

# The glocal as a challenge for local actors having plans for the future

Olivier LEFEBVRE

Dr Lefebvre Olivier France Telecom BD/DPS/SPE 6 Place d'Alleray 75505 Paris cedex 15 France, olivier.lefebvre@francetelecom.com

## 1 INTRODUCTION

About the glocal very much has been said by Michael Porter . According to this author, in some countries there is a competitive advantage, in some industry . It is explained by a « diamond » with four facets : competition and rivalry inside the country, factors endowment, demand, related industries (providers, firms selling components etc ... ) . The competitive advantage appears when the facets are efficient, and stimulating one another, in a country . Then the firms of this country invest abroad, to benefit from the competitive advantage, grabbing market shares and making profits . The country itself is the place of the competitive advantage . The international market is the place of the challenge, where the result of the competition appears .

According to some authors, Michael Porter has explained the mechanism of outward investment (investment from a country with an advantage towards a country without this advantage) , only . From Porter's point of view, inward investment (from a country without an advantage towards a country with this advantage, to benefit from the advantage) exists, but is not important . In a country with an advantage, if an other advantage is lacking, the firms of the country can invest in a country with this advantage, but this concerns a few advantages only . It is necessary that in the country of the firms, most of the needed advantages exist . When a firm invests abroad to benefit from an advantage, in a country (it needs this advantage which does not exist in its country) there is a dilemma . Either the branch has the behaviour of a firm of the country, and benefits from the advantage, but cannot transfer its knowledge towards the parent company . Either it transfers its knowledge towards the parent company, but does not adapt to the country, and does not benefit from the advantage existing in the country<sup>(1)</sup> . A solution is to give the responsibility of a component, or a kind of product, to the branch in the country with the needed advantage .

Sometimes the success of a firm seems to come from the skills of its managers . Here are some examples :

- Global brand . When the brand is known all around the world, there are some advantages . Take the example of mobile phones . May be it will be difficult to integrate some branch, because the customers, in its country, have particular tastes. However, there will be economies of scale, for purchases, the providers accepting reduced prices . The firm can obtain that providers accept specifications chosen by itself, corresponding to the customers'needs . Revenues from roaming will be more important . The firm can be active in countries where demand allows to anticipate the customers'needs in all the world (Japan in the case of mobile phones) . Vodafone and Orange are examples of global brands, in the mobile phones sector .
- Networked firms . Take the example of air transport . Suppose that the company A is a monopoly, or has a very big market share, in its country . It is the same, for an other company, B, in an other country, and there is a big flow of transport between the countries (flights over the Atlantic Ocean is an example) . If one company buys the other, the profit of the new company is more than the sum of the profits of the two companies (the same result could be obtained through an alliance between the two companies) . It is a Stackelberg leader . Suppose that only two firms, the firm and a competitor, sell flights between the two countries . The competitor cannot accept a price war, because its profit would decrease (the profit of the firm does not decrease very much, because of the increasing profit coming from the sales inside the two countries) . The consequence is that the firm is a Stackelberg leader . It chooses the price of the flights between the two countries maximizing its profit (from sales of international and national flights) . The competitor chooses the same price (of international flights) .
- Conversion . The German firm Preussag has converted its activity from metal processing to ... tourism . It was a success. In the European countries (it is not true in the USA) all the facets of the Porter's diamond are not in a single country . Demand and rivalry are in the Northern European countries and factors are in the Southern European countries. However, it is the same for the competitors . The firm had a financial strength . It has chosen external growth (buying other firms in Germany and abroad) . The conversion was thoroughly prepared . The old firm was a reservoir of talented managers .
- Building a production and distribution system all around the world . It is the example of some big firms in the cement sector . It is advantageous to be able to produce cement in a country and to sell it in an other country . A complex commercial policy and a logistics at a world level, are allowed by communication networks . To build this system, external growth is chosen . These firms do not fear to invest too much, as their product can be sold in a country where the demand exists, which is not the country where the product is produced .
- Domination of a particular market through intense R and D . Microsoft and Intel are examples . Important and continuous efforts in R and D allow to keep a big market share, at a world level . Microsoft tries a diversification towards new markets, even if powerful competitors already exist .

Economic success is achieved when two problems are solved, competitive advantage and governance . These problems are distinct, even if they are linked . If one problem is solved, and not the other, it will be a failure . Take the example of land . If a land reform has happened, and if the land is not fertile, the water is lacking, it will be a failure . If the land is fertile, the water abundant, and if there are « latifundia » , it will be a failure . The problem of the competitive advantage is examined by Michael Porter . The problem of governance is examined using the methods of Industrial Organisation (theory of games) or the transaction costs economics . The

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<sup>(1)</sup> For instance, an european telecommunications operator has a stake in a start-up in USA . It is to benefit from a particular technology, as software, that this start-up is able to provide . The european firm benefits from the advantage in USA, but only a particular technology is concerned .

firms (or specialized regions) can be put on a lattice . The two axis represent the competitive advantage (in a country or a region) and the efficiency of the firms' governance . It gives some ideas to compare firms (or regions) from the point of view of economic performance .

Whatever the explanation of glocal is (the Porter's national competitive advantage or the skills of the managers of the big firms) , it will go on .

A third approach does not focus only on firms . It consists in examining the relations between local actors, all preoccupied with long term . These actors are the citizens-consumers, the firms and local authorities . As they are all preoccupied with long term, opportunism can be avoided . According to Thomas Schelling in his book « The strategy of conflict » , in all the situations concerning the human beings (in relations) there are conflict and cooperation aspects<sup>(2)</sup> . When two actors cooperate, there is also a conflict aspect, because the choices concerning the efforts and the payments of each player, correspond to a zero-sum game . If they are preoccupied with long term, they arbitrate between a gain thanks to opportunism (zero-sum game) and a gain thanks to cooperation (during many years, in the future) . If the players have long term goals, they prefer to preserve the relation and opportunism is avoided .

It is the question of cooperation and trust that we shall examine in this text . First we shall describe the three kinds of actors, who are preoccupied with long term . Then we shall examine the question of trust between them . It is crucial for cities and regions, if they have the goal of a steady growth (and also a good quality of life) .

## 2 THE LOCAL ACTORS HAVING PLANS FOR THE FUTURE .

They are of three kinds, the citizens-consumers, the firms, the city managers :

- the citizens-consumers . They consume private and public goods, and they make « intertemporal » choices. It means that they spend money to-day, to achieve two goals . First, to consume the goods they buy . Second, they will benefit from other goods, later, that they will buy, thanks to the purchases made to-day . They are preoccupied with long term, as they consume private and public goods, with a plan for many years.
- Examples are houses and electronic devices :
- Houses : a household buys a house to have a place where to live, to-day, but also they forecast children and want rooms for them, a garden, good schools and colleges near the house etc ... They want a good quality of life for themselves , to-day, but also for their children later . Private and public goods are concerned .

Electronic devices : many households are followers, when the successive generations of electronic devices are concerned . First they have a microcomputer which is not connected . Then the microcomputer is connected to Internet (at low speed) . Later, the microcomputer is connected to Internet at high speed . ADSL technology allows to connect several microcomputers (permanently, at high speed) using a single phone line (which is at disposal to make and receive calls) . Parents have their microcomputer, and children have theirs . The goal is information, entertainment but also acquiring skills which are considered indispensable . Also, the social status of the household is concerned . All this involves the consumption of private and (similar to) public goods . Private goods are microcomputers, software . Similar to public goods are the necessary telecommunications networks . The telecommunications networks are not financed as public goods, but their existence and their extension depend on the dynamism of the city . Only if a threshold is reached (a sufficient number of consumers in a town) , communication networks (cable, ADSL, mobile networks) will exist . It is a reason why some households prefer to inhabit at least middle-sized towns . If the dynamism of the city is sufficient, they are sure that the successive generations of communication networks will be at disposal .

- the firms . They have complex projects for the future . They want to innovate . They make R and D to be able to sell new products and services . The consequence is some uncertainty . This uncertainty concerns the technology which is used, the demand and also financial conditions .

Financial conditions are very important . According to Max Weber, the efficiency of capitalism comes from the entrepreneur 's power . The entrepreneur considers his firm from the point of view of the « account in capital » . He uses financial resources to obtain a financial gain, thanks to projects which are rentable . The separation between possession and production makes possible the decisions of the entrepreneur, who is seeking a financial gain . If he depends on other actors, to have capital at disposal (shareholders, banks) , his liberty is constrained . According to Max Weber, it is a contradiction in capitalism . In fact, the entire liberty of an entrepreneur exists only ... before the choice is made . Often the entrepreneur 's choices are irreversible . An entrepreneur having chosen his project and having borrowed money, is obliged to take some measures :

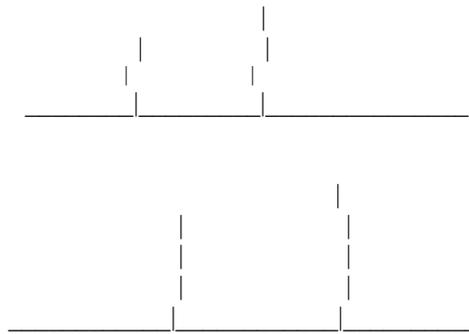
- the borrowed money will be repaid at some term . This term corresponds to the term of the project which is financed with the borrowed money . There is a correspondance between the proceeds and the repaid money .
- if the interest rate lowers, the firm can be more ambitious . The debt is restructured . The firm can borrow more money .
- if the interest rate does not lower or increases, the project is maintained . The debt cannot be restructured .
- it is paramount to avoid borrowing money to repay the debt . It is very dangerous when the interest rate increases<sup>(3)</sup>.

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(2) Conflict corresponds to a zero-sum game . In a zero-sum game, the gain of a player and the loss of the other player, are exactly the same . It concerns the definition of the game, and the result (at the equilibrium) .

(3) This risk exists when a firm prefers to borrow money at short term . It is less costly, but there is not a correspondance between proceeds and repaid money . It is risky, because the firm will borrow money, to repay its debt .

Suppose that there is some change which is favourable to the firms in a sector (increasing demand, lowering rate of interest) . The firms will have more ambitious projects . The two situations, before the change and after the change, are shown in the following figure :



In abscissa, it is time . In ordinates, the quantities of goods which will be produced and sold, in two sectors . After a change favourable to the firms of these sectors, the projects are more ambitious . The projects are more complex, roundabout . The terms of these projects are longer . The quantities of goods which will be produced and sold, are bigger . The new conditions being better, more complex projects are possible (their rentability exists) .

When the conditions which concern the firms of a sector change, they adapt to the new conditions through « tâtonnements » (in the sense of the Austrian economist Hayek)<sup>(4)</sup> .

All this shows that big firms are preoccupied with long term . When they are active in a city, they are interested in staying in this city, provided that the advantages from which they benefit, are durable . These advantages are a job market which functions well, scientific and technological capacities (Universities, institutes, laboratories) , a good quality of life for the employees, a good infrastructure . In particular, the possibilities of extension of their activity are interesting, for firms having plans for the future . They wish local resources not saturated . It concerns houses, land, networks etc ...

- the city managers . They are of various kinds . There are representatives and experts . Representatives are politicians with a mandate from electors . Also, firms have their representatives (in local associations they constitute) . Particular groups of citizens-consumers are represented . Experts are the city planners . The task of the city managers is to negotiate the plans for the future of the city, with citizens-consumers and firms . They obtain that long term will be taken into account, during these negotiations . Their particular knowledge is about long term (potential of the city, problems that the city has to solve, financial constraints etc ... ) . They propose plans, and the local actors (citizens-consumers and firms) choose one of these plans . Would the the negotiation be spontaneous, the result would be an other plan, because to choose a plan for the future of the city is inevitable, but this plan would be determined by actors taking into account short term, only . It means that a plan would be chosen according to the relative forces of the two groups, when the negotiations happen . It would not be optimal . When long term is taken into account, thanks to the city managers, during these negotiations (it is possible, as the local actors are preoccupied with long term) , the result is optimal, or Paretian . In principle, each actor is winning, given that long term goals of these actors are taken into account . This is possible, as these goals exist . For each actor, his welfare (for present and future) ,increases .

### 3 THE PROBLEM OF TRUST BETWEEN LOCAL ACTORS .

We propose a game which is not an accurate model, but which captures the essential of the situation . The two players are the entrepreneurs and the workers . They choose to leave or to stay . There are two cases, one more serious ( « total migration » ) , the other less serious ( « partial migration » ) . In the case of a total migration, the matrix is :

	L	S
L	$1 - c_1, 1 - c_2$	$1 - c_1, 0$
S	$0, 1 - c_2$	$1, 1$

Columns : entrepreneurs .

Rows : workers .

L :leaves .

S : stays .

$c_1$  : workers 'cost of commuting .

$c_2$  : entrepreneurs 'cost of commuting .

The utility in the situation without migration is 1, in each city .  $1 - c_1 > 0, 1 - c_2 > 0$  .

<sup>(4)</sup> There are conditions . Suppose the interest rate lowers . If several projects involve to use the same input, if these projects are more ambitious, it raises difficulties . We suppose no bottlenecks . It is a very much discussed point . The theory of games demonstrates that with a lower interest rate, opportunism is more easily avoided . Partnerships are more easily chosen, and the firms' projects can be more ambitious .

A total migration happens when economic conditions are bad, in the city and when the general conditions of life in the city, are also bad (low level of the quality of life, resources saturated, financial crisis etc ... ). The city managers can do little to avoid the bad economic conditions, but they can avoid the bad conditions of life in the city . The matrix is not a prisoner's dilemma case (there is not a dominating strategy) , and there are two equilibria, (L, L) and (S, S) , but the equilibrium (L, L) could exist . It is better to avoid the risk (entrepreneurs and workers choosing a rival city) .

In the case of a partial migration, the matrix is :

	L	S
L	$1 - c_1, 1 - c_2$	$1 - c_1, u_2$
S	$u_1, 1 - c_2$	$1, 1$

$$1 - c_1 < u_1 < 1$$

$$1 - c_2 < u_2 < 1$$

S is a dominating strategy for each player, and the equilibrium is (S, S) . Trust exists . It is possible, as  $c_2$  could be important (therefore  $u_2 > 1 - c_2$  ) . Also, if to find a job in the rival city takes a long time,  $u_1 > 1 - c_1$  . If one player leaves the city (it would be a partial migration, only some workers and some entrepreneurs leaving the city) , the utility of the other player is less, but he prefers to stay .

If we suppose an effort of the city managers to increase the utility of each player, the matrix is :

	L	S
L	$1 - c_1, 1 - c_2$	$1 - c_1, u_2$
S	$u_1, 1 - c_2$	$u'_1, u'_2$

$u'_1$  : utility of the workers

$u'_2$  : utility of the entrepreneurs

$$u'_1 > 1, u'_2 > 1$$

The utilities of each player are more than in the rival city ( $u'_1 > 1, u'_2 > 1$ ) . Also, the utilities  $u_1$  and  $u_2$  are bigger .

Trust still exists, and is more « robust » . It means that if the conditions of life in the city deteriorate, there is more time to remedy this deterioration . As long as  $u'_1 > u_1 > 1 - c_1$  , and  $u'_2 > u_2 > 1 - c_2$  , trust persists . It will take more time to reach  $1 - c_1$  , from  $u_1$  , than from a smaller value of  $u_1$  (and to reach  $1 - c_2$  , from  $u_2$  , than from a smaller value of  $u_2$ ) . There is more time for a corrective action . It consists in identifying the deterioration of the conditions of life in the city, in choosing a solution and solving the problem . The networks can be used . Particular software allow to conduct enquiries, in a city . Networks allow the city managers to know how the conditions of life in the city are evaluated, continuously, at a small cost .

It is in the interest of the city managers to take measures to enhance the conditions of life in the city, to maintain trust . The goals are a good quality of life, to avoid financial crisis, resources which are not saturated . An ability to make corrective actions, is necessary .

Now we examine the « mechanisms » , or « games » , which allow the actors to choose a project, and how to finance it . These mechanisms are evaluated with several criteria : Paretian efficiency, fairness, incentive compatibility, simplicity . We shall describe these criteria :

Paretian efficiency . The total welfare is maximal . One cannot increase simultaneously the utilities of the two players .

Fairness . The result of the game is equitable if the expenses are paid for by the two players . There is no one player who pays nothing (or very little) . There is a clear reason to justify the way in sharing the expenses .

Incentive compatibility . The players are incited to make true declarations . They are not incited to make false declarations, to benefit from bigger utilities .

Simplicity . The discussions between the players to make the choice, are not too long . The task of the city managers (trying to direct the players towards the Paretian equilibrium during the negotiations) is not too hard . It is important, because it is better when the transaction costs are not high .

In the game 1, the players choose  $x$  (the player 1 pays for  $x\%$  of the expenses, the player 2,  $1 - x\%$ )<sup>(5)</sup> . We suppose the two groups homogeneous, concerning the tastes, or the preferences (for public goods) and the payments (fiscal duties) . On a graph with  $x$  on the horizontal axis and the expenses corresponding to different levels of equipment on the vertical axis, we consider two curves . They represent the preferences of the two players<sup>(6)</sup> . They intersect in  $P$  . For simplicity reasons, this point is chosen . Obviously the result of this mechanism is simple and equitable . It is also Paretian efficient because the sum of the two utilities  $u_1 + u_2$  is maximal . Is it incentive compatible ? In particular conditions, yes . If a group makes false declarations (given any value of  $x$ , an optimal level of equipment lower than the real optimal level) it will obtain a gain . There are two questions to answer . Are all the members of the group cheating ? Is there a reputation effect ? There are three cases :

Not all the members of the group cheat, and there is a reputation effect . The members who do not cheat will observe the cheating (because given the value of  $x$  chosen, they wish a higher level of equipment) . Afterwards, the cheating will be known . As there is a reputation effect, it is not possible . The representatives of the group will choose the high evaluation .

Not all the members of the group cheat, and there is not a reputation effect . The city managers can collect the data directly by themselves . There will be a low and a high evaluation, and they choose the high evaluation .

All the members of the group cheat . There is nothing to do . In this case , the mechanism is not incentive compatible .

In the game 2, given any value of  $x$ , a point is chosen on the Paretian frontier (the points between  $C_1$  and  $C_2$ ) . It corresponds to the sum  $u_1 + u_2$  maximal . The « pressures » from each player are balancing (at this point what is won by one player, and what is lost by the other, are the same) . The choice of a value of  $x$  is arbitrary . This game is not simple . It is not equitable .

It is not incentive compatible<sup>(7)</sup> .

In the game 3, the players choose a level of equipment, then the sharing of the expenses . Either the city managers choose the level of equipment, either the players themselves choose it . The result is the same and the optimal level is chosen<sup>(8)</sup> . It is not simple, but it is equitable . It is Pareto efficient . It is incentive compatible .

Our conclusion consists in several points :

It is the case of a public good consumed by the two groups . Obviously, in the case of a public good which is consumed by a single group, it has to be financed by this group, only<sup>(9)</sup> .

Even if the result of the mechanism is the same (the level of equipment maximizing the total utility is chosen) , the choice of a mechanism is not indifferent . All the three games are Pareto efficient, but there are the other criteria . If the game is simple, the transaction costs are less (the costs of the negotiations are smaller) . Only if the game is incentive compatible, the optimal level of equipment will be chosen .

We can compare the three games in this figure :

	Simple	Equitable	Pareto efficient	Incentive compatible
Game 1	+	+	+	In particular conditions
Game2	-	-	+	-
Game3	-	+	+	+

- Finally, we select the game1 and the game3 . If there are the conditions for the game 1 being incentive compatible, it will be chosen . If there are not these conditions, the game 3 will be chosen .

<sup>(5)</sup> This mechanism has been described by the Swedish economist Lindhal .

<sup>(6)</sup> Given a value of  $x$ , each player has a maximal utility when the level of equipment is of some value (curve  $C_1$  and  $C_2$ ) . It is easy to demonstrate that  $C_1$  is decreasing and  $C_2$  is increasing . Also  $u_1(0) > u_2(0)$  and  $u_1(1) < u_2(1)$  . Therefore there is a single point of intersection  $P$  .

<sup>(7)</sup> In any conditions . Suppose that some members of the group do not cheat . Afterwards, they cannot observe the cheating . Suppose that the group with cheaters is the player 1 . The city managers could collect the data by themselves, and choose the data corresponding to the lower level of equipment (on the left of  $P$ ) or the higher level of equipment (on the right of  $P$ ) .

<sup>(8)</sup> Suppose the utilities (before any expenses) are  $u_1$  and  $u_2$ , and the expenses are  $d_1$  and  $d_2$  . We use the bargain game theory. The gains are equal :  $u_1 - d_1 = u_2 - d_2$  . Therefore :  $u_1 - d_1 = u_2 - d_2 = u_0 - d_0 / 2$  ,  $u_0$  being the total utility,  $d_0$  the total expense,  $u_0 - d_0$  the total gain . The gain of each player is maximal when the total gain is maximal .

<sup>(9)</sup> It is as in the case of a private good, but with a single buyer (if the group has representatives, who negotiate with the sellers) .

- We can imagine other mechanisms and compare them to the games we have described . For instance, the players could choose the level of equipment, then the sharing of the expenses, but one group being the Stackelberg leader . Or a player pays for a fixed amount of money . These games are not Pareto efficient . They are not equitable . In particular in the first case, the group which is the Stackelberg leader, pays nothing . A mechanism which is not equitable, is not possible<sup>(10)</sup> . These mechanisms are incentive compatible, but it is not interesting . Only if a mechanism is Pareto efficient, it is interesting if it is incentive compatible, as this guarantees that the optimal choice will be really made .

#### 4 THE ROLE OF THE TELECOMMUNICATIONS NETWORKS .

There is not a substitution between the old and new networks . Instead there is a « cooperation of networks » . Take the example of mobile phone . A manager will use a Wi Fi (Wireless Fidelity) network in places as airports, hotels etc ... to transfer data at high speed . Then he will use UMTS networks to make calls and transfer data at a low speed . He will use GSM networks in some regions without UMTS networks, to make calls . In a region or a city, it is better if the networks of all generations, exist . If not, later, a « leapfrog » to catch up is impossible . Citizens –consumers and firms are interested in the dynamics of the city because favourable prospects trigger the operators' investments . They accept to finance the projects of the city .

Sometimes regions and cities finance networks by themselves . In Germany, the « laender » have partly financed the cable networks . In France, there is a fierce debate about the possibility for a region or a city, to build and operate networks . An example is a network in two neighbour regions (Bretagne and Pays de la Loire) , which allow the public actors , in the regions, to transfer data at high speed . The regions have financed it . It has been built, and is operated, by an operator .

It is a governance question, and it is difficult to solve it . Take the example of licences (for instance, for mobile networks as in the case of UMTS) . They can be transferable, or not . If they are not transferable, it seems to be better, as there will be a strong engagement of the buyer . But in case of financial difficulties, the buyer will give up, and the network will not be built (we have a recent example which is Telefonica, which gave up building several UMTS networks after having bought licences) . If the licences are transferable, in case of financial difficulties, the licence is sold, and a network will be built .

#### 5 CONCLUSION

Cities are interested in attracting activities . In principle, they can do little to strengthen the competitiveness of the firms (to attract them) . All they can do is to avoid bottlenecks of some kinds (low level of the quality of life of employees, lack of houses, lack of offices) . As we have told, firms have more ambitious projects, if the conditions are better and if there are no bottlenecks . Therefore, they will invest in the cities where conditions for them are good (infrastructure, land for plants etc ... ) . It is interesting for cities to achieve this goal . It consists in a steady growth .

To achieve this goal, decisions are made and there are continuous negotiations between the city managers and the groups in the city (for instance, workers and entrepreneurs) . It is better if the long term is taken into account. Suppose only the short term is taken into account . The relative force of each group, will determine the sharing of the expenses . Then there will be a trade-off to choose the level of equipment . Only the immediate utility is taken into account . Opportunism is possible, even if trust, later, will disappear . For instance the stronger group chooses a level of equipment optimal for itself (using pressures or false declarations on its utility) . For these two reasons (only short term is taken into account, opportunism is possible) , the result will not be Pareto efficient . The result is Pareto efficient when the sum of the groups' utilities (in the short term and in the long term) is optimal .

To take into account the long term is possible . The actors are preoccupied with long term . Their utilities depend on public goods consumed in the short term and in the long term . The role of the city managers is to conduct the negotiations, insisting on the long term . The goal is to obtain the choice (of a project) in accordance with several criteria .

When the goal is to improve the city management, communication networks have a role . They allow several performances :

Enquiries on the satisfaction of the population (concerning the quality of life) .

- To trigger corrective actions, if it is necessary, as quickly as possible .
- To propose projects to the groups in the city . Electronic mock-ups can be used .
- To diffuse information on the daily life in the city (statistics) .
- To allow negotiations to be less costly .
- To strenghten participation .

#### 6 BIBLIOGRAPHY .

PALGRAVE DICTIONARY OF ECONOMICS . Article : Lindhal equilibrium .  
 PORTER MICHAEL . L'avantage concurrentiel des nations . Interéditions . 1993 .  
 TIROLE JEAN . Théorie de l'organisation industrielle . Economica . 1993 .  
 WEBER MAX . Economie et société . Pocket . 1995 .

<sup>(10)</sup> Obviously, the members of the groups, are electors . Also, if the result of the game is not equitable, it will be reflected in lower values of  $(u'_1, u_1)$  or  $(u'_2, u_2)$  , in the matrix .