Growth cycles

Transformation and regional development

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Abstract

Departing from the renewed interest within economic history and neo-Schumpeterian perspectives on growth and economic transformation, we will suggest a theoretical framework for analyzing long term regional economic growth and transformation. Emphasis will be given to different driving forces and their various roles over time, lead-lag relations between industries and how divergence and convergence between regions shift cyclically as consequences of technological change, market integration and economic growth. We claim that systemic approaches in general have been neglected in regional science in favor of “neo-regionalism” in the sense that the study of regional growth has been focusing for years on regional innovation systems and cluster theories without any regard to systemic relations at all.

Using detailed time series data and applying a systemic approach we will follow Swedish regions from the structural crises in the mid 1970s to the starting point of the present financial crises. Our results suggest that there are time lags as well as systemic spatial asymmetries between industries and regions leading to changing patterns of divergence and convergence in the regional system. Furthermore, there are indications that the regional disparities between centre and periphery have increased compared to the situation in the mid 1970s.

Introduction

Growth cycles or long cycles in economic development has its roots in Kondratieff’s studies of prices, inflation and interest rates in the 1920s (Kondratieff 1926) and Schumpeter's work on "Business Cycles" (Schumpeter 1939) a few decades later. Forgotten for decades in the Keynesian and neoclassical theory's dominance these thoughts were called to attention again in connection with the structural crisis of the 1970s. Van Duijn’s "Long Wave in Economic Life" and the Freeman-Perez’ techno-economic paradigm became the most widely known works in the 1980s (Van Duijn 1983 and Freeman & Perez 1988).

The Swedish research tradition began by studies of innovation and development blocks (Dahme'n 1950 and Svennilson 1954) and continued through economic-historical research on structural changes, technology shifts and long-term development (Schön 2000 and 2006). Endogenous growth theory and economic-historical scholars share common interests. The critical factors of endogenous growth theory such as technological change, complementarity and knowledge are now looking for its completion in Schumpeterian approaches and the economy's cyclical movements (Jones & Manuelli 2005, Galor 2005 and Durlauf, Johnson & Temple 2005).

Since the beginning of the 2000s economic historians and economic geographers have been studying the relationship between major technology shifts, growth cycles and regional development. The result has become known as *the geographical reference cycle*, aiming at explaining macro movements in regional development during a growth cycle (Lundquist & Olander 2001, 2007, 2009, Lundquist, Olander & Svensson-Henning 2008 a, 2008 b, 2008 c and Svensson-Henning 2009). So far, it has been successfully used to explain general development trends for groups of regions over time. The field is still open to explore how growth cycle impulses are met in single regions.

Thus far the existence and importance of growth cycles are neglected at large in regional science in favor of “neo-regionalism” (Shearmur 2010) in the sense that the study of regional growth has been dominated for years by regional innovation systems and cluster theories without any regard to systemic relations at all.

Growth cycle progression will be shown with the geographical reference cycle in focus. The account is based in established theory, even if the geographic reference cycle still has many tentative elements. With the reference cycle as a guide the national and regional transformation that the Swedish economy has gone through the last thirty years will be highlighted. The changing roles of various regions over time will be in the foreground. Concluding remarks will address further research and what impact results might have on the perception of business and labor market policies.

Growth cycle –an overview

A constant price estimate of the Swedish GDP growth during the postwar period implies that the long-term economic development is steadily increasing only interrupted by the temporary disruption of financial crises and oil price shocks. Once these crises are overcome the growth adapts to the same linear trend which seems to have lasted for decades.

Analyzing the variations in annual growth rates, however, reveals a cyclical pattern of growth created by variations in growth rates of between five to six percent and less than one percent (Figure 1). Two distinct growth cycles can be identified during the period assessed. The first began during the interwar period, was interrupted by World War II, and then continued with a sharp upturn in 1950 - and 1960s, then slowed down, stagnated and reaching its nadir during the crisis of the late 1970s.

The second growth cycle has reached more than halfway into its conduct.[1] It began early in the 1980s, and then grew at a faster pace towards the end of the century and beyond. The economy is currently in the middle of rationalization, disturbed by the ongoing financial crisis and its impact on the real economy. If the second cycle follows the previous pattern after recovering from the financial crisis, growth rate will slow down compared to previous years, and then decelerate and reach a new low for the annual growth rates. A new structural crisis similar to that which occurred in the 1970s stands as the door. These cyclical patterns of growth stand out clearly against the background of many short-term business cycles and other crises that do not affect the main cyclical course of events.

The explanation for these growth cycles are formed around radical innovations and infrastructural expansion. "General Purpose Technologies (GPT) is a generic term for these radical innovations that create discontinuities and structural shifts that can be seen in the

[1] Extensive research on the current Swedish growth cycle and reference cycle is summarized in Lundquist & Olander 2009.

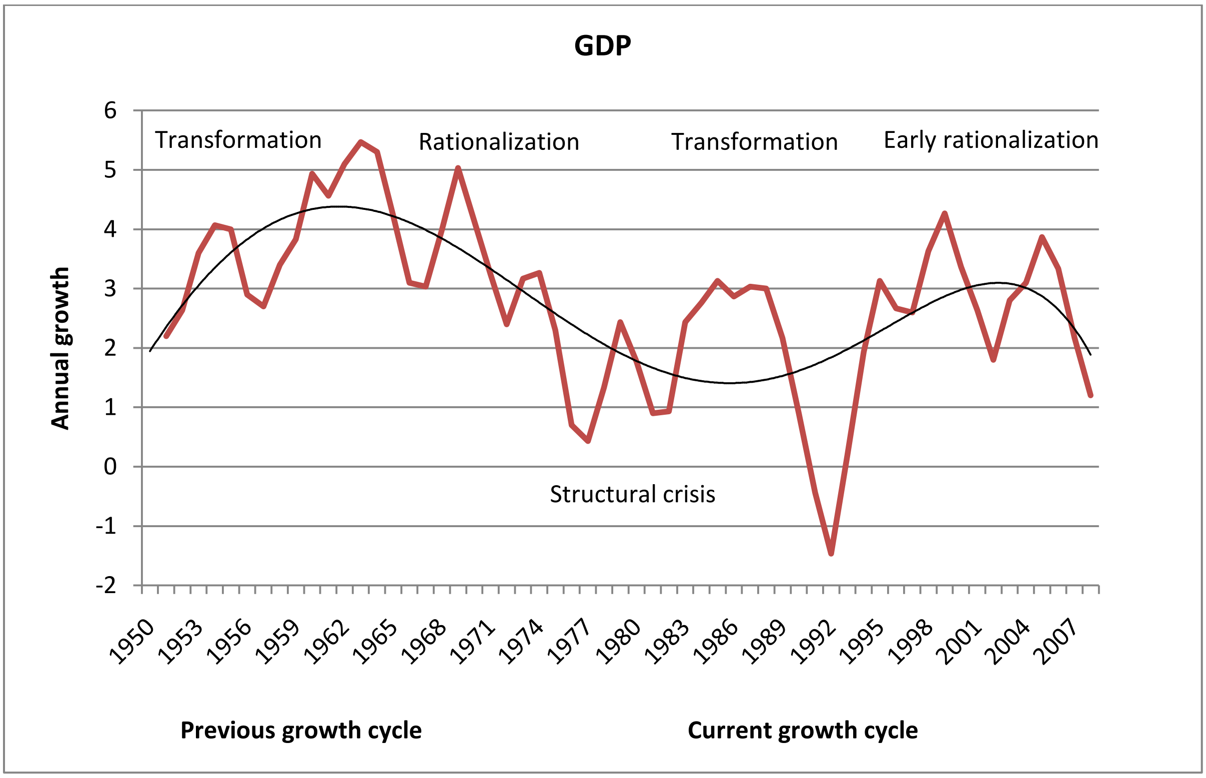

Figure 1. The annual growth shows the cyclical trends in the long term development. Annual growth in percentage. Constant prices (base year = 2000). 3-year moving averages. Polynomial trend line.

break between two cycles (Bresnahan & Trajtenberg 1995 and Lipsey, Carlaw & Bekar 2005). These technologies, which have historically been related to communication, transport and energy, have potentials that can be used in most economic areas and they are associated with significant complementarities in relation to other technologies. Most GPTs have their origin in technological centers in regions and countries, which may alter from cycle to cycle. These technologies can be initiated globally, but cannot immediately take hold everywhere because 'the receiver and development competence', the ability to absorb the new, developing and commercializing it, is absent in most places. Only when the signals reach the accurate context, the development begins to revive, which can occur in several locations simultaneously. These locations will be the starting points for a major wave of growth and transformation, which will affect most regions and countries sooner or later.

The new activities and industries that are emerging around these technologies will take the lead in the transformation period (20-25 years), which is the first period of a cycle. Institutions are forced to adapt to these new development efforts to create stable conditions for further development. The renewal will be comprehensive and growth may be redirected first on domestic market and then in ever wider contexts (Schön 2006, Lundquist & Olander

2007, 2009). GPT will be combined with industry-specific technologies and increase the growth rates of a wider spectrum of economic activities. Some of these new combinations will form development blocks in which cooperation deepens and leads development on (Kander & Schön 2007). The new technology also affects the old parts of the economy, where products and services may be renewed, manufacturing processes improved and costs cut dramatically. Producer services will increase in importance and play important roles in the diffusion of technology and changing market relationships. Increasing demand for components and raw materials will generate growth even in less technology-intensive industries, which act as subcontractors. With rising employment and rising real wages also consumer services will increase their role in the economy. The transformation of the economy starts in the large and well endowed regions. Divergence in regional development is obvious during transformation. Not until its culmination will transformation also boost growth in the less resourceful parts of the economic landscape. The reason is that the new production, when standardized, can be produced even in the simpler production environments, and that the older industries can take advantage of new technology within already established production areas, once it is diversified and standardized.

The second period of the growth cycle, rationalization (about 10-15 years), is characterized by stable conditions in terms of institutions, technologies, production and international relations. New firms are declining in number, existing firms start merging in increasing quantities, and economies of scale may be more significant and integration on international markets is increasing. All this involves gradually increasing competition, especially in foreign markets. Rationalization increases with soaring efficiency, resulting in cost cutting and declining employment. The major regions are no longer dominating growth and there are clear signs of convergence in the regional development. Small and medium-sized regions with low production costs do well in several years, until the international competition knocks out peripheral production or moving it abroad. The process leads ultimately to a structural crisis that weakens the old economic interests and makes societies and economies prepared once again to switch into new growth directions.

Based on this cyclic and systemic notion of regional growth we will in theory and in detail discuss below what characterizes the transformation period and the rationalization period respectively of the growth cycle.

Transformation

The first industries that will grow in a cycle are the new industries and existing industries that become strongly revitalized by the new technology. They are involved in the production or the early use of new products related to GPT's. Examples are equipment for digital communications, media equipment, medicines, medical equipment, digital test equipment and the most advanced parts of the automotive industry. Initially growth develops slowly and is almost unnoticeable in total manufacturing value added. The first firms and production are often small and experimentally oriented. However, growth will increase dramatically after a few years, then also increasing total manufacturing value added. Growth within these industries will dominate the transformation period. They are heavily supply-driven and stimulate demand first in the domestic market and then in export markets. Initially, productivity is not very high, and investments in land and plants grow faster than in the machines and other production techniques. With a time lag productivity rises, prices fall and production volumes increase significantly in these new and revitalized industries.

The technology is gradually diffusing to industries that can make extensive use of the new products. These industries are beginning their growth in sequence. Early transformers consist in particular of producers of investment goods, i.e. firms producing specialized machinery for a wide range of industries followed by more widely usable machines, vehicles, components and equipment. Examples of industries that transform at a later point are those that produce components when the first companies to produce the new products gradually dissolves its production and outsource manufacturing to a growing number of contractors. For some industries, it is conceivable that the influences are not noticed until much later in the rationalization period. Gradually productivity rises in all these industries. They are more or less supply-driven and prices fall, or at least rise more slowly than production volumes. Their domestic markets expand rapidly, and exports increase.

There is also a diffusion that has to do with the new technology's ability to evolve in different directions. It can be combined with new technological advances that are not of the GPT - nature or it may be associated with older technologies that expand the scope. These bundles of innovations, growth and development directions may form development blocks, that represents the complementarities of technologies. It is obviously not possible to predict which development blocks that will be most successful, but it is clear that the combination of new general technologies, new technology of more specialized areas and sometimes useful older technology underlay the emergence of many innovations.

There are many industries whose growth is mainly due to demand from other industries as the transformation continues. This growth can be derived from the supply-driven industries and not from new technology having direct impact on a specific industry's products or performance. When growth diversifies into new directions and developing blocks expand, growth will increase even more in many of these industries due to the fact that demand for inputs and components gets broader and deeper. Values added are generally lower in demand-driven industries than in the supply-driven industries. Growth is therefore not as explosive as in the industries that induced their development. The effect on the domestic market should not be overestimated since import competition is significant, which dampens the impact. Sometimes, however, demand increases so rapidly that bottleneck effects occur causing temporary breaks in the economic growth until production capacity expands. Upward price trends in these industries are in most cases faster than volume growth.

However, there are manufacturing industries which are not affected by the transformation at all. The new technology can be difficult to implement into technology-weak industries and domestic demand is directed against imports from countries with more favorable cost structure. Some industries can therefore easily be reduced or cease to exist. Examples are raw materials, carpets, clothing, simple household appliances, standardized construction products, simple crafts and sports. Generally, industries differ during the transformation. Growth rates and productivity diverge during the process. Productivity comes mainly from moving resources from low productivity industries into high productivity industries. The differences are greatest in the middle of the transformation period.

The role of producer services during transformation is due to the fact that service and knowledge is becoming more and more important in all parts of the value chain. Producer services play a key role in the new knowledge generation and its dissemination and adaptation to different contexts. The boundaries between different parts of the economy are becoming increasingly blurred, making it difficult to analyze manufacturing development isolated from the service. Phenomenon like 'servicification' of manufacturing industries, i.e. the growth of service functions within the traditional industrial firms is one example. That this takes place alongside major outsourcing of service functions from these companies is another example. It has also reference to the fact that commodities are carriers of services and that manufacturing industries and services interact with each other when creating new products and services.

The first producer services that develop in conjunction with the new production will have a wide range of applications. The first IT services are directed towards demand for improvements in management, financial accounting, inventory management and control. It's also about producer services becoming an intermediate link between the IT manufacturing industry and other industries. IT services will not only be directed to the manufacturing industry but to all parts of the economy and may be pervasive. New hardware and software will be integrated into existing products and increase their competitiveness. When production integrates with these new phenomena, scale effects appear, the flexibility of production increases and cost reductions will be substantial. IT services will then be combined with machine and technology-oriented services. It can be supposed that machine and technology-oriented services get started later than IT services, but will increase significantly during the transformation.

With rising real wages the requirements for design, comfort and lifestyle adjustments will increase. The technology-oriented services are followed by an increase in intermediate services in marketing, advertising and design. When the transformation culminates, manufacturing production will still dominate, but supplemented by services that add value for consumers. This service expansion will continue into the rationalization period. In this period, however, the intermediate services have additional tasks and are directed towards other goals.

Household consumption is determined by real wages and the number of people employed, coupled with what supply side can offer in terms of new products, new services and how the relative prices develop in these areas. The transformation means that the demand for skilled labor increases, leading to real wage growth and more employment in new and transformed industries. This causes an increase in demand towards the new consumer goods as their relative prices fall. Mature industries are revitalized through product improvements and cost reductions in production. Households then increase their demand also for traditional consumer goods. The mission of producer services is to increase the service content of products. Still the commodities are primary during transformation. Services make them more attractive and increase their production volumes. Taken all together growth is strong and heavily driven by supply-side in an increasingly ‘servicificated’ manufacturing sector when transformation culminates. Consumer services are growing at this time, but not as much as the service-wrapped manufacturing sector.

Rationalization and crisis

When rationalization begins the manufacturing industry is no longer driven by supply side. Innovations and technologies fall into the background. Transformation is shifted increasingly to the political arena and the international order. Economies of scale and price competition dominate. General productivity in the economy increases at the beginning of rationalization due to intra-industry rationalization, but will fall off later. Wage shares are rising and profit shares are falling. The economy as a whole may grow a few more years at a gradually slower pace. Producer services will grow as their role becomes more proactive and integrated with the manufacturing economy. Later in the rationalization period producer services will also be of great importance for the rationalization of all sectors in the economy. Services are also expanding into areas not previously subject to market interest. When the return on investment in the supply-driven industries starts to fall, the capital is looking for activities that had previously not been priced or exploited. Thus, early in the rationalization period there is a new supply-side of the economy that drives growth for some time. It is supported by services directed towards individuals and households. While this new supply side is emerging the purchasing power is at its highest level. The wage share rises in the economy and the employment rate is rising. The public sector is expanding, thus contributing to the purchasing power and employment. The retail sector, which has already taken care of much of the purchasing power is booming but in fierce competition with the housing market and the rest of consumer services. Consumption is increasing in tourism, but also in personal care, health, recreation, and cultural activities. Concepts abound, new are tested and old are renewed. Thus, it is consumer services that help to keep growth up well into the rationalization period. Much of this growth will be determined by total income, credit expansion and relative prices, i.e. the prices of services in relation to prices in economic activities where productivity gains are keeping prices down. Gradually production capacity will exceed demand. A few years into rationalization manufacturing output will fall significantly. Firms will be closed or merged, due to competition in domestic as well as in international markets. Unemployment and a curbed credit market will affect consumer services then lacking its motor for progress. The economy is facing a structural crisis, often initiated by a financial debt crisis. Generally, differences between industries decrease in late rationalization. Growth rates and productivity rates are converging. After the crisis, these differences are at their smallest.

Regional development

The growth cycle is fundamentally geographic in character. The transformation, the rationalization and the crisis begin in some regions and are redistributed to others in accordance with specific patterns over time. The regional system creates the national cycle and its specific characteristics. Thus, the national cycle is the aggregate result of regional development. The theoretical understanding of these regional process and how they change character over time requires an understanding of how internal and external economies of scale, transaction costs, regional markets, co-location advantages and factor endowments together create industries' location conditions (figure 2).

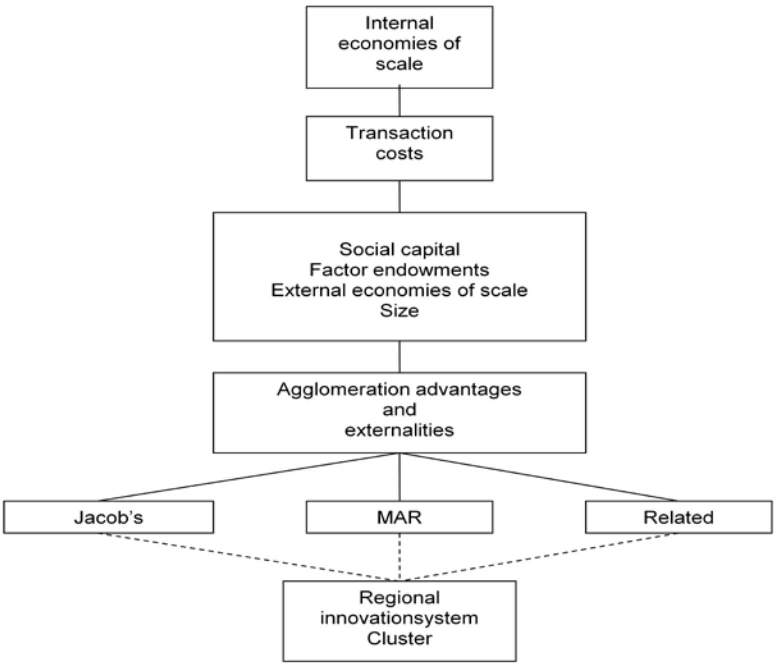

Figure 2. Characteristics which in various combinations make up location advantages for different industries. *(Lundquist & Olander 2009, pp. 71-78)*

New industries and industries that make early use of new technology are mainly located in major regional markets, at the top of the regional system. These large regional markets are needed to provide sufficient economies of scale when transaction costs are high. Production often begins gently and experimentally in these sites. It takes time before the new production becomes visible in these regions. Mature businesses linger, but decrease gradually in size and offer space and resources to the new and emerging activities. Mature businesses are exposed to strong decentralization pressures and their remaining production relocates gradually to smaller regions where the lion part of this production has thrived for long at low costs. However, the transaction costs of the new production will fall step by step and the large regional markets are becoming strained on the resource side. The transformation results in a scarcity of production factors in these regions. Costs increase sharply. The new production then begins to disseminate regionally in several different ways. Other firms may imitate the products or the first companies begin to decentralize the production to other parts of their organizations around the country. Another important mechanism is outsourcing. In this case the production is dissolved into different components and is produced in many different firms and work-places. Some of this outsourcing will remain in the initial industries, while another part spreads to other, often mature industries.

In the coming rationalization period the major regional markets will lose much of their former dominance. The production is then also located in relatively remote parts of the regional system. After the take off and first progress of the new industries other industries will follow in transformation. These industries can be supply-driven as well as demand-driven. The supply-driven industries adopt the new technology over time to renew their products, improve production processes and reduce costs. The demand-driven is most active when the new production is diffusing across the regions. Demand plays an important role in these industries, whose growth begins late in the transformation. Location regions for these industries are mainly medium-sized regional markets. Their need of regional home markets is not pronounced since these industries are working with lower transaction costs. Their markets are national and international already when transformation begins. In contrast, both complex and specialized co-location advantages could be important for these industries. Their transformation begins in mid-sized regional markets then disseminates to periphery.

For advanced producer services large regional markets are important as well. Their learning processes start in these regions and evolve in interaction with a plethora of demanding customers, including not only manufacturing industry but also the public sector, other service industries and trade. From headquarters and key establishments in these regions knowledge must be brought to branch establishments in the country to meet future customer needs and requirements. Advanced producer services are not initiating the transformation. They are reinforcing it once it has started in the manufacturing industries. The delay will be noticeable compared to the new industry's expansion. Only later during the transformation begins an increasing share of manufacturing industry and other sectors seriously take advantage of new advanced services. The large and resource rich regions will grow first, although the knowledge-intensive services are likely to have a much quicker spatial diffusion process than manufacturing industry. The reason is that service providers need only invest in human capital while the manufacturing industry must invest in human capital and products and production capital as well before value added may increase. Given that the knowledge intensive services are supposed to develop new forms and get new roles late in the growth cycle, the major regions are likely to continue to grow into the rationalization before a regional convergence occurs some years before the crisis.

Consumer services culminate in the rationalization period. Either their growth will follow the development of population or take place in discrete sites with unique values that allow themselves to be commercialized, for instance tourism. Changes on the supply side are due to demographic changes, lifestyle and income. Initial concentrations of consumer services will be followed by a proliferation of the regional system due to income distribution over time, but the dissemination will not be as significant as for manufacturing industry and producer services. Consumer services are not redistributed among regions for the same reasons as manufacturing industries and producer services. They are not chasing economies of scale (more than locally), transaction costs, externalities and productivity in different environments to gain knowledge spillover or reduce costs. The consumer services are likely to be more market oriented than production oriented in their location choices. One can therefore expect that these services do not have a strong regional redistribution over time, similar to that discussed for manufacturing industry and its related activities. For general services, however, one should expect more substantial regional changes. During the transformation, these services can be expected to grow rapidly in metropolitan areas and other major regions, driven by both new manufacturing industries and advanced producer services, and then redistribute growth to many more regions around the country.

Finally, it should be mentioned that clusters and regional innovation systems are also based on economies of scale, transaction costs and co-location advantages, but they are specialized agglomerations that are not addressed within this framework. However, they should eventually get their place in the context outlined in this document.

Empirical analysis

For the latest "General Purpose" technology, centered on the microelectronics and CC-technology achievements, the receiver and development competence was well developed in Sweden. The impetus was caught early and the Swedish domestic market became the arena in which the renewal and transformation of the national economy came to be set, around the late 1970s. The commercialization of this transformation has since then been in full swing in Sweden. The following provides a brief summary of the national growth processes of various industry groups. Then the geographic footprints of these processes are discussed including the roles that various regions played in the long-term growth and restructuring.

National dynamics

The manufacturing industry turned out to be the engine for the economy and came first in the renewal and transformation period 1978-1998. Two main categories of manufacturing industries have been identified, supply-driven and demand-driven[2]. These categories were affected quite differently and had different roles during the current growth cycle. S*upply-driven industries* represent industries that to varying degrees were the carriers of the technology shift or at least early and strongly affected by this shift. A key role was captured by the so called new/renewed industries. These industries were strongly supply- and technology-driven by nature in the sense that they owned the ability to receive the impulses of the technology shift and then quickly develop them into new products, processes, and markets. As early as in the beginning of the 1980s these industries initiated the growth that came to characterize economy in general during the transformation period. This growth was booming throughout the 1990s (figure 3) which for these industries resulted in a tripled share of the country's manufacturing value added and a superior development of labor productivity

[2] Manufacturing industries are grouped according to their annual growth and productivity growth 1978-2007 and according to their relative prices and relative production volumes during the period as a whole. New / renewed, transformed, and followers = supply-driven industries. Induced, contracting, and obsolete = demand-driven industries. The method is shown in Lundquist & Olander, 2009, pp. 28-33. Examples of industries are given in Annex.

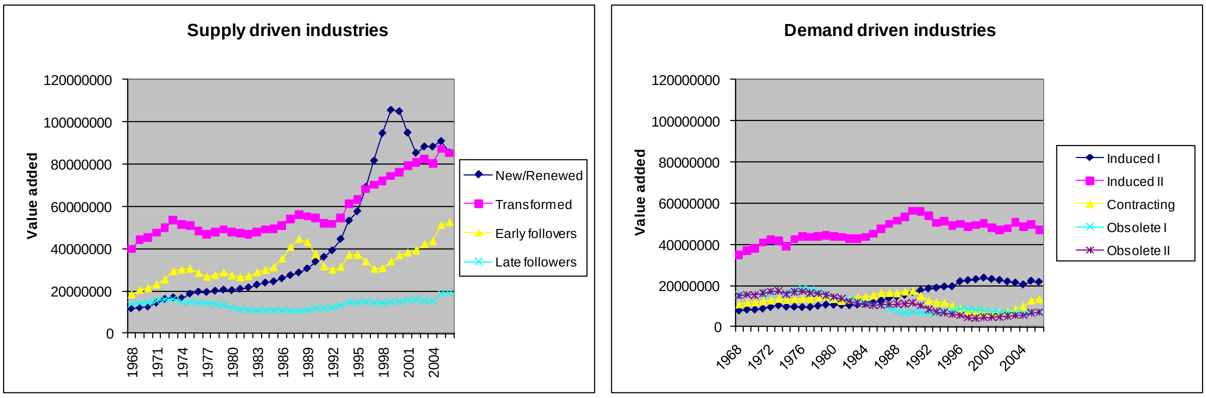

Figure 3. Deflated (PPI-adjusted) value added. Supply-driven industries and demand-driven industries 1968-2006.

compared to other parts of the economy. Gradually, other supply-driven industries followed, the transformed first and later the followers.

The demand-driven industries on the other hand were just indirectly affected by the supply-driven industries, through their impact on demand. They were not driving the transformation and were diminishing sharply in importance in that period. It was only the induced industries

that were slightly growing, benefitting from the supply-driven industries' increased demand for inputs and components. For the remainder of the demand-driven industries the transformation period was characterized by stagnation and even out-phasing of obsolete industries, lacking ability to take advantage of new impulses (figure. 3). The net effect of the transformation period was a powerful growth and renewal of the Swedish manufacturing base. At the end of the period this base was dominated by completely different industries compared to the beginning of the period (Lundquist et al 2008b).

A bit into the rationalization period the growth of the new/renewed industries was broken by the telecom crisis, and production fell dramatically over the next few years, stabilizing at a much lower level. After that manufacturing was strongly driven by the other supply-driven industries that showed a steady growth all the way forward to the looming financial crisis. A weak growth was also seen towards the end of the period within the demand-driven industries. In conclusion, however, the rationalization period brought a slowing down of all manufacturing industries. Growth rates and productivity rates began to converge. Descending investments and employment, in combination with a declining firm stock and increasing productivity, were further signs showing that the manufacturing industries were undergoing

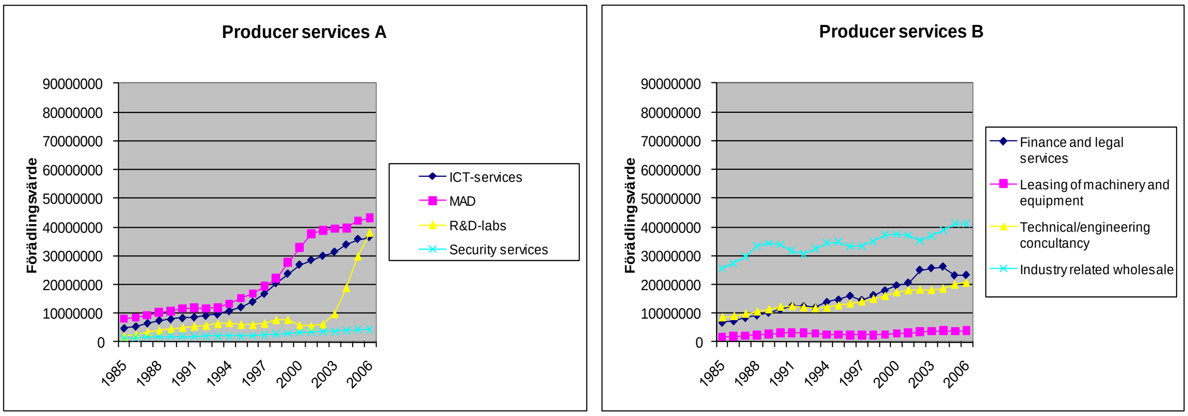

Figure 4. Deflated (KPI-adjusted) value added for supply-driven (A) and demand-driven (B) producer services.

rationalization already during the late 1990s, thereby losing their roles as main driving forces in the economic development (Lundquist & Olander 2009).

Producer services grew strongly in the wake of manufacturing industry transformation (figure 4). In the early 2000s, several years after the new/renewed industries had reached their peak, producer services took over the role as driving force for economic development. The fast-growing and mainly supply-driven part of producer services, consisting of, inter alia, IT services, MAD-consultants (Marketing/Management/Advertising/Design), and R&D laboratories displayed growth curves similar to those of the new/renewed industries in the early 1990s.[3] These, often manufacturing-related services exhibited superior growth and employment development during 1998-2006, that is the initial part of the rationalization period. This was also reflected in the underlying business dynamics consisting of a comprehensive exclusion of old firms, a large number of wrecked new business but most of all of a very large element of successful business creation and entrepreneurship. In the year 2006, 70 percent of the firm stock of producer services (A) had started after 1996. These new firms accounted for over 52 percent of the sector's value added at period end. One result of this strong business momentum, in addition to its significant impact on the entire economy's growth and employment, was also a marked increase in R & D, investments and export quotients (Lundquist & Olander 2009, pp. 34-44). Demand-driven producer services such as technical consultants, industry-oriented wholesale, and machinery leasing, displayed a much

[3] Producer services are grouped according to their annual growth and productivity growth 1978-2007. Producer services (A) = advanced, early and strongly growing services. Producer services (B) = routine-oriented, late and slowly growing services. The method is shown in Lundquist & Olander, 2009, pp. 28-33. Examples of industries are given in Annex.

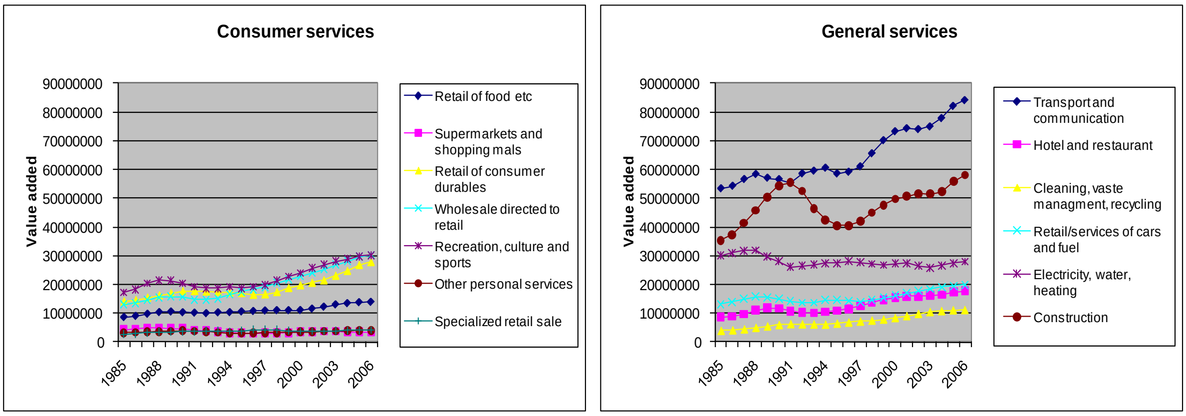

Figure 5. Deflated (KPI-adjusted) value added for consumer services and general services

more subdued growth. These services seem to have met competition rather early and then entered rationalization, which is indicated by the fact that productivity continued to rise, while employment growth slowed down at period end.

Consumer services and general services were not as significantly affected by the supply and demand effects as one might have expected (figure 5). Consumer services, primarily related to retail and recreation, showed a slight increase in growth a few years into the 2000s, but were never impressively engaged in growth before the financial crisis struck. The general services having both business and household customers never reached the growth rates of the total service sector. The strongest growth within general services was found in various types of transport and communications. In relative terms, however, general services lost in significance during the period. The temporal order of growth between industries outlined empirically, may it be within manufacturing or services, follows the expected patterns that was initially presented.

Table 1. Shares of value added in the total economy (public sector excluded)

	1985	1988	1993	1998	2003	2006
Supply-driven man. industries	21,9	22,2	22,8	28,0	25,7	24,2
Demand-driven man. industries	15,4	13,8	12,9	9,8	8,5	7,8
Producer services (A)	3,8	4,7	5,9	8,8	11,8	15,2
Producer services (B)	10,1	11,1	11,7	11,3	11,8	11,1
Manufacturing-related industries	***51,2***	***51,7***	***53,4***	***57,9***	***57,9***	***58,4***
Consumer services	14,9	15,0	14,3	13,4	14,4	14,2
General services	33,9	33,3	32,3	28,7	27,7	27,4
Total	**100**	**100**	**100**	**100**	**100**	**100**

The overall result of three decades of national transformation and rationalization can be summarized as a powerful re-industrialization of the Swedish economy. This process was initiated by the supply-driven manufacturing industries, whose development subsequently opened for a very strong expansion of various types of industry-related services. The manufacturing-related economy, defined broadly as the sum of "pure" manufacturing and related services, has over the past three decades never been greater in value added (table 1) and employment than it was in the mid-2000s.

Regional dynamics

The referenced time order between different sectors and industries is not something that only can be observed at the national level. On the contrary, it appears even more clearly when the process is studied at the regional level. The transformation, the rationalization and the crisis begin in some regions and are redirected over time to others.

In the following analysis the growth cycle progression in the Swedish regional system will be reflected by the development of five groups of regions. Stockholm, Gothenburg and Malmoe, as metropolitan regions, stand by themselves while the remaining regions are aggregated into three groups labeled large, medium and small regions.[4] The division is adopted to reflect the regional diversity of the receiver and development competence, which means differences in the incidence of internal and external economies of scale, production factors and various forms of externalities. The receiver and development competence is supposed to be decisive for the regions' ability to take advantage of the supply and demand effects of a growth cycle. Based on these assumptions the regional groups will provide a guide to where one might expect various locations of industries and how the growth cycle will push value added and productivity forward in time across the economic landscape.[5]

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[4] Starting from the regions' average population size over the entire period, they are divided into groups according to population thresholds. The number of regions and average population are as follows: Stockholm (1, 1536095), Gothenburg (1; 744927), Malmo (1; 457919), Large regions (15, 156745), Medium-sized regions (20, 90253), Small regions (32; 45717).

[5] In a study, including both young and mature industries, Neffke et al. show that the creation of new business as well as the growth of value added are closely linked to different kinds of externalities in various regions and that this linkages alter distinctly during the growth cycle progress (Neffke et al. 2010).

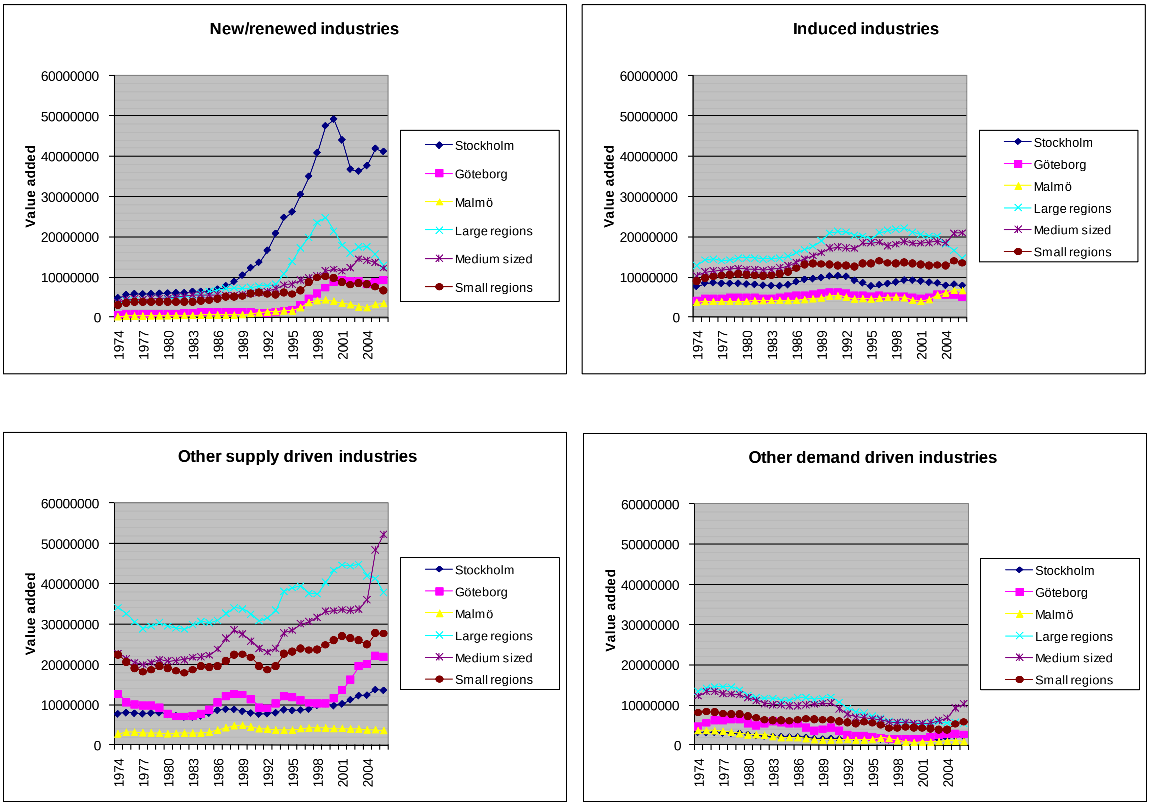

Figure 6. Deflated (PPI-adjusted) regional value added. New/renewed industry, other supply-driven industries, induced industry and other demand-driven industries 1974-2006.

There is no doubt that the growth cycle was initiated in the Stockholm region where the new and experimentally organized economy started as early as in the 1980s, almost 10 years ahead of any other region. Many firms with internal economies of scale and high transaction costs at the beginning of their product life cycles began to develop their businesses there, even if the activities had their origin in other parts of the country. The advantages of this location were reinforced by rapidly growing external economies of scale and Jacobs' externalities, that is big city advantages in terms of diversity. New/renewed industries in Stockholm displayed already at the mid-80s exceptionally high growth rates, long before it was revealed by the national analysis.

Stockholm came to dominate the scene and set the agenda for the continued national and regional transformation. The spatial diffusion of the new/renewed industries turned out to come in two waves, 10 years after the growth started in Stockholm. In a first wave the growth impetus reached some of the large regions, before they reached the Gothenburg and Malmoe region. What happened was likely that the new technology as it matured over time found new independent applications in large regions with universities, but also that some large regions became major subsidiaries, and sub-regions to the economy in Stockholm. The first movers of these large regions benefited from a favorable geographic proximity to Stockholm. This was also the case for some of the medium-sized regions that began to show a higher growth in strong supply-driven industries. Thus, the first wave of dissemination to some large and medium-sized regions arose not primarily as endogenous growth, but was due more to outsourcing from the Stockholm region, which is indicated by the fact that when growth fell back in Stockholm, the same happened simultaneously in these other regions.

In a second wave, almost ten years after the Stockholm region, Gothenburg and Malmoe, being the other two metropolitan regions, started a rapid growth in the new/renewed industries. This second wave came about due to technology maturation and diversification. The receiver and development competence in Gothenburg and Malmoe was at this time strong enough to create endogenous growth processes that supplemented the Stockholm region's growth and thus further came to strengthen the national transformation from mid-1990s. Later, growth in Gothenburg and Malmoe did not decline as much as in many other regions when transformation shifted over to rationalization, indicating that growth was more of a self-generated process in these metropolitan regions.

The said party was about the most advanced and supply-driven industries. As for the rest of the manufacturing industries metropolitan regions did not play any important role. Locations for these industries were regions, further down the regional system, which offer various specialization advantages, connected to MAR externalities. Regions well endowed with these advantages were the first to respond to further transformation pressures, particularly in other supply-driven industries, but also in the sharpest demand-driven. This process took off immediately after the crisis in the early 1990s, especially in medium-sized regions. Parallel to this there was a sharp decline in industries that failed to meet the transformation pressure. Demand-driven obsolete industries were knocked out in all types of regions but mostly in large and small regions. Other economic sectors were not strong enough to compensate for this phase-out.

Even the most knowledge-oriented and fast-growing producer services began their national growth and transformation much later than the manufacturing industry. This was also found in the regional dissemination process (figure 7). As with the most dynamic manufacturing industry, it is clear that service sector growth and transformation started in the Stockholm region. The advanced supply-driven services started their expansion shortly after the early

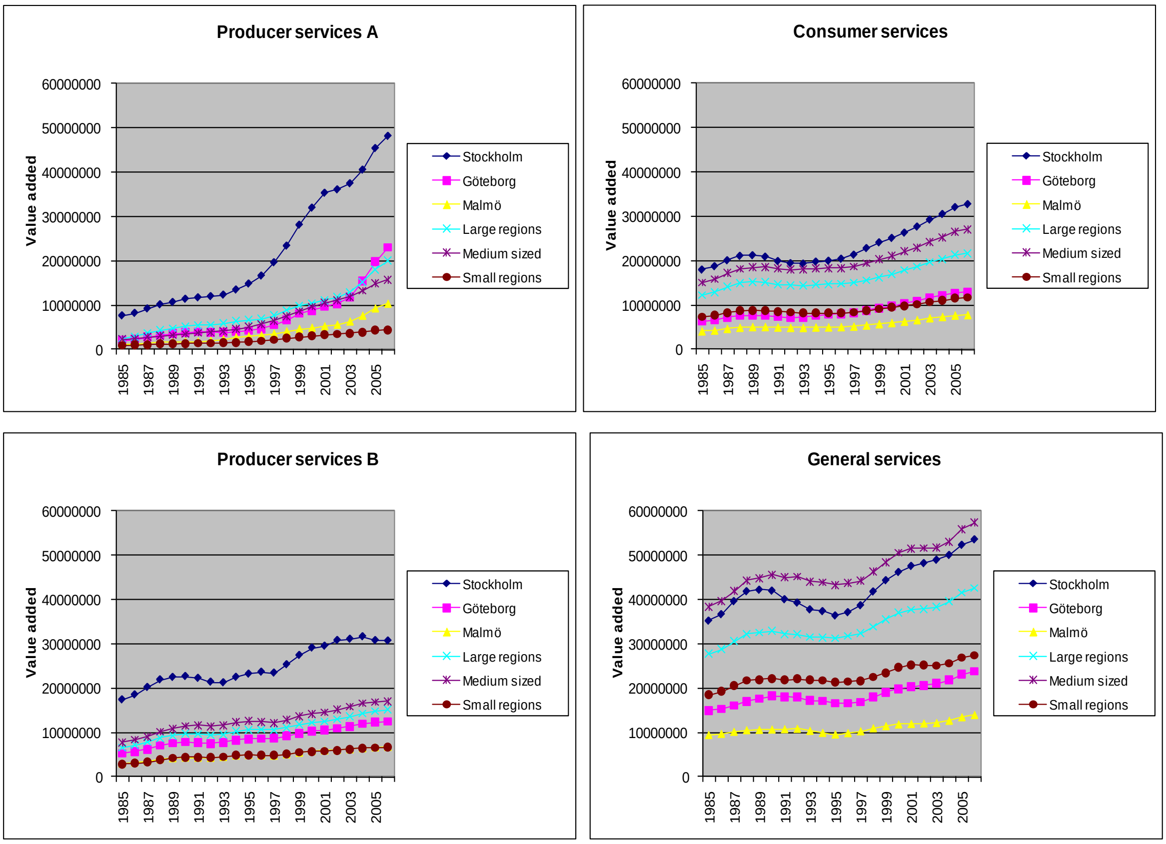

Figure 7. Deflated (KPI-adjusted) regional value added. Producer services A and B, consumer services and general services, 1985-2006.

1990s crisis, i.e. six to seven years after the most supply-driven industries began to accelerate their growth in this region. The other two metropolitan regions had a much later start, and their growth did not reach its peak until the transformation changed into rationalization. Large regions grew almost parallel to the Gothenburg region and the Malmoe region, while medium and small regions showed a nearly linear growth. Thus, advanced producer services did not initiate the renewal and transformation within the manufacturing industry, but rather followed the supply-driven manufacturing industries in transformation and dissemination, though with a marked delay. Gradually, these advanced services met with clients in a growing number of industries whose expansion occurred later in the cycle. For the more demand-driven producer services growth patterns were less dramatic. The strongest growth for these industries was achieved in the latter part of the transformation when the manufacturing economy was peaking. It can also be noted that this development was marked by what happened in the Stockholm region, but it must be stressed that other regions followed the progress very quickly and in a similar manner.

Consumer services had their fastest growth when all sectors of the economy performed best, when real wages rose, employment increased and capital markets expanded. This was the time when commodity retailing, consumption-oriented wholesale, recreation and cultural services grew strongly, while food retailing and personal services grew in a more sluggish manner. This trend was also reflected at the regional level. The differences between the various regional groups turned out to be small which is consistent with the theoretical assumptions. General services displayed regional growth patterns that were very similar to consumer services. Metropolitan regions distinguished, though, by a slightly higher growth rate in late transformation and rationalization reflecting their relative dominance all over the growth cycle, thereby creating necessary investments in community development, transports, and communications.

So far, the struggle between old and new has turned out to be evident in Sweden's economic geography. The Stockholm region, above all, but also to some extent the other two metropolitan regions, had key roles by being starting points for the most dynamic supply-driven industries in manufacturing and producer services. These two heavily transformed sectors together represent a new kind of industrial economy that completely reshaped the economy during the past 30 years. These industries grew strongly and were at the end larger and more important than ever since the current growth cycle began in the late 1970s. This kind of re-industrialization was most obvious in the Stockholm region followed by the other two metropolitan regions. Other regions with the exception of medium-sized regions showed no relative increase of this re-industrialization. Measured in this way the industrial economy has ‘returned’ to the metropolitan regions being the foundation of renewal and growth that has characterized the country as a whole over the period. Stockholm reached its peak in 2000 when the region's share of the total manufacturing-related economy amounted to over 28

Table 2. Shares of manufacturing-related industries in different regions

	1985	1988	1993	1998	2003	2006
Stockholm	22,5	22,9	23,7	26,1	26,7	26,7
Göteborg	10,4	10,4	10,0	9,9	11,8	12,7
Malmö	5,9	5,8	6,0	6,0	5,8	6,2
Large regions	22,9	22,7	22,8	22,7	21,4	19,2
Medium-sized regions	23,9	23,9	23,7	22,4	22,4	23,8
Small regions	14,4	14,3	13,7	12,9	12,0	11,4
Total	100	100	100	100	100	100

percent. Thereafter was a marked decline for Stockholm, while Gothenburg, Malmoe and medium-sized regions increased their shares. The shares of large and small regions, however, decreased even before the financial crisis, possibly indicating that the regional dissemination process had come to its end for this time, leaving many small regions unstrengthened for the next structural crisis.

Employment impact

The relationship between regional economic growth and job development for the entire period 1978-2006 was very strong. Regions with the strongest growth in value added, particularly in the supply-driven industries, also managed largely to create jobs that replaced those phased out in stagnant and obsolete industries. Momentum was strongest in the metropolitan regions with Stockholm in the lead. The Stockholm region created almost 200000 new jobs representing 50 percent of Sweden's total employment growth during the entire period. Also the Gothenburg and the Malmoe region increased employment stronger than national average. The three metropolitan regions created together 80 percent of total employment growth in the country. Large and small regions had to pay a high price for transformation and did not recover at all from their employment loss in the previous structural crisis in the late 1970s. Their job situations rather deteriorated. Especially large regions displayed an exceptionally weak growth in employment from 2003 and onwards to the looming financial crisis. They hanged on as sub regions until the telecom crisis during transformation but did not manage to recover from the crisis and go on by themselves into rationalization. Producer services were

Table 4. Relative development of employment 1978-2006 in different industries and regions (public sector excluded).

	Supply-driven	Demand-driven	*Manuf. in total*	P-services A	P-services B	Consumer services	General services	*Services in total*	All
Stockholm	-18	-53	-32	570	32	37	64	87	54
Göteborg	29	-56	-14	1113	53	40	38	80	43
Malmö	-4	-48	-35	722	33	30	39	65	27
Large regions	-45	-65	-54	1261	48	36	43	68	-6
Medium-sized	8	-30	-10	1142	38	42	54	67	28
Small regions	-33	-43	-37	1105	47	24	49	53	-4
All regions	-19	-49	-33	796	40	36	50	73	21
Absolute number (in thousands)	-89	-199	-288	280	62	101	230	673	385

not able to compensate for weak manufacturing development in these regions. Their prospects for the future are worrying seen in the light of the underlying trend. Also small regions lost shares of manufacturing industries, although their losses stabilized at period's end. Their main problem seems to be a weak producer service sector adding too little employment to the economies. Consumer and general services are not able to compensate for this on their own.

Concluding remarks

A synthesis of research of Swedish long-term economic growth has given rise to a conceptual framework of structural change and long cycles. In this synthesis, the long-run growth process is composed of successive structural periods of roughly 40 years characterized by the diffusion of GPT innovations that together with complementary activities are driving economic progress. Interaction between institutional, technological, and economic change is paramount to explain the process of change and growth.

Growth cycle impulses will hit industries and regions in rather ordered ways, as stated by the geographical reference model, thereby explaining the overall development for regions of different sizes over time. Since, however, there are growth residuals within each group of regions, the analysis must be put forward looking for answers why growth cycle impulses sometimes are met differently in single regions even if regional capabilities and advantages are kept constant. Hypothizing that the receiver and development competences are not fully explained by traditional regional resources, we suggest that industry relatedness analysis (Neffke & Svensson Henning 2008, 2009) will be tested. This analysis claims that regions whose industrial structure are diversified around shared skills and production technologies and at the same time related to strongly growing industries have a wider opportunity space and greater chances to prosper than regions lacking these intra-regional relations. To put growth cycle analysis further by taking into account regional differences in relatedness may be a fruitful effort.

The following questions also calls for further research. Is the model of transformation and rationalization and the periodisation of structural crises valid for other economies as well? To what extent are growth cycles in different countries related to each other and interacting over time? Are regional growth cycles interacting with each other across national borders, thereby revealing economic linkages between regional systems? Can growth cycle trends be separated correctly from other trends in annual growth data (wave-let analysis), thereby identifying short business cycles within transformation and rationalization periods? Can regressions of these short business cycles in different countries reveal interdependencies between economies hard to detect in other ways?

Finally, from a policy perspective, it is important to bear in mind that regions alternate in driving the national development forward. Dynamics in certain regions are at times of national interest and economic policy at different geographical levels needs to be coordinated in ways that support the growth and transformation in this type of regions. This also implies that it is necessary to accept the fact that some regions in certain periods will run away from others in terms of growth. Over time, the importance shifts from forerunners to followers as the renewal impulses disseminate across the economic landscape. To be prepared for this sequential number of appearing growth regions requires new policy thinking, since the policy targets are changing continuously. Regional roles and complementarities over time must be central to the economic policy agenda. Policy measures directed to support the metropolitan regions and their strategic roles of innovation and dynamism must be seen as a national concern which need not conflict with other regional interests. As growth engines in the Swedish case the three metropolitan regions have been central to national growth but they have also opened for a strong momentum in many regions in the rest of the country that had been difficult to achieve otherwise.

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Annex 1. Industry Classification

Grouping of industry sectors

New/renewed: a very strong and consistent growth throughout the course and sharply declining relative prices and sharply rising relative volumes. Their progress are driven by both product innovations and process innovations. Telecommunications, medicine and pharmaceutical products, measuring devices, vital parts of the automotive industry and spirits are important examples of products and activities.

Transformed: a moderate and steady growth. Relative prices and relative volume change in the same direction as the previous industry group, but not as sharply. Examples of products and activities with strong improvements in products and processes are aircraft / engines, rail vehicles, pumps, turbines, generators, some plastic goods, capital goods, industrial gases and synthetic fibers.

Followers I: a moderate growth, mainly at the beginning of the process, stagnating at the end. They are exposed to a weak market growth with declining relative prices combined with declining relative volumes. Parts of the automotive industry, computers, kraft pulp, kraft paper, electrical household appliances, tools and equipment are examples of products and activities in the industries.

Followers II: characterized by low growth, stagnant during the first part of the process, increasing during the latter part. The industries have suffered from slightly declining relative prices and sharply declining relative product volumes. Examples of products and activities include pulp and paper machinery, machine parts, office machinery, metal packaging, mineral water, soft drinks and refined sugar products.

Induced I: has dual drivers. Their growth characteristics are the same as for new / renewed industries, but is not as strong. Declining relative prices and rising relative volumes points to a combination of supply-driven (technology driven) forces and secondary derived demand increases. Industries are dominated by inputs to other parts of the industry. Plastic packaging, plastic semi-finished products, paint manufacturing, corrugated cardboard, veneer, and glass products can be mentioned as examples.

Induced II: growth characteristics very similar to transformed industries. The development is typical of demand-driven industries with secondary growth, i.e. rising relative prices, combined with increasing relative volumes. Mainly consumer goods but also simpler inputs are common, with examples such as coffee, confectionery, malt beverages, glass manufacturing, chocolate, crisp bread, canned food, matches, electrical wire, cable, ink, plates, wall hangings and metal structures.

Stagnant: hardly any growth with sharply rising relative prices and declining relative volumes. It is quite simple consumer goods and inputs that dominate production. Among consumer goods clothing, lamps, washing, and among the inputs mineral, construction metal products, chemicals, lubricants and container glass are included.

Obsolete I and II are characterized by shrinking markets, the second group of almost extreme extent. Relative prices are rising sharply and volumes are decreasing even more. Examples of Obsolete I include battery manufacturing, china, sports equipment, cement, flat glass, tires /

tubes, nails, screws / bolts, leather goods, agricultural machinery and abrasives. Among Obsolete II are outboard motors, clothes, shoes, jewelry, carpets, wooden, particle board, brick, metal and fertilizers.

The grouping of service industries

Business Services A: is the fastest growing group of services. They are first among services to begin their growth during transformation. Growth is primarily supply-driven. It consists of IT services, MAD-consultants (marketing, advertising, design and management consultants) R&D-laboratories and surveillance / security.

Business Services B: Growth is compared with business services A weaker and essentially demand-driven. It consists of industries in the financial / legal, technical consultants, equipment rental / leasing and industrial wholesale.

Consumer services: Services directed towards individuals and households. Growth is mostly demand-driven and get started late in the growth cycle. Commodity retailing, consumer-oriented wholesale and recreation / culture are fast growing parts while food retailing, supermarkets / hypermarkets and personal service have much weaker growth.

General Services: Includes industries that depend on demand from both households and the total industry. Consists of fast-growing sectors like construction services, communications / transportation and hotel / restaurant and partly by low-growing services such as vehicle / fuel, cleaning / sanitation and electricity / gas / heat / water.