I. INTRODUCTION

This paper is concerned with the relations between innovation and economic growth. It tries to set down the criteria which would help to compare and improve how these analyses take into account the fabric of institutions influencing the relation between innovation and growth. The institutionalist dimension is effectively crucial if one wants to go beyond a mere tautology between growth and innovation whereby economic growth which is not directly accounted by increases in the quantities of inputs gives the measure of innovation. How this extra growth is effectively achieved depends on how agents in an economy can learn from the past or from their environment. Such competence is directly conditioned by the set of institutions which grounds the co-ordinations of agents. This set largely rooted in history has a straightforward national dimension. Still institutions can be defined separately and we shall first retain the definition of institution that North(1990) gives: institutions are constraints, humanly devised, which frame the interaction of agents in some area. In such broad definition institutions are rules of very different kinds, largely overlapping. Therefore to say that institutions matter in economy is a truism and the problem becomes to feature this institutional context to make this assessment operational. If institutions are so numerous and diverse, how are we going to relate various parts of this fabric of institutions to the issue we are concerned with? There is an empirical "naturalistic" answer which tends to consider that there is for each economic issue a set of institutions naturally involved, in referring to the activities more specifically concerned. Delineating the chain of activities related with an issue is not straightforward and leaves in practice rooms for interpretations which is a factor contributing to differentiate the approaches. At the root of such differences of interpretation is the fact that the definition of institution, be it North's definition or more specific ones, implies more complex relationships. This paper will mainly try to clarify the criteria that should preside over the selection of institutions to be tied with such specific economic issue as the relations between economic growth and innovation. The broad and unilateral definition that North gives of an institution will serve as an instrument to start our investigation, even if it leads rapidly to redefine the role of institution.

Basically to address the above issues implies to take a comparative perspective. In effect institutions are largely national specific. The question seems therefore all the more relevant that we are comparing the achievements of different economies and all the more so if we are comparing the dynamics of economic growth. Two questions are central to organise our analysis on the role of institutions: the complementarity of institutions and their hierarchy regarding their compelling power concerning the issue under view. The complementarity of institutions first appears as a straightforward notion: institutions act upon the behaviours of agents in certain areas of activities. The connexity between these areas of activities translates into some form of simple or functional complementarity between the corresponding institutions. To assess the complementarity of institutions one has thus to consider the complementarity of sub sets of activities, which in turn depends strictly on the issue retained.

Still the relations between institutions can be more complex. Set aside this first meaning of complementarity in terms of areas of activities concerned, institutions can be related in the way they act upon behaviours, be it because they use similar or interdependant rules or codes for their enforcement. Such inner complementarity can vary in degree. It is this complementarity which explains why fabrics of institutions are often national specific. The notion is therefore much more complex and is worth further investigation to help to compare and appreciate various systemic approaches of innovation and growth. We shall start in section II by presenting various institutional approaches looking mainly at how they cover the field of areas under study, e.g. how they select the relevant areas of activities. This amounts to consider the first type of complementarity. But this first complementarity criteria is not highly discriminating ...and leaves largely open the question of the relevance of the set of institutions selected, e.g. of the extent to which they depend in the way they work on external institutions. Allowing for some institutions to be more "complementary" than others as we do in considering a second type of complementarity, addresses this issue of interaction between institutions. We try in section III, still using North's definition of an institution, to give some content to such notion of inner complementarity and find that it gives way to different rankings or hierarchies between
II SELECTING SETS OF COMPLEMENTARY INSTITUTIONS IN THE ANALYSIS OF INNOVATION AND GROWTH.

1 Opting for a more or less extensive assessment of the institutional context.

Technology has cropped up as a 'hot' topic for economic policy as well as academic research at least since the beginning of the 1980s under the influence of several factors: the productivity slowdown in most major industrialised countries, the rise of new competitors in Asia and particularly Japan, the recurring inefficiency of short-term demand-oriented keynesian policies to cure unemployment and last but not least the growing importance of non price competition on product markets. The 1980s and 1990s have seen a turn-around in the approach of the problem. Whereas the nature of technological change was a largely neglected factor in traditional growth theory, it becomes a central focus in the modern theory of growth.

But innovation is neither an exogenous improvement of the production techniques given by 'God and the engineers' nor a stroke of genius of an innovator whose behaviour is mostly unexplainable. Each of these conceptions, the former derived from the standard neo-classical growth theory à la Solow [1956], the latter from a certain approach to neo-schumpeterian theory are essentially unsatisfactory insofar as they tend to reject the possibility for an economic investigation of innovation and technological change.

Though making technical change endogenous is not as simple as some contemporary modelization may suggest in emphasizing the role of some specific activity (be it R&D or education). To account for the main stylized facts on the dynamics of technical change one has to integrate into the analysis the influences of the institutional context. In our acceptance of the notion of institution, it means all the institutions which are compelling somehow the actions of the agents in the field under view. This is a broad definition of the institutional context which leaves too many options. It goes from a genuine view of the sub system that one can relate directly to the emergence and diffusion of new technologies to broad context where all institutions at some stage impinge on the dynamics of innovation.

It does not mean that the selection is entirely arbitrary. Once the level of analysis is defined (setting limits to the sphere of institutions which could be involved ) then the coverage has to be consistent, e.g. include all the effects which are relevant at this level and in a structured way, avoiding duplications.

To fix the ideas we would consider at one end the approach in terms of National systems of innovations, which are concentrating on the set of institutions which are closely related to all the activities directly concerned with the production and diffusion of new knowledge and technologies. At the other end of the institutional approaches of the subject, one finds the vintage Regulation approach where the issue of growth and innovation can be traced in a rather loose and unspecific way in the general account of the inter relation between demand and productivity regimes.

We shall survey these two approaches to check their advantages and their limits. One carries a too narrow approach of the innovation process which undermines the impact of institutions unrelated with the agents of TC but clearly linked to the overall process of innovation. The other introduces , whatever the subject , a similar comprehensive fabric of institutions but the influences are too unspecific which reduces the effectiveness of the institutional approach.

In the between a certain number of approaches retain a handset of institutions of diverse areas. These reasonned choices may be looked upon as intermediary solutions improving the relevance of institutionalist approaches but difficult to compare and open to a certain adhocery. We shall also review in this section these approaches of the third type in order to introduce our discussion on the criteria to be used to select the more relevantly the range of institutions corresponding to the issue under view.

Beforehand it is useful to clarify two points. First, in assessing the institutions which are relevant to take into account on a given issue , one tends in fact to refer to an area of activities : diffusion of innovations, education, research activities ... more than to subset of institutions. In effect institution is a broad category and institutions are forming in each field a dense fabric of rules. Therefore taking an activity area instead of a definite subset of institutions is one easy way to refer in fact to the whole lot of institutions, which are framing one way or another the actions of economic agents in the area. This correspondence between areas of activities and institutions governing these activities is straightforwardly used in lots of institutionalist approaches. North distinguishes explicitly the two levels in considering that institutions are the rules and the organisations are the agents. ... which leads to a broad definition of organisation as to encompass all activities. Such isomorphism should not mask that institutions interact in the very way in which they operate and that this leads to other forms of complementarity which will be investigated in section III.

Secondly, the emphasis put on the various kinds of activities involved around the issue retained implies that one should have a clear view of the chain of activities effectively concerned. The coverage of the issue by
the chain of activities selected (which defines the complementarity of the first type C1) may nevertheless not be so straightforward. It may be the case that the definition of activities is codetermined with the chain of activities and the chain of corresponding institutions. An illustration of such difficulties is precisely given with the innovation issue. It certainly implies the activities of those directly in charge in the firms to monitor innovation, as well as all the activities involved upstream in the building up of these competences and knowledge, e.g. research and education activities. Clearly it has been widely accepted that activities dealing with the financing of innovation are also concerned. But this constitutes already somehow a different step in this logic looking directly at activities, even if everyone one agrees that the way in which innovations are financed is crucial in their dynamics. A similar extension will take into account the general characteristics of the work force, of work organisation in general and finally of those who are going to use the innovations. Gradually all activities can be integrated in the chain under view.

In effect institutionalist approaches of the subject can range from exhaustive to restrictive selections of activities. In our survey of these approaches, we shall start with those taking a restrictive view of the sets of institutions/activities to be concerned (the national system of innovation approach), then jumping to the opposite with the vintage Regulation Approach, which takes a broad view of the relevant set of institutions/activities, to finish with the set of studies which propose “intermediary” solutions. Their selections turn out to be more effective to characterise national trajectories of economic growth, which is helpful to design policies. Still it raises the question of the criteria and relevance of the selection made.

2. A short overview of the “national systems of innovation” approaches.

The concept of innovation system (IS) has been the focus of many studies and a few papers have surveyed the field. Following Smith [1998], one may distinguish two levels of analysis:

- The most basic level revolves around a firm and its environment. Innovation involves complex interactions between a firm, its network of suppliers and customers, and sustained interactions between users and producers of technology. Inter-firm linkages are more important than arms-length market relationships. Institutions affecting the pattern of interactions between economic units are to a large extent national and hence all interactions in the same country will have common determinants.

- The wider context: cultural aspects, social customs, national traditions,...

Regarding the former point, this view is sometimes fought by those who advocate that the influence of national-specific institutions is limited and that some more important influences are at work: regional systems of innovation or even sectoral systems. As a consequence, the supporters of the regional or sectoral IS view tend to downplay the importance of macro-level institutions and determinants and to emphasise more local channels of interactions. A further consequence is that in this context, strictly technological determinants tend to dominate other possible influences: local knowledge externalities flowing within regions are considered the main structuring factor for regional IS, or the sector’s technology is considered as the most important factor for the pattern of firms’ interrelations.

Influences at the latter, wider, level explain why one may speak of a national system of innovation and not just local systems centred around firms or networks. The pattern of relationship is not just specific to a particular network, but to all economic units belonging to a given ‘culture’. But the macro-level is not only a matter of national culture, whatever this concept may be. It will be argued below that the pattern of co-ordination of economic units involves macro-level institutions, which somehow give a macro-level coherence to more regional or sectoral patterns of interaction.

The next important idea, and the prime reason for the comparative study of IS, is that national structural differences are taken to explain diversity in growth performance of the different countries. This involves a two-step procedure.

- The first step is that technology and more generally the accumulation of competence is organised along very different lines across countries. It is thus possible to separate countries according to the structure of their science and technology system, and the way science and technology interact with other parts of the economic system.

- The second step is that innovation, and more generally technological change and the accumulation of competencies, are the main factors influencing the competitiveness of firms, industries, regions, nations. This hypothesis may not seem controversial at first sight - in the light of recent theories of endogenous growth, the new international trade theory, etc. It is however where the problem of ‘techno-mania’ lies.

An empirical implication of the IS approach is that technological differences coming from differences in
national IS can be observed with the pattern of technological specialisation, the latter taken to be the ultimate expression of competitiveness. This is why the bulk of empirical work done on IS has paid a great deal of attention to the patterns of industrial specialisation in relation to the pattern of scientific or technological specialisation. The fact that there exist significant relationships between science and technology on the one hand and competitiveness on the other hand is then taken as a confirmation of the importance of technology. Differences in national IS could then be reflected in the different variants of the relationships between technology and competitiveness: different elasticities, functional forms, ... in econometric relationships.

But econometric testing is not the only empirical route followed by IS scholars. On a practical level, one may follow Keith Smith in distinguishing two approaches to IS, both rooted in the studies of innovation:

- Firm-level studies of interdependence between users and producers of technology. This type of studies has led to the 'Danish' approach of IS: the national system is an expression of the importance of interactive learning between users and producers of technology. Learning processes and competitive specialisation co-evolve in a process which is national-specific partly because some national-level institutions have an influence in shaping the interaction process, and partly because interactions are facilitated when firms belong to the same country. However, the importance of firm level interactions in this scheme leaves the door open for the consideration of industry-level or regional IS.

  - National-level policies and factors shaping firm behaviour. Less emphasis is put on the co-evolution aspect of firms' behaviour and national characteristic and a greater weight is given to the policy aspect.

To sum up, Smith [1998], gives three basic conceptual underpinnings of the IS approach:

- Economic behaviour rests on institutional foundations. The consequence is that different modes of institutional set-up lead to differences in economic behaviour and performance.

  - Competitive advantage results from variety and specialisation, it has path-dependence inducing effects. Successful specialisation are self-replicating, with system creation as an outcome.

  - Technological knowledge is generated by interactive learning. This gives different knowledge bases among different types of economic agents

The first one is an important element which puts the whole range of IS approaches in line with other institutions-based approaches in economics.

The second point stresses the focus of IS approaches on external competitiveness and specialization in their assessments of national trajectories. The third point is more evolutionary in spirit. It may also be seen as hinting to the structure of interaction between institutions which should be outlined in the approach.

Most IS approaches are thus focusing on the set of activities which are explicitly linked with innovation. But the third point hints at the fact that this chain may be expanded very broadly! Things tend effectively to become more complicated and open to take into account all kinds of institutions if one counts among the activities concerned directly involved in the innovation process all kinds of learning processes.

Thus the distinction between narrow and broad definitions of IS put forward by Lundvall whereby:

- the former limits itself to the areas of science, research, technology and in some cases education.

- the latter extends to all economic structures and institutional set-up affecting the production system and innovation.

, goes beyond the restrictive view specifically taken in IS approaches. It is even open to what we shall call general purpose institutional approaches.

Table 1. Different definitions of IS ands different levels of analysis.

Several approaches relate the whole institutional architecture of an economy to its main economic characteristics in order to account for all the aspects of their growth patterns. Because of their fully fledge nature we called them general purpose institutional approaches. In fact they map the whole institutional fabric by means of a partition between all the social activities and relations that structure one’s life.

Their specificity is precisely this policy of including everything in a small number of classes, from work to leisure, education and health but also government activities. The vintage regulation approach is one of such approach them (cf. the régulation school: M. Aglietta, R. Boyer, A. Lipietz,...), It organises its reading of activities around five sets of relations (wage labour, forms of competition, international relations money and public authorities). The relations between these five forms characterise the overall mode of regulation of the economy. The SSA, (Social Structures of Accumulation,) gives another example of such general purpose institutional approach although the approach is very much country specific (adapted to the case of the US economy) and period specific (tied in its structure to the institutional context of the pre 70s with a special attention given to the pressure put on workers in the labour market ( Social Structures of Accumulation (SSA) (S. Bowles, D. Gordon, ...).

Régulation theory has incorporated institutional determinants in its analysis of modern capitalist economies. The basic idea was to attribute the properties of growth regimes to a special mix of institutional forms. Five structural forms are supposed to be able to account exhaustively in an orderly way for all the whole institutional fabric of an economy. Such partition which refers to a partition in the activities of agents could easily be discussed. It has been marked in essence by the period to which it mainly applied , the fordist era and therefore by the main traits of the institutions of the time. The five structural forms of the vintage model are presented in table 2. They are complementary (a complementarity of the first type C1) as they cover in principle the whole set of institutions, even if this coverage is loose meaning that the institutions are only define in very general terms. Still this patchy description of the institutional fabric also describes some key linkages existing between broad structural forms which defines the mode of regulation of the economies under view. Beyond this institutional pattern one can observe some hierarchy between the structural forms given by their internal dynamics and the relative strength of their spill over on the dynamics of the other forms. For instance, the ‘Golden age’, i.e. the post war high growth period, was derived from the central role of the capital/labour accord (a.k.a the wage/labour nexus) and this accord permeated the whole economic system via a new style for State intervention, oligopolistic competition, the credit regime and a stable international regime. In this respect, during this period, the wage-labour nexus was the driving institutional form of the growth regime. Nowadays, this hierarchy seems to be challenged since the forms of competition and forces coming from the international regime directly affect the inner organisation of the post W.W.II capital/labour accord, which gives a definition of the hierarchy of institutional forms: one form is driving the transformation of others (see Amable , Petit 1996).

**Table 2**

<table>
<thead>
<tr>
<th>Structural forms</th>
<th>When the dynamics of the wage labour nexus is prevailing</th>
<th>When the dynamics of the forms of competition is prevailing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wage labour nexus</td>
<td>Expanding coverage and formulas</td>
<td>Expanding non wage income, reducing welfare</td>
</tr>
<tr>
<td>Forms of competition</td>
<td>Oligopolistic price competition</td>
<td>Expanding new markets and non price competitiveness</td>
</tr>
<tr>
<td>International relations</td>
<td>Mobility of labour</td>
<td>Mobility of capital</td>
</tr>
</tbody>
</table>
The role of technology in this theoretical set-up was at the interplay between productivity and demand regimes. It conveyed dynamics of innovation close to the one sketched by Kaldor in its cumulative causation model (combining the causes of increasing returns, given by a dynamics of innovation within and between firms à la Young, with the “keynesian” hazards of demand, as monitored by the various “technologies” of market intermediations). Still this dynamics and its institutional background remained rather elusive, and a broad Kaldor-Verdoorn relationship accounted for the dynamics of productivity gains.

Moreover all countries, except the United States, considered by the régulation approach were catching-up economies, and their relationship with innovation and technical progress in the Golden Age was not so much a matter of finding new products and processes than to adapt the dominant technological paradigm of mass-production to local conditions. In the fordist period of fast growth, the main institutional constraint that could bear on the dynamics of innovation was thus coming from the whole set of institutions governing the wage labour nexus.

The situation changed when Japan and Europe at least partially caught-up to the US level of productivity and when the Fordist production model experienced a crisis. Competition among firms became more centred on improvements in product quality and differentiation and less on the possibility to produce mass-consumption goods cheaply. The rapid diffusion of information technology-based products changed the principles of competition too because of the rapid technical progress in electronics. In this new regime the whole focus for the dynamics of innovation was not so much on the institutional context given by the labour nexus but evolved more centrally around the forms of competition (see Petit 1998).

It follows that if these comprehensive approaches help to give a general frame to the whole institutional context, they remain too broad and further specifications are needed if one is to follow the dynamics of growth and innovation in a comparative way for countries which have all experienced a similar shift towards a new growth regime. To be able to track national trajectories within one general growth regime is effectively crucial to design policies.

The approaches retaining more specific subsets of subsystems are by definition less opened to such critics of being too general. We shall rapidly present and discuss the pros and cons of studies which made a deliberate choice to retain a subset of systems.

4 Selecting subsets of sub systems.

To avoid the charybde of a narrow delineation of the relevant institutional context, which will miss a large part of the influence of the institutional fabric involved, and the scylla of a representation of the whole fabric of institutions, too broad to compare national trajectories on the issue, one can choose to select a subset of sub systems as the proper description of the relevant institutional context.

To compare these approaches, looking at the issue innovation and growth in taking account of the architecture of institutions which matter, one can not only look at the set of activities/institutions they retain (the first kind of complementarity C1) but also the reasons more or less given for their choices hint at the kind of interactions between institutions (the second kind of complementarity C2) the feature.

Table 3 gives some of the main examples of such approaches.

<table>
<thead>
<tr>
<th>Notion</th>
<th>Content</th>
<th>Implication</th>
<th>Analytical tools</th>
<th>Author(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comparative</td>
<td>Firms</td>
<td>Interactions between financial</td>
<td>Theory of growth and innovation,</td>
<td>M.Aoki</td>
</tr>
<tr>
<td>Institutional Analysis</td>
<td>Financial system and labour market institutions</td>
<td>principal agent</td>
<td></td>
<td></td>
</tr>
<tr>
<td>------------------------</td>
<td>-----------------------------------------------</td>
<td>------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Innovation performance</strong></td>
<td>Firms, Finance, Business association, Trade unions</td>
<td>Central problem of coordination and information flows</td>
<td>Socio economic analyses</td>
<td>Soskice D., Hall P.</td>
</tr>
<tr>
<td><strong>Worlds of production</strong></td>
<td>There exists a multiplicity of coordination principles for social and economic activities, giving as many national or sectoral configurations</td>
<td>There are at least 4 worlds of production: interpersonal, market-based, industrial and unmaterial, that have no reason to converge</td>
<td>Socio-economic analyses, data analyses on sectoral statistics, history of industrialisation paths, international comparisons</td>
<td>Salais and Storper [1994]</td>
</tr>
<tr>
<td><strong>Social Systems of Production</strong></td>
<td>Complex of scientific and technological organisations, education systems, industrial relations, financial systems, governing production.</td>
<td>The different SSPs are more or less efficient according to the international context and the nature of the dominant production paradigm. Because of institutional inertia, there is no convergence among SSPs</td>
<td>Comparative study of the current configuration of SSPs for the large industrialised countries. Long run historical studies.</td>
<td>Hollingsworth [1994]</td>
</tr>
<tr>
<td><strong>Social Systems of Innovation and Production</strong></td>
<td>The interactions between six subsystems define the logic, coherence, contradictions and possible ways for evolution of the SSIPs and their macro-economic performance</td>
<td>No necessary institutional convergence., Differentiated patterns of technological and economic specialisation. Different implications in terms of macroeconomic performance</td>
<td>Theoretical analysis (growth theory and institutional approaches, régulation theory), Empirical analysis of 12 developed countries</td>
<td>Amable, Barré and Boyer [1997]</td>
</tr>
</tbody>
</table>

Some of these approaches are very comprehensive without claiming to be of universal use as the ones surveyed in the previous subsection. For instance, the Social systems of production approach investigates the way the different institutions or structures of a country or region are integrated into a social configuration, governing production processes. The concerned elements are:

- the industrial relations system
- the training system
- the internal structure of corporate firms
- the structured relationships among firms in the same industry or between suppliers and
customers

- the financial markets of a society
- the conceptions of fairness and justice held by capital and labour
- the structure of the state and its policies
- a society's idiosyncratic customs and traditions as well as norms, moral principles, rules, laws and recipes for action

The main hypothesis, common to all systemic approaches, is that all these elements cohere together, but Hollingsworth and Boyer stress that the different elements vary in the degree in which they are tightly coupled with each other onto a full-fledged system. Varying degrees of coherence explicit how these authors see the interactions between institutions working in related fields. Coherence here may mean that institutions in these sets are re-enforcing each other ... which as we shall see in the last section can mean that less ruling is needed (because institutions are creating trust) ... or that the ruling is all the more binding. Clearly it goes some way towards an assessment of the interaction between systems of activities/institutions.

The worlds of production à la Salais Storper define strong coherence or complementarities within consistent worlds. The interaction is here seen as clearly segmented.

Another example, with six sub systems, is given by the empirical analysis in Amable, Barré and Boyer [1997]. Twelve developed countries have been classified according to their institutional characteristics in the six following sub-systems:

- *Scientific activities* (academic)
  - *Technological and innovative activities*
  - *Productive activities*,
  - *Labour market activities*.
  - *Educative and training activities*
  - *Financial activities*

The macroeconomic *performance* (for the 1980s) indicators constitute a 7th set of parameters which helps to assess the main correlation between institutional profiles along the six sub systems and economic performance. The six sub-systems define *Social Systems of Innovation*. Emphasis is thus put on the fact that interaction between institutional contexts is not limited to the STI system (Science, Technology and Innovation) but encompasses also the effects of the institutional setting prevailing in other sub systems.

These intermediary approaches (subset of subsystems) do improve our understanding of the various growth patterns of contemporary economies. They also raised issues of interest regarding the selection of sub systems to operate as well as the validity along time and among countries of these approaches. In other words the selection depends on the question raised, but also on the period and the country. Basically these sub systems approaches also revealed some assumptions (some times drawn on empirical investigations, sometimes following appreciative theorizing) on the interactions between institutions (or between institutions contexts). It thus shows a mix of considerations on complementarity of the first and second kinds.

How are we going to select the more satisfying selection of sub systems and can we in the first place compare the relevance of different selections? To work in that direction and get an idea on the criteria to be retained we will first try to clarify what we mean by a more complex kind of complementarity between institutions and its implications in terms of dynamic relations between institutions.

### III SORTING AND RANKING INSTITUTIONS: FROM COMPLEMENTARITY TO HIERARCHY.
Let us now address the more semantic aspect of complementarity between institutions. We considered in section II a weak notion of complementarity (the first type C1) whereby institutions were complementary according to the linkages between corresponding areas of activities. This complementarity has itself two dimensions, depending whether one considers the width of the coverage of the activities linked to the issue or its density. Still this complementarity is weak in the sense that institutions under view can be independent in the way they work. As a matter of fact this is not very likely. As we mentioned, the selection of the sub systems of activities itself already encompasses an idea of interactions between agents which tends to imply that the rules of behaviours are interdependant.

1 Around the second type of complementarity between institutions (C2).

Let us now consider the various forms of interactions that may exist between the ways in which institutions work. The interactions can be very diverse.

An institution can rely strongly on an important (influencing) pre-existing institution. In this case history matters in the construction of the institutional fabric. We can feature that path dependent effects occurred.

Another way to look at interdependence between institutions is to consider that their effects either pile up, or re-enforce each other. These interactions may well be asymmetric.

Finally institutions may comply to an external cause (environmental issue, and chiefly technology characteristics).

Let us note passim that institutions need not be complementary in the first sense to be complementary in the second sense.

2 Hierarchy of institutions.

We have already mentioned the existence of a hierarchy between institutions when changes in some sub sets of institutions induce changes in others.

Similarly a hierarchy between institutions can stem from ideological representations. In other words the legitimacy of institutions may be unevenly spread.

Finally the ranking of institutions may simply follow from various degrees of obsolescence. In effect firms may respond to various institutions more or less strongly given the decaying state of these “rules”.

3 Causes of changes and erosion.

An important thing in identifying the set of C2 complementarities and their hierarchies is that it may help to feature the changes and obsolescence that may occur.

Institutions and institutional fabrics should not be considered as fixed. Even if it takes time in some cases they erode and disappear. Chiffly they undergo on going transformation which can be read mainly at the level of C2 complementarities.

We are far to master if only to understand these long term evolutions, basically as we tend to define institution as organisation principle which in some field and some level have proved useful and have therefore lasted and diffused. Origins of institutional change differ an thing are different whether institutions have been created by legitimised public authorities or instaure by means of common practices.

It points to the importance in the life of institutions of their legitimacy, how they are perceived by actors. All of which involve the representations that people have and therefore the ideologies.

3 Conclusions.

We can now draw the preliminary conclusions brought by our investigation on how to address such issue of innovation and economic growth when considering that the institutional fabric matter. The issue we take is policy oriented. For this reason one needs to identify in a comparative ways national trajectories of countries at more or less similar development levels. Only in this range can policies expect to be effective. In such perspective studies on national systems of innovation, strictly speaking, take the risk of leaving aside important institutional linkages. On the other side broad institutional approaches such as the vintage regulation approach may set of a too broad picture to grasp national trajectories at the level required for policy designing.

Therefore studies selecting sub systems may effectively be adequate analytical tools. Still we tried to show in this contribution the importance and the difficulty of such selection. We conclude that it is crucial to take into account the very structure of the institutional fabric concerned. It means in our words to identify as much as we can the structure of the “semantic” complementarities C2 and the hierarchies between institutions that they conveys. Reasons for the importance of such taking into account are many.
First it can help policy makers not to be misled by institutions which are not decisive but contingent to the historical construction of the institutional fabric under view.

Secondly it can help to identify the levels of internal crisis and erosion which may counterdict the conclusions drawn on the appearances. Thirdly it can suggest to innovate in the reverse engineering that policy makers are tempted to do. They can take short cuts, adapt in synthesising effect, anticipate evolutions and the like.

One should try in further research to illustrate such cases both looking at the dynamics of institutional change (with a specific attention to obsolescence and erosion) and at the dynamics of policy making, where imitation is often driving the first steps of the policy makers and more or less bold innovative adaptation the result of the decision making process. This concerns institutions which are fostered by public authorities and government. An issue to be explored in parallel is the reaction and institutional creation which takes place simultaneously in practices, diffusing from successful “local” organisations to common institutionalised practices.

**Table 4. Institutional complementarity**

<table>
<thead>
<tr>
<th>Approach</th>
<th>Main institutions &amp; organisations concerned</th>
<th>Complementarity</th>
<th>hierarchy</th>
<th>Contributors</th>
</tr>
</thead>
<tbody>
<tr>
<td>VintageRégulation</td>
<td>5 institutional forms:</td>
<td>Expressed in the dynamics of the growth regime and the mode of régulation, the latter defined as a set of procedures and behaviours (individual and collective) that serve to reproduce fundamental social relations through the combination of historically determined forms, support and steer the growth regime and ensure the compatibility of a set of decentralised decisions.</td>
<td>The wage-labour nexus is the driving institutional form of the fordist regime, but this hierarchy changes.</td>
<td>M. Aglietta, R. Boyer, A. Lipietz, J. Mistral, P. Petit, …</td>
</tr>
<tr>
<td>Social Systems of production</td>
<td>Market is but one mode of co-ordination among economic agents. There are markets, hierarchy, communities, state, networks and associations. Several elements are considered:</td>
<td>All the different institutions and forms of organisation cohere together, but the different elements vary in the degree in which they are tightly coupled with each other onto a full-fledged system. Hence a diversity of possible systems. Institutions do not act through incentives alone, they shape modes of representation of the world for agents.</td>
<td>Varies with history and the configuration of institutions.</td>
<td>W. Streeck, R. Hollingsworth, C. Sabel,…</td>
</tr>
</tbody>
</table>

between suppliers and customers
  • the financial markets of a society
  • the conceptions of fairness and justice held by capital and labour
  • the structure of the state and its policies
  • a society's idiosyncratic customs and traditions as well as norms, moral principles, rules, laws and recipes for action.

Central problems of the economy are coordination problems. Institutions enhance information flows among actors, provide monitoring and facilitate credible commitments, communication and the establishment of compromises over distributional issues.

Interactions between the financial system (corporate governance) and the labour market (industrial relation) or between the Central Bank and the mode of wage bargaining.

Not a major issue for this approach. Observable with the structure of power and the process of political decision-making. In Germany for instance, domination of the bargaining institutions (labour unions / firms).

Varieties of capitalism

<table>
<thead>
<tr>
<th>Firms</th>
<th>business associations</th>
<th>trade unions</th>
<th>financial system</th>
<th>Central Bank</th>
</tr>
</thead>
</table>

Central problems of the economy are coordination problems. Institutions enhance information flows among actors, provide monitoring and facilitate credible commitments, communication and the establishment of compromises over distributional issues.

Interactions between the financial system (corporate governance) and the labour market (industrial relation) or between the Central Bank and the mode of wage bargaining.

Not a major issue for this approach. Observable with the structure of power and the process of political decision-making. In Germany for instance, domination of the bargaining institutions (labour unions / firms).

Comparative Institutional Analysis

<table>
<thead>
<tr>
<th>Firms</th>
<th>financial system</th>
<th>labour market</th>
</tr>
</thead>
</table>

The features of the financial system and the labour market define a set of incentives. Complementarity is based on the joint effects of these combined incentives. For instance, the main-bank relationship characteristic of Japanese industry defines a particular type of management.

The financial system organisation and the pattern of work organisation within firms implicitly drive other components of the economy.

M. Aoki

D. Soskice, P. Hall,…
monitoring which reinforces the work incentives of the team-based work organisation within Japanese firms

The different sub-systems are characterised by a certain mix of institutions and organisations that are inherited from history and partly transformed by political action and purposeful agents. Each sub-system is characterised a set of possibilities and incentives for agents. The compatibility of each sub-system with the other defines ex-post the growth trajectories of nations.

No a-priori hierarchy, which depends on the historical period. The wage-labour nexus (labour-force subsystem) in the fordist era; finance or competition (industry subsystem) in the post-fordist period?

Social Systems of Innovation and Production

6 sub-systems:
- science
- technology
- industry
- labour force
- education and training
- finance

The different sub-systems are characterised by a certain mix of institutions and organisations that are inherited from history and partly transformed by political action and purposeful agents. Each sub-system is characterised a set of possibilities and incentives for agents. The compatibility of each sub-system with the other defines ex-post the growth trajectories of nations.

No a-priori hierarchy, which depends on the historical period. The wage-labour nexus (labour-force subsystem) in the fordist era; finance or competition (industry subsystem) in the post-fordist period?

Amable, Barré & Boyer

References


Coriat B. Dosi G. Learning How to Govern and Learning How to Solve Problems : On the Co-Evolution of Competences, Conflicts and Organisational Routines, IIASA , WP-95-06

Freeman C. [1987]


