainly the road, and the railway more occasionally, with interactions decreasing as we move away from the town. Finally, distance acts as a powerful brake, especially during the first few kilometres, which is expressed by a better fitting of our index through the square root and logarithmic functions of the distance.

It is possible to to propose a model of the modernisation index according to spatial variables as follows:
equation 3:

$$I_m = 54{,}14 - 2{,}41\sqrt{D_v} - 5{,}71\sqrt{D_r} - 0{,}82\ln(D_t) + \theta$$

where D_v is the distance to the town, D_r the distance to the road, D_t the distance to the rail network and θ the part that is not explained by the model.

It is necessary to go deeper into these results by including the differential role of towns that we emphasised at the beginning of this chapter. For this purpose, we have taken up the model again and defined an isolation indicator of the villages expressing their lack of relative accessibility to the town that we shall express as I_e, and which is defined as follows:
equation 4 (isolation indicator):

$$I_e = 2{,}41\sqrt{D_v} + 5{,}71\sqrt{D_r} + 0{,}84\ln(D_t)$$

The effect of the regression of the modernisation index on the isolation factor speaks for itself as shown by the coefficient of determination of the modernisation index fitted by the distance (already presented in Table 11), but also by the isolation indicator.

The results presented in Table 14 show that the modernisation level is dependent on the type of town near which the villages are located and their level of isolation. It should be noted that the general isolation indicator (I_e) is more suited to describe the relation between the modernisation level around towns having a dominant services sector than towns with dominant industrial or agricultural sectors, because the fitting by an isolation indicator defined for each type of town does not increase the quality of the fittings noticeably. This can be explained in particular by the influence exerted by the three categories of towns having a dominant services sector on all the other towns (80 % of villages are located near a town having a dominant services sector). The cases of towns having dominant industrial and agricultural sectors and mixed towns are also special. Actually, in this case it is the distance to the road that indicates the best fitting, because the distance to the town does not have any impact (the beta coefficients are nil).

Table 14: A comparison of the coefficient of determinations of different fittings of the modernisation index.

	Fitting by a distance to the town function	Fitting by the isolation indicator (I_e)	Fitting by an isolation indicator defined for every type of town (I_{et})[32]
All towns	11.5	0.22	0.22
Towns having dominant services and industrial sectors	0.15	0.25	0.26
Towns with a dominant services sector	0.14	0.24	0.24
Towns with dominant services and agricultural sectors	0.10	0.22	0.22
Towns with a dominant industrial Sector	0.08	0.10	0.12
Towns with dominant industrial and agricultural sectors	n.s.	0.09	0.12
Towns with a dominant agricultural sector	0.03	0.14	0.16
Mixed towns	n.s.	0.10	0.13

n.s.: not significant

To illustrate the complex relationship between periurban positioning, the type of town and the role of communication networks, we decided to cross these different elements. Table 15

[32] The accessibility index for each type of town is based on the linear model suggested by the regressions effected in accordance with the economic activity in the nearest town. So 7 regressions have been effected which have given us 7 models enabling us to create indices suited to each type of town. It has been expressed as I_{et}.

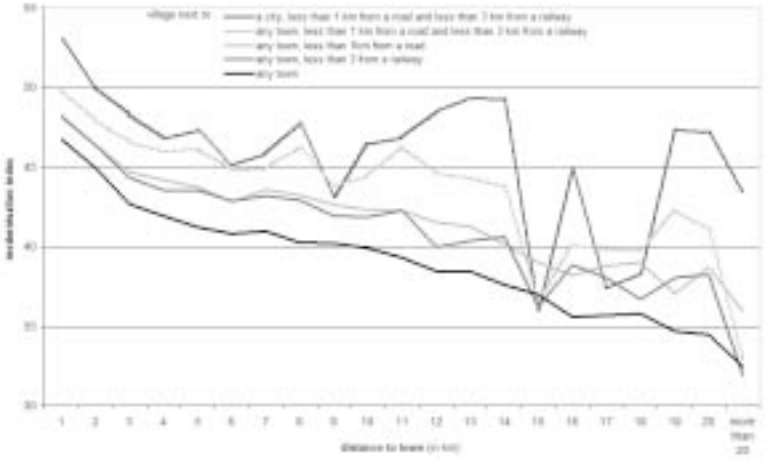
presents in detail the levels of the modernisation index according to their geographical location. We see that the different elements somehow "add up" to create marked differences between the villages. Thus, villages located in the immediate vicinity of a road (less than one kilometre) and/or of a railway line (less than 3 km) and/or in the "umland" of a city clearly stand out from other villages.

Table 15: Modernisation level of villages according to their geographical location.

Villages	Average level of modernisation at 1 km from the town	Average level of modernisation at 5 km from the town
All	46.7	41.2
Villages which are less than 1 km from a road	48.2	43.7
Villages which are less than 3 km from a railway line	48.2	43.5
Villages which are less than 1 km from a road and less than 3 km from a railway line	49.9	46.2
Villages which are next to a city, less than 1 km from a road and less than 3 km from a railway line	53	47.3

Figure 18 illustrates this perfectly. Immediate proximity of the road and railway line has an impact that we have already emphasised. Besides, the impact is even stronger in the area around cities, which compels us to insist on the pluralistic dimensions of the phenomenon of periurbanisation. Periurbanisation offers a clear structure organised around towns, which has to be nuanced according to the accessibility level. Finally, we have to recall a key feature of our study: impact of urban places and effects of accessibility are stronger around the bigger towns than around smaller ones, where they are almost nil.

Figure 18: Distance to the town and accessibility: another view of the periurbain area



CONCLUSION

These results show that though there is certainly a periurban space around Indian towns, which is clearly different from rural spaces, it is nevertheless useful to remember that this space is not homogeneous and present around all towns. The type of town and its demographic size in particular, which sums up a part of its socio-economic characteristics, constitute a factor that explains the more or less distinct presence of a periurban space. In this respect, cities having a predominant services sector are more noticeable as compared to all other towns (see in particular Figure 12). That is where we find the most significant periurban area in terms of space, and one which is most different on account of its characteristics from the rest of the rural environment.

But this periurban space is itself structured by communication links, which create new inequalities within it. As a matter of fact, beyond the ideal concentric pattern, the periurban reality is more fragmented. So it makes way not only for spaces, whose urban characteristics are highly developed, but also for interstitial spaces that are comparatively unprivileged and that could be defined, according to Kundu, as “degenerated peripheries”. Periurbanisation is therefore quite real, visible and measurable. It constitutes today a subject that should be studied at depth with the help of field studies, which will serve to highlight the astonishing diversity of forms it can assume.

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PERIURBANSIATION IN TAMIL NADU: a quantitative approach

SUMMARY

In a context of fast socio-economic transition, the primary role of towns on rural change is to question. By endeavouring to free ourselves of ideological baggage (rural or urban bias), this paper is an attempt to measure the extent of periurbanisation that has taken place in Tamil Nadu.

This work is based on geographical data, based on the 1991 census for Tamil Nadu and Pondicherry. The author undertook a systematic exploration of the relation between the 225 urban areas and the 16,085 villages of Tamil Nadu in order to estimate the influence of the urban areas on the surrounding villages.

After re-examining the definition of urban areas, this paper underlines the diversity of periurbanisation, not only according to the type of town, but also on the basis of accessibility to these towns.

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