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The city in the information and communication technology age:
A comparative study on path dependency

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THE CITY IN THE INFORMATION AND COMMUNICATION TECHNOLOGY AGE: A COMPARATIVE STUDY ON PATH DEPENDENCY

Peter Nij kamp
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The role of the city in the modern electronic age is rapidly changing. Cities are no longer closed islands of local opportunities, but are open nodal points in a global network environment. The Information and Communication Technology (ICT) has lifted the traditional physical – geographical constraints which kept cities imprisoned since the early genesis of modern cities. More openness means also more actors in the global economic playing field, so that cities tend to become increasingly competitors of each other. In such a competitive game between cities the success conditions are largely determined by the adjustment potential, and the flexibility and resilience of several stakeholders in urban life. The paper analyses the causes and implications of urban path dependency and tries to offer an analytical framework through which actual developments in various cities can systematically be mapped out. The paper proceeds then – by way of a comparative contrast analysis – with an empirical investigation of two dynamic cities, Berlin and Amsterdam. Based on extensive field work, an attempt is finally made to offer clear policy conclusions and recommendations for urban ICT policy.

1. Setting the scene

In the history of **mankind** cities have always played a **crucial** role. City formation was **often** a **result** of **political**, socio-cultural en **economic forces** and was essential for the dynamics of an economie-geographic system. City **size** was **often** contingent on the prevailing technology, **such** as water provision or transport systems. **Lack** of appropriate technology has in **many** cases of urban history **almost** meant an impediment to further urban growth. In our modern age information and communication technology (ICT) **may** act as a new driver for urban dynamics.

At the beginning of the new millennium economies in **general**, and cities in particular, exhibit an unprecedented dynamics, offering new threats and opportunities. Cities have become sources of hope and concern. A large part of the European **Union** is, compared to other developed economies, persistently suffering **from** unemployment (Castells 1996). Particularly cities exhibit **considerable** employment losses. This has generated various responses from the **side** of urban policy-makers. There are **many** cases **where** local administrations try to attract firms by refraining from taxing them in various ways (Berkhout 1999). These regions are generally located at the edges of the EU, **covering** Ireland, the British Midlands, the Northern part of the Netherlands, the **Walloon** region, **France**, the Basque area, Finland, Southern Italy, Greece and East Germany. Sometimes a true **fiscal** paradise is created, **where** enterprises do not have to **pay any** taxes on **profit**. These regions belong generally to the poorest **ones** in Europe. The same applies to cities: mostly, industrial cities and port towns are involved in **such** revitalization **policies** (Van den Berg et al. 1998). These **places** suffer **often** from so-called dis-urbanisation and high unemployment **figures**. At the same **time**, Europe's **main** cities, **such** as Paris and London as **well** as the Dutch Randstad and Southern German cities, amongst others, experience a phase of new prosperity.

This paper aims at contributing to an explanation of the different dynamics of modern cities, and to suggest policy perspectives for urban administrations concerning modern unemployment policy. The basis of our investigation is formed by the notion of a technological revolution and of subsequent path-dependence in the development of urban economies. It is undoubtedly true that **economic** history has been radically modified by various technological revolutions. It is remarkable **how much** the Industrial Revolution and the Electric Age have impacted on the last century. It seems plausible that a new revolution, i.e. the ICT revolution, **will** determine the face of the new millennium. To assess the ICT impacts on urban development, we take for granted that current conditions **may** be the outcome of small events in (possibly remote) history. Against these background observations, we **address** in this paper the question: which are the perspectives of urban development policy, in the light of the ICT revolution?

In order to assess the urban consequences of the ICT revolution, it is necessary to identify its characteristics. It is useful to offer **first** some definitions of information, transaction **costs** and 'economic revolutions' from an ICT viewpoint.

We **may** refer here to Machlup (1983) and Ouwersloot (1994) for a treatment of information, data, knowledge, meaning and known conventions. Knowledge is essentially an accumulated stock of information based on synergy, while information refers to **structured** flows of data (numerical or symbolic description of phenomenon). Thus knowledge results from the **adding**, (re)structuring, editing, and other operative **changes caused** by the flow of information. Information is usually part of a communication **process** aimed at improving insights into (partly) unknown **aspects** of a phenomenon.

The **often** adopted assumption of perfect information (e.g., in neoclassical analysis) is highly questionable against the background of actual behaviour in which uncertainty and risk taking is **rather** common. If the information **process** were free of **costs**, information would **■** within the borders set by technology **■** always be completely available. But this is not the case. Transaction **costs** lower the **price** the demander is willing to **pay**, and raise the **price** the supplier wants to **receive**. In both cases **social** welfare is **affected**.

First, there are **costs** faced by the demander of information. He/she has to **decide** what information is needed, and has to search for the relevant information concerning **prices**, quantities, quality, and the consequent possible set of suppliers. **After** information is acquired, a decision has to be taken. The less information is available, the more **time** and **costs** have to be spent in the **decision-making process**. We **will** denote here the demander's **costs** as information search **costs**.

Secondly, we need to consider the costs **faced** by the supplier of information. The consumption of information does not limit others in consuming it; the character of information is **non-rival**. *“When the supplier of information communicates a part of his knowledge, this does not reduce his own knowledge”* (Ouwensloot 1994, p. 22). But since **having** a knowledge surplus offers the opportunity to exercise power (i.e., to **benefit** from **asymmetric** distribution of information), spreading knowledge might **depreciate** the suppliers’s relative position. The supplier of information cannot be sure whether the demander **will** act to **his/her benefit**. Furthermore, the information sent by the supplier has to bridge spatial and **perceptive** (i.e., social, cultural, etc.) distance. It should thus be edited in order to **provide** the demander with the **perception** that is pursued by the supplier (Ouwensloot 1994). **When** a transaction is agreed, the supplier has to see to it that the transaction is **carried out**. In other words, **he/she** has to **enforce** the demander to **pay** the **price** agreed.

The information **process** is closely connected with choice. The goal of engaging in the **process** is **making** an optimal – or at least better – choice. The receiver of information **goes** on gathering information, as long as the expected **benefit** exceeds the costs. As expectations might turn **out** to **be** not correct, it follows that the receiver might stop looking for information **when** it is actually still better to obtain more.

The **importance** of information and knowledge is enforced by the technological revolution in the ICT sector (see Castells 1996). Communication and information **can** be subject to technological **changes**, since they are essential to man’s **coping** with **nature**. It is important to distinguish between technological change and diffusion of wealth. Technology sets the bottom to transaction costs. If technology enables transaction costs to fall, social welfare **can** increase. The former does not **mean** that the **latter** occurs immediately and everywhere, as the Industrial Revolution showed (Castells 1996). So the revolutionary element is not primarily in the diffusion of wealth, but in the **shift** of the technological boundary to wealth creation. Wealth creation is not only subject to technological possibilities, but **also** to **political**, social, institutional and cultural circumstances, since they **provide** an **economic** order (North 1981).

In **human** history, periods of gradual change are sometimes interrupted by rapid, shock-wise developments. This **can** be said of the Industrial Revolution (the steam engine, the railway locomotive, the **factory** system) and the revolution of the **second** half of the nineteenth century – the Electric Age (R&D laboratories, electricity, metallurgy) (Kranzberg and Pursell 1967; Castells 1996). Kranzberg and Pursell (1967) argue that **when** man settled, this was the start of civilisation because man *“could not afford to live in constant conflict”* anymore. So this was a point **where**, since collaboration became unavoidable, the necessity of information and communication increased dramatically. In a transaction costs approach, one could say that costs were lowered, because it became possible to trade on the basis of trust.

Since the mid 1970’s we have witnessed a rapid technological change in the field of information processing, in particular in **regard** to its speed and capacity. In this context the term ‘Information and Communication Technology (ICT)’ is remarkably **well chosen**. In contrast to its predecessors, the ICT revolution is characterised by the **interplay** of information and technology, **rather** than just technology improving information processing. To identify ICT, we refer to machines that are just there to store, **process** and transmit information. Information has become a marketed product itself, and the common **definition** of information **technologies** is “the converging set of **technologies** in microelectronics, computing (machines and software), **telecommunications/broadcasting**, and opto-electronics” (see Castells 1996). The level of information processing made possible by these **products** enables further technological inventions. These machines take over in a rapidly increasing number of households and enterprises. The increased centrality of information for **economic** activity renders the new **technologies** essential, and **accounts** for the **pervasiveness** of the ICT revolution.

The ICT revolution is signified by major **changes** in labour, capital and product **markets**. Just as the Industrial Revolution gave rise to the industrial society, that is to say, socialisation of work and salarisation of wages, the ICT revolution leads to the information society, with its own characterisation of work. The organisation of work is deeply **changed**, moving toward – as Castells (1996) – **writes** ‘the individualization of labor in the labor **process**’. Life long learning and ‘employability’ become **crucial** **factors** for employees, as knowledge becomes **crucial** for productivity, and innovation becomes

decisive for value added. Repetitive tasks in the work process **can** be automated, rendering traditional institutions **such** as lifetime job and salarisation of work obsolete. The stress is on decision-making, not on assembly lines. **When** enterprises become networked in a global **economy** and **when** the scope of possibly profitable transactions comprises the **whole** world, it is favourable to be 'footloose', to be able to **locate** wherever it is most profitable to do so. In other words, existing job security institutions **may** become **brakes** on new possibilities for **profit** generating.

It seems fair to conclude that an **economic** revolution is taking **place** because of rapid technological change with consequences influencing the **core** of **human economic** activity. ICT is the source of it. It is important to identify **changes** in the work process that are connected with the ICT revolution. The **latter** is the technological basis for the trend in job relations towards a loose, network basis: the individualisation of work. It is noteworthy that the implementation of ICT revolution-connected work **processes** interacts with institutions at various geographical levels. This leads **us** into an exploration of the opportunities at an urban level.

2. Challenges to Urban Policy

In this **section** we will **address** more **specifically** the spatial component – in particular the urban component – in the ICT revolution. The Industrial Revolution positioned the city **already** in the **centre** of an economic-technological force field. The 'marriage of science and technology' (North 1981) generated high returns for modern cities, a position which was significantly enforced in the Electric Age. In the **second** part of the twentieth century we have witnessed the emergence of **sub-urbanisation** and **tertiarisation**, which meant **often** an **erosion** of city **centres** but a reinforcement of metropolitan **areas**. The rise of the ICT sector **will mean** another challenge to urban policymakers at the beginning of the new millennium, especially because the skills requirements for ICT workers **will** lead to an upgrading of urban employment (occupational training, education, and on-the-job learning). Consequently, **also** migration policy **may** become an important tool in an ICT driven city.

Improving the efficiency and transparency of the labour market is a logical instrument as well, though mainly based on institutions requiring national **action** for change. They are **often** not subject to the **competence** of urban policy but to national governments. Finally, it is possible to try to relocate the **demand** for labour. Taxes and subsidies **can** be used to attract investors by either supporting input or output. The former support **can** take the form of wage subsidies, capital investment subsidies, or other resource-based support **such** as energy **cost** reductions. The **latter** measure includes buying **products** by the public sector and **price** subsidies, while **also** administrative planning restrictions **can** be relaxed or **bureaucratic processes simplified**. Consulting **can** be applied as well.

Labour market policy in Europe is mainly exercised at the national level. **All** EU countries have a system of unemployment **benefits**. The employment disincentive that might occur as an obvious **result** is **clear**; workers might have an incentive to **quit** their jobs, and the unemployed might have an incentive to **stay** unemployed. On the other hand, one could argue that the **income** safety provided enables the unemployed to search **longer** for a more suitable job, increasing labour market efficiency. Targeted **policies** **can** influence employment more directly, involving less **dead weight** loss, i.e. subsidies to those **who** would have been employed anyway. They **can** assume different forms. First, *employment subsidies* **can** be used to increase **demand** among groups experiencing persistent unemployment (for example, youth unemployment and long-term unemployment). **Second**, *job guarantees* might **benefit** the long-term unemployed. The form of unemployment under consideration here is especially disadvantageous, because qualification decreases with the period one is unemployed. Long-term unemployment is persistent; it declines only **very** slowly **after economic** recovery has set in (see Fallon and Verry, 1988). Third, *work sharing* might be practiced, be it by **means** of early retirement, splitting jobs, or shorter working hours. The problem here is that no net employment increase occurs; meanwhile **fixed** labour **costs** rise. Firms and employees must be compensated, and the net **costs** of the measure are thus high. This situation occurs widely in Europe, especially with respect to early retirement.

The labour market requirements of the information society are **quite** different from those of the industrial society. The **importance** of certain **factors** declines, whereas other **factors** gain **importance**. Let **us** take a look at the **factors** facing enterprises. The proximity to natural resources is no **longer** a necessary requirement, because in **many** instances the wage differential between a European location and a location with low wages (for example, in South-East-Asia or Eastern Europe) **compensates** for

the extra transport costs. Promising sectors in the information **economy** are not dependent on physical work; it **can** be automated. Employment that cannot be replaced by machines becomes increasingly important. The emphasis shifts towards those tasks that are non-programmable, **where** the **human** mind masters computers. The tasks involved with **decision-making** gain **importance**. So the **existence** of a well-educated labour force replaces the proximity of physical labour as a geographical factor. But even this picture appears, in a theoretical setting, irrelevant. Supplier and demander are mostly not required to be at the same physical place for the **economic** transaction to be **carried out**.

For example, ICT **makes** working at home at flexible **time** schedules ever better possible. It seems appropriate in this context to deal concisely with telework. This possibility is, like **many** features of the ICT revolution, not new. **Rather**, ICT enables it to be a more realistic alternative to large groups of the workforce. **After** all, besides imposing problems of superfluity on cities, it **may** serve as an instrument to **relieve** typically urban problems like traffic congestion and **lack of space**. Location and environmental **factors** could be improved by it. Employers could save costs. Employees could improve the **co-ordination** of occupational and family activities. Bratzel en **Dienel** (1999) **mention** the following urban implications:

- The number of centrally located **companies** **can** decrease dramatically
- Micro-firms **can** evolve
- Virtual **companies** with (partly) global interconnections **can** arise

Hence the **condition** of qualified workers in the neighbourhood of the production **site** becomes less relevant. At least, the possible radius of location is enlarged. Furthermore, due to the increased scope of competition induced by the ICT revolution, employers want job relations to be more flexible. So institutions addressing this matter are of **importance when** looking for location alternatives.

Today the characteristics of cities are **very** different from medieval **times**, but still the city has, because of its **many** inhabitants, a fluid labour market (Sassen 1994). So it is relatively easy for employers to keep their production **processes** at the preferred **size**. For cities, it **means** that unemployment **can** differ enormously. The case for targeted **policies** focusing on increasing **demand** in sectors with overrepresentation of unemployment is thereby enforced.

On the other hand, the city attracts those **who** are less interested in job security (e.g., migrants), because getting **access** to employment is easier. The increasing opportunities offered by ICT affect the **importance** of suppliers to the citizen, too. It becomes less important to live near retailers. With the (theoretical) possibility of telework and flexwork, the distance to jobs is far less important. The **average** citizen **can** be described as earning enough to be highly mobile, so choosing a place to live on "**weak**" criteria (**such** as quiet environment in suburban quarters, or the **busy** excitement of inner cities) becomes possible. But the developments involved lead to polarisation, both *within* and *between* cities.

In exploring the perspectives for urban employment and policy in our ICT age, it **may** be interesting to see **how** cities perform in the European urban system. In which urban **areas** does **economic** growth **concentrate**, which industrial cities **can** and cannot keep up with current trends, and **how** do cities **depend** on **each** other? Various studies have tried to identify urban systems in Europe (see Krätke 1995; Bratzel en **Dienel** 1999). They identify mainly two **economic** growth regions, the first from London via the Dutch Randstad, the Rhineland to northern Italy (called the 'Blue Banana'), the **second** along the mediterranean **coast, covering** Milan, Barcelona, Grenoble and Valencia. It is called the 'Sunbelt' region. Figure 1 **provides** an overview of this spatial - **economic** force field in Europe.

Figure 1. Growth centres in the European urban system

Source: Krätke, p. 134

Urban networks are becoming less nationally oriented. Cities that were **once** at the periphery sometimes are at **once central**. It seems that a widening gap **can** be seen between those cities that connect to the **global** network, and those that do not (Sassen 1994). Peripheral cities and old port cities apparently have lost ground. Of course, this cannot be said of **all** old industrial cities. Some of them reappear with new functions. **Many** authors **identify** general trends to construct a division, or hierarchy, of European cities. Castells (1997, pp. 112-4) divides **between**

- Metropolises, which gain power, because in these **places** central decisions are made
- Declining **old** industrial cities apparently **incapable** of adjusting to the new **technologies** and activities
- New regions attracting capital and labour, and becoming **dynamic economic centres**.

Krätke (1995) has made an interesting distinction, **where** he draws on the quality and radius of **control** capacities of **firms** and specialisation in innovative or traditional activities in the city. He identifies the following types:

1. Global cities – international **control centres** with concentration on high-qualified services. Examples: London, Paris
2. European metropolitan urban regions – concentration on European activity **where products can be** innovative or industrial. Examples: Brussels, Berlin, Amsterdam, Milan, Stockholm
3. Nationally important urban regions – locations of **intra-national/regional** services and enterprises **where products can be** innovative or industrial. Examples: Lyon, Barcelona, Copenhagen, Prague, Rome
4. Cities with specialisation on innovative production structures – concentration of firms with flexible, networked production relations and a large supply of production-oriented service. Examples: Stuttgart, Bristol, Cambridge
5. Cities with specialisation on standardised mass production – concentration of externally **controlled** enterprises with traditional industrial organisations. Examples: Porto, Manchester, Thessaloniki
6. Marginalised urban regions – decline or **lack** of surviving industrial production enterprises with low supply of production-oriented services, and a large informal **economy**. Examples: Naples, Palermo.

It is clear that cities have not disappeared at all. Large cities are even growing (Sassen 1994). So a view proclaiming the end of cities is certainly not correct, or has to be geared to special effects. Earlier economic revolutions were not accompanied by immediate population and employment responses. Computers may be fast, but people adjust gradually. In our telework example, it may be interesting to have a look at the possible antagonists of telework (see Table 1).

Table 1. Objections against telework

<i>Enterprise decision makers</i>	<i>Individual managers</i>	<i>Teleworkers and potential teleworkers</i>
Unaware of the rationale for telework; lack of pressure to adopt telework	Absence of a clear company policy	Management seen as unsupportive or resistant
Concerns about middle management to cope with change	Perceived difficulty in “ managing at distance”; fears about loss of control	Concerns about impact on career – concern that “being out of sight” will mean being out of touch
Reluctance to add to the topics being discussed with Unions	Uncertainly about employment contract implications and employees responses	Confusion about relative responsibilities of individual, manager and company
Difficulties in supporting widely dispersed home-based employees	Perceived and actual problems in communicating with employees	Practical concerns about home-based working – family impact, spatial availability, differentiation between work/private life

Source: *European Telework Development* (1998, p. 302)

European Telework Development (1998) reports that, apart from difficulties in the measurement of telework, it seems clear that it is only slowly adopted in Europe. Helten and Fischer (1999) come to fairly similar conclusions. Antagonists of telework provide a good example of the power of special interest groups; many people simply do not want to work at home.

Particularly strong institutions concerning the labour market seem to be at work in Europe, rendering it rigid from an ICT-based viewpoint. Apart from that, man needs interaction with man. Increased mobility causes extra possibilities toward profitable economic transactions. As computers cannot replace personal interaction, the spatial outcomes of the possibilities toward making these profitable transactions, i.e. the cities, grow.

As far as the ICT revolution enhances possibilities for profitable transactions in an economic sense, actors’ preferences are likely to become more divergent, and the possibilities of governments to adjust the behaviour of actors become, indeed, restricted. Thus, firms and citizens are highly volatile concerning their preferences, whether the implications are spatial, financial, or work-related. Moreover, information is the source of economic action by self-interested individuals. As they are able to dispose over large amounts of information, it becomes increasingly difficult for the state to know which information they possesses. Subsequently, the state cannot anticipate, or steer economic action. Indeed, the amount of products is enlarged dramatically, and traded electronically. The virtual character of such trade makes policy very difficult to implement. In addition, the global scope of economic transactions is not restricted by national boundaries. Whenever national policy is not convenient for an enterprise, it can quite easily move its actions to other countries, with the concomitant loss of employment and public income. To be sure, complete footlooseness is not reached by global markets. Workers are restricted in their mobility, and face-to-face contact remains central. But economic actors avoid transaction costs. The global scope of trade provides these actors with an

increasing number of alternatives **when** transaction costs appear in the form of taxes or quantity restrictions.

The future trend **will** be, in the light of the developments set **out** alone, a logical development from industrial modes of **decision-making** toward networking and an individual approach. Urban administrators **will** recognise that standardised, hierarchical, centralised, quantitative, **exclusive** measures are not appropriate. **When** trying to **maximise** the financial base, individual preferences need to be taken into account. Institutions adapt only gradually to the new paradigm. The **nation state loses competence**, but still **dictates** the **pace** of urban physical planning and labour market policy, though a trend toward decentralisation **can** be observed, strengthening competition among cities. The urban administration does not function in a perfectly **democratic** way. Self-interest guides its actors. It is vulnerable to the **collective action** of interest groups, likely to **oppose** against the individualised work forms of the ICT revolution. It is not **well** able to **cope** with the problems imposed on it. An obvious question is whether urban policy in the next decades **will** exhibit a **sufficient** degree of resilience to make the city survive. This **will** be dealt within the next **section**.

3. Path Dependence in Urban Development Policy

The **economic** historian Paul A. David, in his “Clio and the economics of QWERTY”, deals with the question **how** the keyboard with the word QWERTY left on top became as **accepted** and common as it is. **After** all, **when** it is assumed that 40 keys are to be arranged on the board, 10^{48} outcomes are possible, and it has been shown that the QWERTY arrangement is not the most efficient. David argues that it is not technological superiority that determines the acceptance of **products**, but **chance**. The QWERTY arrangement was there because it was **convenient** on the conventional typewriter. As typists **across** the globe were used to the system, it was adopted for computer keyboards as well. The author **defines** pathdependence as follows (David 1985, p. 332):

In a general sense, **when** a product, by **chance rather** than technological superiority, gains an acceptance lead in early stages of the competition with other **products**, further acceptance becomes more likely. The **process** starts to **accelerate**, and it is **very** likely that one single producer **competes all** rivals **out**. The **dynamic result** is self-reinforcement. The notion of processing being *locked-in* involves that early **chance** in the **process** determines in which direction a market **tends** to develop. But since the product adopted **may** not be the best one, because its technology is not **selected** by technological arguments but by **chance**, it is in no way **clear** that the **chosen** path is optimal. For example, a technology with low initial **benefits may** prove to be superior as **time** elapses. But since another technology with large early **benefits** is **chosen**, the former does not get the **chance** of being developed further.

The topic of increasing returns was **already** noted by A. **Marshall** in 1890, stating that whenever production costs **fall** as market shares increase, a firm that by good fortune **happens** to attract a good deal of the market in the early adoption stage **can** beat its rivals. It is not a **convenient** notion in economics, because the assumption of diminishing returns is dropped. The outcome is thus not one of equilibrium; it becomes uncertain, in other words, it is non-ergodic (Arthur 1994, p. 27). It is, **however**, not unlikely that producing more implies benefiting relatively more. During production, the producer gains experience on **how** to **produce** as cheap as possible (learning by doing). Certainly, **when** considering **products** with **many** technological features, this is an important factor. As well, experience **can** enhance production of similar **products** with the same **technologies** (Arthur 1994, p. 4). Because of existing networks and **infrastructures**, existing users **may** have only limited possibilities of switching **products**. Last but not least, as **products may** be highly complicated in their applications, information contagion **may** occur.

Indeed, it is commonly assumed that **once** production is increased, the marginal returns decrease. This **may** be because of scarce production **factors** not being **capable** of being substituted, the effect of increased **demand** on market **prices**. Increasing returns thus need further exploration. As Estrin and Laidler (1995) argue, it is not the product itself, but the features attributed to it that yield the **consumer** the pursued satisfaction. There are several ways – possibly technologically different – to **achieve** satisfaction. Let us now consider the features of competing **products** important in determining the possibility of increasing returns. Certainly, increasing-returns goods and services must have some **durability** to imply inflexibility of transaction sequences facing consumers. **When** consumption of the good is short in **time**, it is easy to switch in case of unsatisfying results.

Next, products must *compete on different technological features*. To the producers of the goods (assumed they compete), increased **demand** for the competitor's product is lowering output. They thus compete on **prices**. If we change this feature, and assume that both products have different technological characteristics (**such** as fuel for a certain group of **cars**), the **dynamics** change. **When** a **car** producer sells more **cars** of the group under consideration, the fuel producer **can** expect to sell more fuel. To be sure, this case is not **convenient** yet because **when** more fuel is sold, it is not an indication that more of the appropriate **cars will** be sold. Increasing returns apply only to the fuel supplier.

When competing products have the same technological features, path-dependence **may** occur (for example, due to brand loyalty), but has no implications since in both cases the technological development is the same. Arthur (1994) **provides** a proper example of increasing returns. In the **video**-market, selling more video-recorders of a certain type **means** that more videocassettes **will** be sold as well. In turn, **when** more videocassettes are bought and (pre-recorded **ones**) rented, more people **will** buy video-recorders of that type. Suppliers of different types of video-recorders are competed **out**. So **when** products are complementary (that is to say that they do not sell without **each** other), increasing returns are possible, because there are compatibility restrictions **between** the goods provided by competing firms. In other words, there exist network externalities (Blankart and Knieps 1991): the **size** of the network of consumers **already** using the technology is a determining factor with a positive influence on consumers deciding which technology to adopt. As argued above consumers have incomplete information about products with respect to the degree to which they satisfy **needs**. The transaction **costs** involved with obtaining more information **makes** them stop searching for more information **once** they do not expect this to be **profitable** anymore. This leaves them with **having** to **decide** (partially) on the basis of expectations. It is not sure whether these expectations are the same. They **depend** on the preferences about the product. Which product has the most satisfying features? **When** preferences are homogeneous, it is likely that a single supplier, namely the supplier with the most favourable product characteristics, gains **all** of the market. **Once** heterogeneity is allowed, the outcome is probably market sharing and monopolistic competition. In both cases, network externalities are important, because a large network raises the use value of the product.

In short, **when** a new technological standard becomes available, consumers consider two criteria before they switch networks (Blankart and Knieps 1991):

- The additional utility of adopting the new technology (the *technology effect*)
- The **difference** in utility corresponding with the number of agents using the new standard (the *network effect*).

The idea is that *critical mass* is attained **once sufficient** consumers have decided that the technology effect **compensates** for the (presumably negative) network effect. It is thus in the interest of suppliers to **provide** the **consumer** with the **perception** that this is the case. Is **asymmetric** information, resulting in **adverse** selection, the **consequence**? It seems to be, as producers are likely to have more information about their products than consumers (Estrin and Laidler 1995). But two qualifications have to be added. First, consumers are not just **acting** on the basis of **price** information but of technological features. This **goes as well** for **firms**. **Second**, the information available to producers cannot be assumed to be perfect, because, in a **dynamic** view, products are in early stages of development here. It is perfectly possible that information division is **asymmetric**, but not necessarily to the advantage of one of both parties (for example, in the QWERTY case).

Products with **many** technological features confront the potential **consumer** with a choice problem. **When** products have to **fit** into a network, the question of compatibility becomes **all**-important. More **often** than not, a **consumer** has no knowledge about **how** to connect (for example, computer network systems). The same **goes** for the amount and **costs** of maintenance, the degree to which the product **can operate**, the uses the **consumer** has in mind, and **how** to use the product. The amount of information needed **will** in **many** cases not be available because of high transaction **costs** of receiving it, and because of uncertainty regarding the supplier's incentives and amount of knowledge. In **such** cases, it appears **logical** to ask previous and current users of **selected** products. Seen as a **process**, information is consequently spread selectively, as the information that the **prospective consumer** gets is dependent on the choices made by previous users. **Asking all** users is impossible; it is too time-intensive, so opportunity **costs** are too high. Complete rationality would **also** imply using the information that previous users gathered **when** they were potential consumers – with the **time** intensity

sky-rocketing. So let US assume that the potential purchaser only asks previous users without knowing which product they use. In doing so, **he/she** obtains information about certain products, and these are probably the products with the largest shares in the market. This is called information contagion (Arthur 1994). The **consequence** of it **can** be a pathdependent process. The suppliers with the largest shares in the market have the largest probabilities of selling their products, so the process reinforces itself. Although the potential **consumer may** get information based on negative experiences, known technological features **can** still **provide** the potential customer with an incentive to choose the product (this differs with the degree to which consumers are risk-averse, and with network externalities)

As the products enabling the ICT revolution are, **indeed**, of a complicated technological character, it seems reasonable to say that path-dependence **can** be observed in an increasing part of product **markets**. Moreover, the rapid developments with respect to compatibility, processing speed and applications speed up the products' life **cycles** – the technology affect is omnipresent, and increases uncertainty. The **effects** are dependent on the degree to which potential purchasers act **risk-averse** and rational. So path-dependence need not emerge, but the possibilities thereof increase. Information contagion **can** be seen as a method to lower transaction **costs** with minimal loss of private **benefits**, incorporating **considerable** consequences for aggregate **processes**. In the light of the previous remarks, the notion that the **economy** becomes more subject to increasing returns is no giant leap. **Indeed**, Karlsson and Larsson (1990) argue that in **times** of rapid technological change, the share of product competition **tends** to increase. Product competition is interpreted here, broadly speaking, as competing on technological features of products, and **price** competition as competing by trying to maintain the lowest possible **price**. **Indeed**, ICT is **all** about technological competition and compatibility. ICT equipment is relatively durable, moreover. Use of personal computers, Internet, and satellite and cable television is, **indeed** rapidly increasing in the EU (Bratzel and **Dienel** 1999). But the influence of ICT on consumer's preferences **deserves** some consideration. If the assumption about consumers becoming more heterogeneous is correct, pathdependence is possible only to a limited degree. On the other hand, the video-recorder and QWERTY instances **can** be updated by the adoption of Internet software, and differing features serving homogeneous **needs** in the field of personal computers **can** certainly be identified. In this context, Karlsson and Larsson (1990) argue that product competing enterprises **locate** in central regions, and price-competing **firms** in peripheral regions. This would imply that path-dependence is more likely to emerge in central regions. But peripheral regions are, in this way, dependent on technological development as well. If the argument about ICT-based products competing on technological features is correct, just as the notion of rapid developments in ICT sectors, a process of outsourcing price-competing products to peripheral regions is likely to take **place**. Positioning the city as a supplier of location, ICT enables enterprises to take less account of geographical **factors**. Product **markets can** be found everywhere, but qualified workers are scarcer, and not highly mobile in the European setting. Agglomeration **economies** exist in this respect. ICT renders transport **costs** less relevant (though not obsolete, because of increased transactions possibilities), but the highly technological base requires large amounts of knowledge. It seems likely that spin-off **effects** are among the determinants of the location decision – they **can** be **identified** as network **effects**. Entrepreneurs shift attention toward local **financial** and institutional frameworks. They stress flexible work relations with respect to transport **time** and **cost**, labour regulation, and workforce potential. **Indeed**, it seems fair to say that agglomeration **economies** gain **importance** throughout entrepreneurial **economic** history, and the ICT revolution is no exception. **However**, the location process **will** become more path-dependent. Leading branches of the ICT revolution **locate** in central cities because these cities offer knowledge potential and a fluid labour market. Only on the basis of knowledge is it possible to exercise **control**; only a fluid labour market enables flexible work relations. To cities, **having** established an **infrastructure** of leading branches **makes** the process reinforce itself. To conclude, path-dependence offers a reasonable explanation for the polarisation process between cities. The process is not easily altered, because **structures already** in **place** are **decisive** here. As a **result**, a spatial hierarchy of cities **may** emerge (see Table 2).

Table 2. Hierarchy and dynamics of urban regions in two dimensions

¹ Innovative industrial organisations forms (conform “new technologies”)

² Vertically integrated, “Fordistic” industrial organisation

³ Control, finance and services capacity together form “metropolitan complex strategic enterprise activities”

Source: Krätke (1995, p. 141)

Path-dependence may be the reason why Krätke (1995) attributes global functions only to London and Paris – it is the outcome of a self-enforcing process impossible to countervail (see as well Arthur 1994). Additionally, Krätke considers only cities with a concentration on innovative production relations capable of moving upward in the hierarchy. The dynamic process envisaged by Karlsson and Larsson (1990) appears to shed light on the urban dynamics; it is more likely for products in the later stages of their life cycles to be outsourced to regions with specialisation on traditional production structures. Hence those regions have opportunities dependent on technological development. The wage level seems to be the main determinant here. Innovative regions, however, are dependent on agglomeration economies (i.e. spin off) for development of new products – hence path dependence is

experienced in those regions. The theory renders it seriously questionable cities **can** move from classification 5 to 4, from 4 to **3a**, and from 3a to 2a. **Rather**, global cities tend to increase the degree to which they exercise **control**. European and nationally important cities with specialisation on innovative production structures are **capable** of that as well. Other cities **however, can** be considered to experience problems attaining innovative production structures because they have no critical mass.

In this section we have tried to argue that the rise of ICT-products raises the share of **markets** with path-dependent processes in the **economy**. **Once** certain suppliers (be it in product, location or other **markets**) attain critical mass, they **will** experience increasing returns to **scale**. The **process** of dividing market shares becomes self-enforcing. The city is confronted with **such** processes in two ways: first, price-competing firms tend to **locate** in other **areas** than product-competing firms. **Second**, the city itself is a marketed product with highly complicated technological features. This concerns mainly the location decision by firms and individuals. Whenever urban government wants to **alter** path-dependent processes, it **will** have to do so rigorously. The **costs** of **making** demanders **overcome** network **effects** must be considered high. Aggressive policy, **however**, must be seen as highly complicated to **achieve**. Urban administrations are pathdependent themselves in the light of the incentives by urban bureaucrats. The goals set by urban government are highly compatible; without a workforce, no enterprises **will locate**. Without reasonable job perspectives, citizens, though not perfectly mobile, want to migrate elsewhere. The city **can** thus attain critical mass in this respect. Cities that do **will prosper**, cities that do not might experience persistent problems only to be improved by aggressive, costly **policies**. One could even ask in some cases whether policy has **any** use at all. This question **will** be further addressed in the next section on the basis of a **comparative** study on urban developments in Berlin and Amsterdam.

4. A Comparative Case Study of Amsterdam and Berlin

In the preceding section we have described the **nature** of path-dependent processes, and argued that they are, **once** in function, difficult to change. In the case of urban policy, there are **many** driving **forces** that cannot be influenced by the administration. By way of **comparative** illustration, we **will discuss** here the cases of Amsterdam and Berlin.

It appears useful to examine cities with different historical **backgrounds** and **dynamics** to identify pathdependent processes in urban development. The analysis was based on **structured** interviews with urban policy-makers. The interviews were subdivided into **six** parts:

- Introduction
- General questions on the problems facing the city
- ICT and urban development
- New ICT in the professional context
- Changes in urban administrations and **politics**
- Conclusion.

The interviews are, of course, not appropriate to derive statistical statements. The aim is to arrive at a qualitative assessment of the perceptions by and approaches of legislators concerning urban **structure**, history, and administration in the light of the new ICT opportunities. We **will now first** present our findings from Amsterdam and Berlin in a concise form.

Amsterdam

Urban labour market policy in Amsterdam is formulated as a centralised activity. Lower levels of administration implement policy instigated by the national government; measures concerning **job**-related education, for example, are purely **directed** by national instruments (Van Dam 1992). Urban planning in the Netherlands has got a long history; it is formulated **rather** centralised as well. Three **reasons can** be mentioned (Cohen and Nijkamp 1999):

- The **fact** that large parts of the country are below sea level implied, historically, a long struggle against water. The maintenance of the water system **caused** a strong central planning tendency.
- The high population density in and around Amsterdam **causes** land use to have high opportunity **costs**
- **Income** and **economic** activity discrepancies between the Randstad and the rest of the country are perceived as unpleasant in the political arena, implying interference with market **forces**.

However, decentralisation is an ongoing **process** now, but still with communities implementing the programmes of the **state**, heavily dependent on it for finance. **Specific** payments **contribute** a large share of budgets, limiting policy freedom severely (Van den Berg *et al.* 1998). Within the administration of Amsterdam the **economic** development department (*Dienst Economische Zaken*) and the physical department (*Dienst Ruimtelijke Ordening*) are responsible for planning, the former for enterprise location and the **latter** for spatial planning. Their **competence** overlaps, **however**. To **provide** firms with a single communal reference point, a dedicated service for enterprise location has been established in February 1998. Ten years ago, district administrations (*stadsdelen*) were created to improve service to the citizens.

Urban policy in Amsterdam **stresses** the **lack** of **space**, environmental **decay**, **traffic** congestion and employment **mismatch** as **main** current problems. A relatively large amount of unemployed **persons** are low qualified, whereas there is a deficit of high qualified workers. Amsterdam performs particularly **well** as a national and international finance **centre** and location of European headquarters of firms (over 200 foreign **firms** and 62 banks are located in Amsterdam). The **lack** of **space** **creates** an administrative problem as well: Amsterdam's communal **competence** is **insufficient** to deal with **many interdependencies**. The city's image is perceived as **having** structurally improved during the last decade. The interviewers had highly different opinions, **however**. The administration's image is perceived as slow and **bureaucratic**. Housing and accessibility must be seen as problematic. Still, Amsterdam benefits of the appreciation of urban life.

The ICT revolution is perceived as improving efficiency in the administration; similarly the **economy** is seen as more **dynamic**. Firms develop, move and decline **much faster**. All respondents agreed on the notion that increased ICT use would only foster mobility; as Amsterdam has neglected public transport for 20 years, traffic problems **will** only increase. Nevertheless, Amsterdam has a long history of media processing, and the culture to deal with ICT is perceived as good. **Indeed**, the city comprises one of the five **main** global connection ports for the World Wide Web. The administration itself **may** have to develop toward a project-based unit, as formal **competencies** are too rigid to allow for the high degree of interdependence of **many** policy issues. ICT **can** be used to foster service towards citizens, but its use should not be overestimated, because ICT penetration is still low. ICT poses compatibility problems; various parts of the administration have different systems, with the **result** of problematic communication. On the other hand, as technological development proceeds rapidly, it is perceived as useful to foster creativity by subsidiarity in systems adoption.

Main critical **factors** in the future **will** be national **decision-making** on urban land, e.g. Schiphol airport, and the degree to which Amsterdam **can stay** connected to the global network. The city cannot **reach** the critical **economic** base of London, Paris or Frankfurt, but with respect to its **size**, its **control** capacity is remarkably high. It is a challenge to maintain and expand it.

Berlin

Urban development planning in Germany is up to states and communities; its organisation differs consequently. The German system **stresses** self-government. Since 1990 Berlin is organised as a city-state (Bundesland). Its legislative body is responsible for both communal and **state** tasks; the *Landesplanung*, is under its **jurisdiction**, and subject to the goals set in the federal *Raumplanung*. Those tasks are subdivided into the following departments, the *Senatsverwaltungen*:

- Labour, professional education and **women**
- Construction, housing and **traffic**
- Finance
- Public health and **social** issues
- Internal affairs
- Justice
- Schools, youth and sports
- Urban development, environment and technology
- **Economy** and enterprise
- Science, research and culture.

The number of administrations was **already** cut down in 1992, and its planned to be reduced to 8 by the end of 1999. The mayor is less powerful than the prime ministers of other states – **every** member of the senate is **fully** responsible for **his/her** own administration. The senate only determines in case of disagreements among senators. Berlin has 23 districts (*Bezirke*). **However**, a reorganisation is planned, reducing the number of districts to 12 by the year 2001, in order to **relieve** the financial base by reducing personnel and rationalise on service **products** and decision-making.

Berlin's relatively independent position is mirrored in its **considerable legal competence** concerning labour market policy. The **latter** kept **many** East Berliners from unemployment during the post-reunification years. The amount, **however**, is declining. In June 1997 it was under 40.000, coming from 100.000 in 1993. Berlin's Senate uses 4 types of labour market policy:

- Additional **financing** of federal labour market programmes
- Enterprise-orientated labour stimulation
- Professional advanced education
- Measures for integration of particular groups.

Concerning the **first** type, national labour market policy concerned over 50.000 **persons** in 1997. It involves temporally limited **projects**, wage subsidies for **social** services in the public sector, stimulation of further education and training, cyclical measures, pension measures, and new instruments with respect to training for long-term unemployment **persons** experiencing difficulty to reintegrate, **pilot-wise** employment, and subsidies for founding **firms**. Still the part of labour market policy that aims at (re) integrating workers in the labour market is small, and **many** measures have an ad hoc character. **However**, the workforce of West Berlin is now signified by a disproportionate share of low qualified workers, that of East Berlin by **many** high **qualified** workers.

The administration in the city stressed sometimes highly different problems, including the stagnating **economy**, the rapid **pace** of polarisation and sub-urbanisation, the large **difference** between East and West, the **lack** of **concepts** for stimulating Berlin's **economy**, and the problems with respect to adaption to the new conditions **after** reunification. High unemployment and employment mismatch, though, are seen as **central**. ICT-related individualisation of work is seen as a threat to the city, but it is believed that urban **areas** still play major **roles**, as face-to-face contact cannot be replaced by ICT. There is uncertainty on **ICT-induced** developments. ICT is seen as clearly increasing efficiency, both in the private and public sector. But as the financial base of Berlin is poor, the administration is the last one to adopt it. **Much** technological knowhow and **competence** were traditionally outsourced to private **firms**. It is thus improbable that the administration **will** integrate ICT in **all** its activities.

Synthesis

Amsterdam has **faced** rapid **divergence** of the national unemployment **rate** during the early 1980s. Policy in the 1960s and 1970s fostered capital-intensive production **structures**. The bankruptcies of the early 1980s **can** be seen as a response to the abolition of **such** policy (though the national **economic** crisis was a major **cause** as well). Here is a good example of path-dependent **economic** development. **However**, **after** 1984 renewed interest in Amsterdam **can** be observed, concerning citizens as **well** as **firms**. Though the **communal** administration is highly restricted to conform itself to national policy, its efforts in acquiring **control** functions **can** be seen as successful. Amsterdam seems to have critical mass: urban administrators trust on good policy enabling Amsterdam to be a major hub in the ICT network. Favourable location **factors** here are, apart from the **core** city, the good accessibility in the international context, the international education system and a **rather** high **qualified** labour force. Moreover, **many** **firms** with high **control** capacity **already** reside in Amsterdam; certainly more than one would **expect** from a fairly small city.

This case provided a good example of the notion that leading cities in the global network are **internally** polarised; though Amsterdam's **economy** performs **well**, the **rate** of unemployment among the low **qualified** stays high, at some 20%. It confirms that **effective** policy cannot **rely** on multiplier **effects** of locating firms in the services sector. Moreover, Amsterdam is confronted with a spatial problem. Two reasons are the geographic location of the city between waters, and the well-developing **economy** itself. The effect is, **first**, that housing construction becomes problematic to **such** an extent that new quarters are now built in water, and **second** that the administrative borders do not **allow** Amsterdam to grow. The increasing returns of the city in the light of firm location **will** increase the severity of this problem. There is certainly no **space** to **locate** industrial **firms**. To conclude, although

Amsterdam is a promising city in the global network, the perspectives for unemployment policy are not necessarily great.

During the decades of political separation, the dynamics of Berlin's economy became **static**. Policy implied normally **unprofitable** production to **stay**. **After** 1989, **all** sorts of catching up trends emerged: fast sub-urbanisation, skyrocketing unemployment figures, and rapid decline in the possibilities for policy. The urban financial base is at historical depths now. **However** drastically and painfully, the structural change did not leave policy paradigms unaltered. Urban policymakers aim at qualitative measures, which **provide** the appropriate incentives, instead of relying on subsidies by **higher** levels of government. **All** relevant divisions of the administration stress supporting only knowledge-employing enterprises. Certainly, ICT-based **firms provide**, if successful, the city with more dynamics. **Offices** require **cleaning**, it is said, so low-qualified labour benefits as well. There are multiplier **effects**. But it is questionable whether **such** policy **will** raise employment in **all** sectors, and policy does not seem to **address** low-qualified and long-term unemployment in particular. The **sectoral** division of labour gives the idea that policy **will** only lead to mismatches on the labour market. Furthermore, the city has no particularly advantageous climate to innovative **firms** in the German context. The knowledge pattern among workers appears overestimated. Innovative firms have no incentive to **locate** in a fairly peripheral **place** like Berlin, and the proximity to the federal government does not seem to be **attractive** to them, neither does the **objective** of becoming an East-West focal point. Eastern Europe **can** be seen as a peripheral region with a **comparative** advantage for **price-competing products**. Wages in Eastern Germany are **quite** rapidly catching up compared to Eastern Europe, so Berlin does not have an advantage in **price competing products**. It has, though, a fluid labour market due to high unemployment. But that is common in Eastern Germany.

Berlin has no critical mass. **Indeed**, the city has the internal polarisation characteristics of large cities, but intra-urban polarisation is not to the city's advantage. Headquarter location patterns do not imply a structural increase of Berlin's **importance** in the European urban system; **rather** the contrary. It is interesting though, **how** the government's move to Berlin **will** influence the economy. There is potential of workers in the public sector, but ICT enables **many** firms to **stay** far from government and still have intense communication. The number of **firms** planning to **locate** in **Berlin** is not promising. Innovative employment seems thus the appropriate way, but, it is not successful because this is not extensively applied. Policy **may** have to be more intense, but experience with subsidies, the serious problems with Berlin's financial base, and the comparably lowqualified parts of the labour force prevent this. Berlin is still under the influence of its history, and the emerging picture is a **confirmation** of the urban hierarchy set **out** above.

Comparing the two cities, the following theses appear to be **confirmed**:

- Cities in the global network are internally polarised
- Polarisation between cities **tends** to strengthen, in a pathdependent **process**
- Increasing returns in enterprise location are highly determining
- Even in cities with critical mass, it is difficult to lower low-qualified unemployment
- Acquisition of **firms** in the services sector does not **suffice** as an employment policy
- The **perception** among urban policy-makers differs; some even reject the notion of an information society
- Policy is too gradual, and too difficult to adjust due to institutional frameworks.

5. Concluding Remarks

Developed economies experience an **economic** revolution. It is commonly named the ICT revolution. This revolution **changes** location factors. Location factors are not completely determined on the basis of geographical, predetermined circumstances, neither are they determined purely on the basis of economies of agglomeration. The ICT revolution **tends** to raise the **importance** of agglomeration economies because technologically competing products require large initial investments and knowledge. The **importance** of geographically determined location factors decreases because communication possibilities lower transaction **costs** dramatically. The consequent global scope of **markets** renders enterprises and citizens footloose with respect to their physical environments. Nevertheless, the **importance** of face-to-face contact remains. Physical transport is certainly not becoming irrelevant. **Rather**, the need for physical transport increases because more transactions become profitable.

However, the increased relative **importance** of economies of agglomeration **causes** a path-dependent, self-enforcing **process** of concentrating **economic** activity and growth in **places** that **already** attained critical mass. These **places** are, in the ICT era, likely to be cities. Cities have a comparatively fluid labour market, and **concentrate** knowledge. But their established **economic structure** is of **importance**: knowledge and physical **infrastructure**, and policy. Among cities, those that **already** have critical mass of productcompeting enterprises and a high-educated workforce tend to attain most **economic** activity. Small, exogenous events **can** be determining in attaining and losing critical mass. Those cities not **having** critical mass face decline. Industrial employment, traditionally locating in cities because of the large workforce offered, declines as rationalisation replaces man by machine, and footloose **firms can** choose **where** to **produce** most profitably on a global scope. A path-dependent **process** of enterprise location is determining the European urban system.

European cities emerged mostly on the basis of geographical factors allowing profitable trade. Political factors were important to attract workers. The concentration pattern of **economic** activity and growth in Europe has been fairly constant since the emergence of cities, the **main** area being an axis stretching from South **England** via the Dutch Randstad cities and the German Ruhr area to North Italy. The Industrial Revolution saw **economic** activity shifting toward cities with a large, flexible workforce and **considerable** domestic **markets**. The Electric Age strengthened the stress on large **scale**. The decades since 1970 have seen a shift of employment to **higher qualified** jobs and an accelerating shift from industrial employment toward services employment in Europe. Additionally, increased mobility enabled suburbanisation. Industrial cities face decline, whereas cities with innovative milieus, large controlling **competence** and a sophisticated workforce (implying critical mass) gain **importance**. The path-dependent **process** leads to **divergence**, inducing different employment outlooks for different cities and for different groups within cities. The **dialectic** of the ICT era is not between employers and employees, but **between** those **who** possess knowledge and **intelligence**, and those **who** do not. **Second**, it is between those employed and those unemployed. The most problematic group is that of the **low-educated** unemployed. Unemployment among these groups **tends** to reinforce itself, as they **stay** unemployed **longer**. Employed workers have enough critical mass, be it in the form of special interest groups, trade **unions** or independently, to keep unemployed workers from being a competing factor. Moreover, unemployed **persons** lose knowledge, and they have no **means** and incentives to form a special interest group.

This observation confronts urban employment policy-makers in different ways. Because employment **processes** are path-dependent and bureaucrats are regarded as self-interested representatives of cities competing for enterprises and citizens, policy is pathdependent too. The appropriate **difference** is between cities with critical mass, and cities without critical mass. Because enterprises with supradomestic **control** functions **will** not **locate** in the **latter places**, unemployment is likely to **reach** high levels in **all** sectors and among **all** qualifications. On the other hand, **price-**competing products tend to be **produced** in peripheral regions. Assuming that the feature 'without critical mass' overlaps with "peripheral", **such** cities **can** attain lowqualified employment, assumed they offer possibilities for low-cost production. **Economic** growth worth mentioning is not to be expected of this kind of employment, and **firms can** migrate as soon as a more profitable region is perceived. Policy **aiming** at locating **such firms** is not reliable because the resulting **economic** activity is not of a character implying structural growth. On the other hand, policy just **aiming** at attracting **dynamic**, innovative firms cannot be seen as providing **sufficient** employment to low-qualified

workers. Cities possessing critical mass are confronted severely with unemployment among the **low-qualified** as well, because pricecompeting firms **will** perceive locating there as too expensive.

Any policy trying to **address** unemployment will, in the light of the path-dependent employment response to technological developments, have to be:

- **Pro-active.** It appears particularly problematic to **provide** a countervailing power against competitors with critical mass in an undesirable way, and attaining critical mass is highly dependent on external **factors**. **Higher** levels of administrations, notably the national states, do mostly not allow for **such** policy, **moreover**
- **Flexible.** Because pathdependent **processes** are uncertain in early stages, it is appropriate to try do direct them in a desired way. It is important to **address** exogenous events as fast as possible
- **Targeted.** Unemployment patterns are subject to structural differences likely to increase. There is no use trying to fight these for individual cities, i.e. peripheral **areas** are **very** unlikely to succeed in attaining innovative enterprises offering high-qualified employment.
- **Structural.** The use of ad hoc subsidies is useless; it is even harmful, as it deprives **firms** of the right incentives. Policy should aim at providing firms and citizens with the right urban knowledge and physical **infrastructure**.

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