

COMPETENCE IN HEALTH CARE^{*}

- an industrial systems analysis using competence bloc theory to compare European and US health care

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Abstract

While European health care systems are mostly public and similar the contrast is large to the US health industry based to a large extent in the market. Using *competence bloc theory* the industrial potential of Swedish and European health care is assessed and compared with US health industry. To get the the analysis properly framed health industry is defined to include health insurance, health care and the supporting biotech, pharmaceutical and medical instrument industries.

A gradually aging industrialized world makes wealthy customers demand the sophisticated life quality enhancing medical support new technology offers. The overwhelming influence of *substitute customership* in Europe, through politicians, social insurance, doctors etc., however, holds back development through suppressing the preferences of the true customer (the patient), discouraging innovative product competition and entrepreneurship. The larger part of cost escalation in US health care can be attributed to quality improvements, and luxury health care has stimulated innovative product development.

While Swedish health care so far has been a technological winner, commercial competence to become internationally competitive is lacking. It appears politically difficult to recognize that private for profit health care may be both more efficient and profitable than publicly run services. However, once competition for profit has been introduced public providers have to improve performance and the differences will disappear.

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^{*} This paper is based on *competence bloc theory* as presented in G. Eliasson – Å. Eliasson (2002b) to evaluate the commercial potential of health care as an industry, based on a comparison of the public service sectors in Europe, notably in Sweden, with the more customer oriented and entrepreneurial health industry in the US. The paper draws on two earlier studies Eliasson (1997b) in Swedish and Eliasson G.-Å. Eliasson (1997).

1. The Health Care competence bloc defined

Health care in all its manifestations is an extremely competence demanding service. Neither the product nor the production technology is well defined. The knowledge input is highly tacit and each service provided draws on multiple integrated technologies. We, therefore, find it natural to look at health care as an industry operating in a market and begin with defining the product and its customers. For this *industrial study* we use the analytical tool of *competence bloc theory* (G. Eliasson – Å. Eliasson 1996, 2002). By comparing Swedish and US health care we examine the possible transformation of a regulated and price controlled public service into a dynamically competitive industry,¹ capable of producing the same, and more by less input. To assess the industrial potential of health care the selection and allocation of resources throughout the entire health services competence bloc are studied.

Competence bloc analysis starts from the demand side by defining the product and its customers. After that the *industry* capable of supplying that product can be defined. The dictum of competence bloc theory is that customer competence and willingness to pay set the limits of product quality developed. The demanded output is health. While the 20th century witnessed a significant extension of the average life length of individuals, the technology of the 21st century offers a significantly increased *quality of life*. The expression of a demand for a health service that produces that result is, however, obscured by the confused customer role in health care services, regulators, politicians, insurers, doctors, lawyers and other *substitute customers* interfering with the voices of the true customers, the patients.

Health care industry is conventionally defined as (hospital) care and medical services, the pharmaceutical and the medical instrument industries and the part of biotechnology industry that supports pharmaceutical industry. An industrial systems analysis of health care, however, requires a much broader definition that reflects all inputs in the final health product demanded. We have added the laboratory equipment industry that supports biotechnology industry and also health insurance industry which structures the composition of demand for health services, being in Europe almost completely in the public domain. One also has to add the legal services industry (notably in the US) supporting the patient in disputes with insurance, substance and care providers, and the regulators, the latter significantly reducing

¹ Similarly to transforming a formerly planned economy into a market economy (Eliasson 1998).

the scope of action of all actors in the industry. The complexity of the correctly defined health industry is shown in Figure 1. The figure indicates the large number of different ways the health product can be composed to satisfy a particular demand. For that, however, both the customer and the product have to be well defined such that well defined health services contracts can be formulated, property rights to contracted commitments efficiently exercised and the right prices established. The more of this that can be achieved the better the market will become relative to Government regulation as a welfare provider in health industry. The details of Figure 1 in combination with the competence bloc filter of Table 1 also indicate that technology is only part of, and perhaps not the important factor in organizing an industry capable of delivering the demanded health product to the final customer.

The competence bloc lists the minimum number of actors with tacit competences needed to expose each project to a maximum competent and varied evaluation. These actors (see Table 1) contribute competence at different stages of the creation and selection process in supporting new establishment, forcing losers to exit and taking the winners on to industrial scale production. The outcome will be industrial growth through positive experimental selection, or the *Schumpeterian creative destruction process* of Table 2. *Customer competence* plays a critical role in this dynamic by setting the limits to the demand for quality and the wealthy industrial economies have a large competitive advantage in customer competence (Burenstam Linder 1961). The *innovator* comes up with new technical combinations, and the *entrepreneur* adds the commercial competence of identifying profitable innovations. Without own financial resources the entrepreneur depends on the *competent* evaluation by a *venture capitalist* to obtain reasonably priced financing. The terms for venture capital funding, however, also depend on the existence of deep and competent *exit markets* where venture capitalists can unload their investments without large risks. In venture capital and exit markets the US has a competitive advantage over Europe. Finally, when a winner has been identified, *competent industrialists* are needed to take the project to industrial scale production. Also here specialist competence is needed. Executive experience from traditional industry is rarely sufficient.

Competence bloc theory (G. Eliasson – Å. Eliasson 1996, 2002b) provides a model for systematically integrating data and other information for a systemic understanding of the evolution of an entire industry. To assess the industrial potential of Swedish health care we,

therefore, go through the entire competence bloc, constantly making comparisons with the US. We also observe that much of what can be said of Sweden can also be said of Europe.

2. The health care product and its customers

Erik Höök (1962) observed that whether publicly or privately supplied certain high quality services were luxury commodities that were predominantly consumed in the rich industrial countries. This goes especially for health care and education, the demand for which tended to grow faster than in proportion to income.

The ultimate end product of health care demanded by the customer is to be kept as healthy as possible for as long as possible, the ideal product being defined by the *light bulb time profile*, i.e.; *constant quality of life until sudden death* (Eliasson 1997b). The ideal health care contract is a commitment on the part of the provider to guarantee an agreed upon future state of health. We will use this definition of the product, even though almost all literature focuses on intermediate input definitions of health care, such as the provision of particular treatments. We should consequently expect the customer (the patient) and the high income customer in particular to prefer product quality improvement rather than a lower price for given services. Hence, competition among health care providers, if there is competition, should be characterized by innovative product competition, not by rationalization and more cost efficient production of given products.

2.1. Substitute customership

Due to limited knowledge, a deficient state of mind on the occasion of exercising demand, insurance practices, legal rules, and ethical codes, the *preferences of the true customer* (the patient) are not *expected to be competently expressed in the market*. "Substitute customers" step in to support the true customer in, or deprive him/her of his or her difficult choices. The health care competence bloc, hence, features a *fragmented and confused composite of customers* made up of the patient, the insurer, the hospital care provider ("the doctor"; see Figure 1), the regulator and of politicians and lawyers. Particularly interesting is the fact that several substitute customers also serve the dual roles of being factors of production. The public insurer (in most European countries) attends to the particular political ambitions of the Government which may run counter to the interests of large groups of patients. The doctors

also interfere with their particular professional ethics. The substitute parties in this composite customer role, thus, do not always act as good agents for the true customers who, therefore, sometimes need an additional agent, a lawyer or a health consultant, to protect their rights through a legal process. Here the US and European systems differ radically. Both in the US and in Europe, but less so in the US the legal systems are also designed to prevent high income earners from buying preferential medical treatment and this, of course, also limits the use of the market to allocate resources in health care². In addition, the tough clinical testing and authorization requirements of new drugs and medical equipment to check for negative side effects is another form of substitute customership or "insurance" that interferes with the free product choice of the patient. The insurance contract, furthermore, defines and limits the quality of health services received.

(Figure 1, Tables 1 and 2 in here).

The sick patient needs double insurance; insurance for the incidence itself (health care financing) and insurance for breach of insurance contract and malpractice in care. Litigation is becoming an increasingly important part of health care also in Europe, even though the US leads in devoting resources to that process, notably when it comes to paying large damages that match the loss of life quality a maltreatment may lead to. As the analysis will show, increased use of litigation may be a positive side of the health care process. The providers of health services in most countries normally play a double role, both having a decisive influence on the type of services provided and covering part of the bill.

The final product of health care has to be defined in terms of the success of correcting a health deficiency in an individual. The output of all industries (and technologies) in Figure 1 then become inputs into this extremely multidimensional end product. The absence of competition and a "commercial spirit" among substitute customers as well as providers, however, tends to stimulate centralization and large scale production of standardized health services for a market the true customers of which demand variety. The role of *substitute customers* in covering up the preferences of patients, notably the insurer, is of such

² The kidney exchange programs in the US offer an interesting principal example. Most states prohibit trade in organs for transplantation and the medical community appears firmly opposed to such trade. However, "barter solutions" involving changed priority orderings in waiting lists for "cadaver kidneys" are allowed. Roth-Sonmez-Unver (2003) demonstrate through simulations that by allowing pairing of one or more voluntary donors of kidneys with rearranged priorities in the waiting lists for cadaver kidneys immunological incompatibilities can be overcome and welfare significantly increased. So while money wealth cannot buy you

fundamental importance in competence bloc analysis that considerable attention will be paid to them below.

2.2 *The insurance contract defines the product*

The ideal health care market would *trade in commitments on the part of insurance and care providers to maintain a predetermined level and quality of health of the individual*, and some customers should be expected to ask for coverage for top of the line luxury or high technology service. The existence of an efficient such market, however, is precluded for four reasons. *First*, the level and quality of health cannot be easily defined and measured. *Second*, technological uncertainty associated with determining the potential health hazards of the individual and the treatment needed to correct insurable deficiencies as a rule cannot be reliably estimated. *Third*, adverse selection and moral hazard make it difficult to define the contracted commitments precisely. *Fourth*, ability to pay for the insurance and/or the care is not everywhere present. Hence, these markets have only developed partially. Some argue that, therefore, the solution should be socialized health care. The situation is, however, the reverse. The US with the most commercialized health care markets exhibits the boldest attempts to commitments in these respects and the reason may be the steep damages imposed for not supplying the contracted and/or the best practice product. It is, therefore, important to compare the various attempts to managed health care business in the US with the European socialized and nationally standardized health care systems.

A large part of US health care is financed over public budgets (see Table 3) and through different subsidies to hospitals. However, charity by hospitals and/or outright legal requirements of hospitals to provide certain treatment, notably emergency care to uninsured people are also common. Mas-Canal (2001) identifies the problem nicely. She observes that, "in the past hospitals (in the US) had been able to finance the social mission of providing charity care through a complex system of internal cross-subsidizing where privately insured patients were charged higher prices". The emergence of a competitive health care industry during the last twenty years has created a more efficient, and in many ways qualitatively better health care service, but it has also (and this is part of the increased efficiency) (1) trimmed away the margins previously available for charity to the uninsured and (2) forced Government hospitals to take on charity care patients. This change, Mas-Canal demonstrates,

a medical favour, finding a voluntary donor can.

has resulted in a negative health impact on the uninsured. Increased competition and the creation of a more business minded health care industry have brought costs into the open, and turned the charity and redistribution sides of health services into what it really is, a political issue.

Overprescription, overmedication and overtreatment are controversial and difficult issues. Before the Boskin report (see below) they were discussed as inflationary factors in the US. Many studies, however, demonstrate that prices and the behavior of health care providers respond to economic incentives and competition, and that the increased use of new technology both reduces risks and improves health outcomes. Overtreatment may, therefore, also be looked at as an added and demanded uncertainty reducing quality of health care.

Obviously, the nature of the contract between the customer/consumer of health services and the provision of the same services matter critically for product quality. This principal observation is, however, cold comfort when it comes to formulating the same contract. The first problem derives directly from competence bloc theory; the multiple nature of the customer and the dichotomy between who pays and who receives the service. This makes the insurance contract very complicated. The second problem has to do with lack of knowledge of the production process when the product demanded is correctly specified; namely to keep the patient at a prespecified level of health. As a consequence practically all contracts are input, not output specified. However, even so, new technology offers tremendous opportunities to improve product quality in the sense of keeping patients in good shape. It must, therefore, be *important for welfare that the insurance industry comes up with innovative and efficient contracts that support, not only the efficient and rapid introduction of new technology, but also insurance tailored to the varied demands of the customer.* Such contracts have to recognize the complexity and the lack of knowledge of the two parties of the deal to agree on the right way to price the risks involved. In general, when neither product nor production process can be well specified the rational arrangement is not a standard contract but a negotiated (between the customer and the insurer) customized contract. This means that the risks are defined and apportioned ex- ante, and not classified ex- post when an incidence has occurred and the insured is in a disadvantageous situation. This is the exact opposite to the dominant mode of organization of sick insurance and health care, reflecting the political position in Europe that the individual patient/customer is too ignorant to be allowed to shop

for health care services. His case, in the case of an incident, will be responsibly attended to ex- post by trusted authorities.

2.3 *Quality versus length of life*

Some patients might prefer a somewhat shorter life, if they could, and in exchange, benefit from a higher quality of life until death. Medical technology increasingly offers such innovative trade-offs moving the life profile closer to *the ideal lamp bulb life profile; constant quality and sudden death*. Life quality enhancing services are, however, costly and not available to all, even though they eventually become standard services with lower costs and available to most, at least in the wealthy industrial nations. In European countries with socialized health care offering standardized contracts and care being financed by taxes the individual has little say in these choices. Only the very rich can chip in private money to obtain special, high quality customized treatment. In fact, law and regulation prevent the Swedish patient altogether from recovering the cost for standard treatment covered by public insurance if he or she wants to add higher quality treatment than allowed by the public insurance.³

In most European countries the true customer to medical services has been eliminated and replaced by a standard bureaucratic decision process or ad hoc decisions by a factor of production, the physicians. The doctor (and the hospital) represents a highly competent substitute customer when it comes to health care technology, but a doubtful substitute customer when it comes to representing the true preferences of the patient. For instance, the possibility that some patients may want to trade a better life for a shorter life may clash both with physicians' ethics and insurance policies. A both private and social welfare reduction may be the result. Objecting to the common view that medical care has not contributed much to health Lichtenberg (1998, 202,2003), Lichtenstein-Virabhak (2002) and Cutler-McClellan (2001) show that the introduction of new and more efficient medical technologies and drugs not only reduces mortality and prolongs life. It also raises capacity to work and expected life income across all age groups and, hence, contributes to economic growth. And the outcome is

³ It is now (it was not some years ago) possible to obtain that service in a private hospital, but then the patient has to pay all privately.

cost efficient⁴. The provision of costly intensive care during the last six months of life, on the other hand, is more controversial. It does not seem to increase survival rates following acute conditions, and people seem to prefer less, rather than more intensive treatment at that stage (Skinner and Wennberg 1998). Highly controversial is the so called medical care rationing by patient preference in the US, or to "die with dignity" at a phase when more treatment offers only a marginal improvement in the probability of survival and is followed by an unacceptable decline in the quality of life (Singer and Lowy 1992, Byrne and Thompsen 1997). With 60 percent of an individual's life time medical expenditures borne in the last year of life, and 40 percent of these in the last month, there is a steep cost-efficiency trade off in taking one step further to reduce terminal medical expenditures associated with sharply declining quality of life by offering an earlier benefit, most simply in the form of lower health insurance fees, or more luxury, life quality enhancing treatment earlier in life. Taken together, the raising of quality of life through innovative improvement of health services products should be a high return investment proposition for a commercialised health care industry.

The causal links between knowledge, health and income have long been a cause for concern among economists. Do healthy individuals earn more income because they are healthy and therefore demand more education and health services, or can subsidized investments in education and health care be instrumental in making individuals better income earners? Using inheritance data Meer-Miller-Rosen (2003) conclude that the causal link rather runs from health to wealth⁵. Wolfe-Haveman (2001), however, argue strongly that the single most important explanation of both health and income is education. Educated people tend to have better access to jobs, be more capable of coping with change, be healthier etc than less educated people. Gruber-Madiran (2002) in their survey of the literature on health insurance and labor supply- a virtually empty research field before 1990- indirectly conclude that health services are a demanded consumption item rather than an investment in a future higher

⁴ On the surface the US "war on cancer" declared by President Nixon in 1970 does not appear to have had much of an impact. The age-adjusted US mortality rate from all malignant cancers was more or less the same in 2000 as it was in 1969. But this reading of the statistics is misleading argues Lichtenberg (2004). It is true that the incidence of cancer has increased but this is because of improved diagnostic procedures and the decline in mortality from other causes, notably cardiovascular disease. Given the higher incidence, mortality is down strongly and Lichtenberg can keep the hypothesis that the increased survival rates in various malignant cancers depended on the stocks of drugs administered for the various cancers.

⁵ Rosen-Wu (2003), furthermore, add that households in poor health tend to avoid risky, but potentially more rewarding financial assets. Case (2001) also found that exogenous increases in income (unexpected pensions) among poor South African blacks were shared among members of large households to improve nutritional status of household members and indirectly their health.

income. They observe, based on the typical US organization of health insurance through the employer that availability of health insurance through the job is a key factor in the decisions “to work, to retire, to leave welfare and to switch jobs.”

2.4 The aging customer

The aging of the populations in industrial countries will raise health care costs . The US is, however, quite well off compared to countries such as Japan which according to some estimates might have almost 60 percent of its population at 65+ by 2050 (see NBER Reporter, Summer 1999, Gruber and Wise 1999, Gruber and Zinman 2001). Gruber and Wise conclude that the single most important long-run fiscal issue facing the developed world is the aging of its population. That same fact should, however, also create tremendous opportunities for the health industry in the rich industrial nations if it can refocus its product development on the raising of quality of life and ability to work at above retirement age. In terms of competence bloc theory this would shift focus towards the market and the customer and away from the fiscal problem.⁶ Many studies also show a strong negative correlation between wealth and early death. The causality, however, appears to run from health to wealth rather than the other way, adverse health events having adverse economic implications (Hurd, McFadden and Merrill 1998).⁷

⁶ Skinner and Wennberg (1998) also show that rapid growth in health care spending is concentrated to the young (less than 1 year-old) and the old (65 and older). Among the old circulatory disorders and neoplasms are the most common high cost diagnoses, and mortality has decreased dramatically over time as life quality has increased. Harding (1995) observed the same from Australian data. Cutler and Meara (1997) point to technological advance as the main factor behind the disproportionate increase in health care costs among these groups. Burger and Schneider (1995) demonstrate that a new drug for advanced Alzheimer patients covers its costs through a reduced need for care. Increased life quality for the patient and relatives comes as a free bonus.

⁷ Interesting complications arise when medical cost-efficiency analyses take into account future costs for medical care when interventions increase the length of life rather than the quality of life (Meltzer 1997). A large part of medical treatment is received during the last months of an individual's life. Skinner and Wennberg (1998) observe that the use of intensive treatment in the last six months of life varies a lot between regions in the US and for no obvious (measurable) reasons, and despite the fact that people prefer less, rather than more intensive treatment. In sum, they conclude that regions providing more intensive care do not seem to gain any net health benefits over other regions and that allocative inefficiency may be present in the sense that patients are not matched with the treatment they prefer. Rather, intensive treatments seem to rise with the presence of particular specialists in the region. Excessive use of highly reimbursed treatment is a related problem. Gruber and Owing's (1994) hypothesize that the varying decline in fertility in the US 1970-1982 induced obstetricians/gynecologists to substitute from normal childbirth towards more highly reimbursed cesarean delivery. Their results are significant and robust.

Early retirement appears to be a characteristic of all industrial countries with a growing share of elderly in their populations. This is expected to put great strains on the financial solvency of retirement income systems around the world. One would also expect private and pension wealth to induce less healthy persons in particular to retire early. The explanation, however, rather appears to be disincentives to work built into the generosity of the social security systems in Europe in combination with a system that heavily "taxes" continued work (*NBER Reporter*, Summer 1999, p. 91). On this Prescott (2004) concludes that the reasons Americans work 50 percent more than Europeans and generate a 40 percent higher per capita output are to be found in higher taxes in Europe and an elastic labor supply, creating an ugly intergenerational problem of how to pay for the excessive social and retirement benefits a large number of Europeans are living on, that cannot be refinanced through higher taxes. Also, the standard forecasts that greater life expectancy will increase medical costs may not be true. First, since end-of-life costs generally decrease with age at death, a greater life expectancy will mean that a smaller share of the elderly will die at ages when medical costs are at their maximum. Second, reductions in disability among the elderly also reduce medical spending. This is in keeping with success in moving towards the "light bulb" health care product. The net effect should be a reduction of average medical spending on the elderly. However, this net reduction is not sufficient to significantly reduce the overall increase in medical spending projected. If this increase is largely a matter of quality advance in health care services (see below) that is also demanded by customers willing to pay, the overall effect should be a contribution to growth and a (large) welfare increase and nothing to be concerned about (Cutler and Sheiner 1998). *The aging of the populations in the rich industrial countries could, therefore, be looked at as a business opportunity*. If the markets for health care are well organized for firms to capture those opportunities the results could mean a positive leap in welfare, notably for the elderly, and possibly also solve the problem of financially collapsing public retirement schemes in Europe.

2.5. Demand induced technology advance

Economists have long discussed the relative importance of demand induced innovation and technological or science push factors behind innovation. But there has been little empirical evidence to show. The thrust of competence bloc analysis is that technology push is not sufficient, and maybe not even that important. Other, economic factors may be decisive.

Finkelstein (2003) have designed as unique study on the effect of (three) policy (health insurance) changes on incentives to invest in new vaccine developments in the US against six particular diseases. Finkelstein distinguishes between (1) static effects in terms of increased use of existing vaccines and (2) induced investments in “developing improved versions of the existing vaccine (dynamic consequences)”. She, furthermore, distinguishes between five dynamic consequences; (1) spillovers, (2) reduced side effects, (3) the development of new and more efficient vaccines, (4) increased use of the improved vaccines and (5) increased vaccination “for unaffected diseases” but can only estimate the effects of (3) and (4) and reports “robust” evidence of an increase in vaccine investment “because of increased demand incentives”. The response so measured, however, appears to be limited to late stage commercialisation investments (clinical trials) and not to a pre-clinical research aimed at developing “fundamentally new technologies”, but the results are still of principal interest, especially if coupled with a different dimension of dynamics, namely the economic consequences of keeping people healthy and at work. .

Differently designed health insurance also induce different hospital quality supply responses. Hospital investments in improved quality depends on the return hospitals receive on those investments. Gowrisankaran-Town (2002) observe that competition among hospitals for patients made privately produced managed care or HMOs produce different quality offerings from hospitals than competition from publicly purchased health care through the Medicare and Medicaid programs, the former appearing to raise, and the latter to decrease welfare.

3. Technology potential and innovations

The health industry comprises many diverging technologies that integrate in different ways. The technological potential of health care, however, is not only a matter of applying state of the art technology on the patient, but of how different technologies are innovationally combined. Of particular importance are the possibilities to substitute technology for expensive care, for instance in the form of improved early diagnosis and preventive medication, through substituting medicines or efficient new medical devices that require no, or only a brief, stay at the hospital or through improving incentives to use total resources

more efficiently. Here the role of the insurer as a representative and rational substitute customer for the patient is critical.

3.1 Luxury health care needed for innovative product innovation

Quality is the fundamental output of health care. Variety in services offered is a fundamental and costly part of product quality. Product quality depends critically on the quality of input factors, but also, and significantly on the incentives to be efficient and to use new technology. On both sides variety in supply is an important ingredient of quality.⁸ The United States has the highest per capita health care expenditures in the world, and a health industry that is to a significant degree private and subjected to competition. It also stands out as a leader in the advancement of treatment technologies with – as we will see- also (*NBER Reporter*, Summer 1999, p. 6). The question is: Does this depend on the resources spent, on the organization of industry (private vs. public, for profit competition or regulation etc) or on something else?

Health care in Sweden and England is primarily publicly provided. The rest of Europe has a higher private share, that is, however, still lower than the public share. The US spend almost as much (as a share of GNP) on publicly provided health care (1997 6.5 percent; see Table 3) as Sweden, but even more (or 7.5 percent) on private health care. This means significantly more *per capita public care* in money terms in the US than in Sweden. While the Swedish share has been significantly lowered since 1983 (from 9.5 to 7.2 percent) it has increased in the US (from 10.4 to almost 14 percent). Extensive health care of high quality is a luxury investment in life quality, primarily only available in the rich industrial economies. It will be increasingly demanded. Advanced, high cost health care in a wealthy country with many highly educated, experienced and competent individuals, furthermore, should be looked upon as a highly (socially) profitable investment in production (Bhargava, Jamison, Lau and Murray, 2000, Strauss and Thomas 1998). It is socially costly to keep these people outside production in terms of output lost (Lichtenberg 1998).

(Table 3 in about here)

⁸ as illustrated by Currie and Gruber(1997) who find that eligibility for coverage under the US medicaid program for teen mothers *in combination with* closeness to a hospital with a Neonatal Intensive Care Unit meant a sizable reduction in mortality of children.

US experience suggests that the higher the health care cost share in GNP, and the higher the private part in that share, the larger the share of total costs that is devoted to raising life quality and to preventive care rather than corrective treatment. The higher these shares the larger the innovative and exclusive technology content of the medical service provided. The reason is partly the luxury care allowed for in the diversified US health insurance system, but mostly the less regulated and more varied and, therefore, also more entrepreneurial health industry in the US than in Europe, characterized by innovative product competition. Clearly, growth in health care spending is largely driven by those at the top of the spending distribution (Cutler and Meara 1997).⁹ Treatment that is costly and of a luxury nature today will, however, with time become standard treatment and generally available through technological development and experience. Obviously, customers willing to pay for costly high-technology quality-increasing care are not only necessary for the existence of an industry providing these services. It is also a necessary requirement for the creation of the same new technology that later becomes standard treatment available to almost all at a reasonable cost. A group of rich customers, so to speak, pay for the development of new advanced technology through buying the associated health services. The larger that group, the faster the creation and diffusion of the same technologies.

The conditions for the development of a sophisticated high-technology health care industry, therefore, are only good in a country in which the citizens are willing (and in practice allowed) to spend on luxury, quality-raising and customized medical treatment. A high private share is not only associated with high quality. A private, decentralized organization of health services is also congenial to the commercialisation and diffusion of innovations that arise spontaneously in the care part of the health industry. Health industry doesn't differ from other forms of production when it comes to innovative product development. It also has to be experimental, and exclusively offered to the few to begin with. Hence (see Eliasson 1997b, p. 38), the low private share of the health care industry in Sweden puts the transformation of the Swedish health care sector into a viable industry at risk.

⁹ The Medicare program in the US available to all above 65, in fact appears to have been more beneficial to high income earners than to the poor because they live longer and use health care provisions more efficiently than low income families and the poor (McClellan and Skinner 1997). The expansion of Medicaid eligibility 1984-1992, however, has substantially increased preventive care among the poor and significantly improved health outcomes, notably when it comes to infants and child mortality (Gruber 1996, 2000a, b).

3.2 *Cost explosion or quality advance – the US experience*

The observed "cost explosion" and the slow measured productivity development in medical service provision have been interpreted – in the US in particular, but also in Europe – as a problem signalling the long-term impossibility of providing reasonably high quality services for the citizens. Statistics in the US, when adjusted for quality change are, however, rather consistent with a rapid increase in the supply of a demanded quality of health services.¹⁰ Improved quality in health services is to a large extent related to (innovative) variety in product development, that is costly, but that should be seen as more, not more expensive health service. And innovative product development in health industry should be associated with significant spillovers (Eliasson 1997a) to the rest of the industry thus boosting the value of total industry output if properly measured. The general picture appears to be that real prices for medical care have not increased by far as much as was earlier believed. They may even have decreased, when compared with a general price index also corrected for quality change.¹¹ There is indeed a need for more adequately designed medical care price indexes (Berndt, Cutler, Frank, Griliches, Newhouse and Triplett 1998) that incorporate quality changes due to technical advance. This is exceptionally difficult for products ("treatments"), the benefits of which extend over a lifetime, that the patient may not be willing to pay for and that are (therefore) often being paid by a third party (Shapiro, Shapiro and Wilcox 1999¹²). When constructing a quality-adjusted price index that reflects the entire treatment of one major illness (depression) rather than a fixed basket of goods and services, Berndt, Bush and Frank (1999) find that the real price of health care has fallen, rather than having increased substantially¹³. For a number of well-defined treatments, the increased costs (in the US) have been found to correspond to a radically enhanced quality of services providing an improved quality of life. In fact, for many services (including surgery) the price has been lowered (see,

¹⁰ For a survey also see Eliasson (1997b).

¹¹ See Triplett 1999, Boskin, Dulberger, Gordon, Griliches and Jorgenson (1996, 1998).

¹² The producer price index, furthermore, appears to undersample younger and more competitive products and, hence, both overestimates price increases (Berndt, Griliches and Rosett 1992) and fails to reflect the welfare gains to customers who regard generic and branded versions of a drug as perfect substitutes (Griliches and Cockburn 1993).

¹³ Part of the overestimation of price increase may occur because of a drift in price indexes caused by the introduction of *new goods* Berndt, Griliches and Rosett (1992) observed in an earlier study.

for instance, Berndt, Bir, Busch, Frank and Normand 2000 and Triplett 1999).¹⁴ Cutler, McClellan, Newhouse and Remler (1997) conclude that prices of medical care may be declining, or at most, have risen only modestly in recent years (also see Triplett 1999). This result becomes stronger if also quality of life improvements (not only life length consequences) are factored in.¹⁵ Then the index falls by 1 to 2 percent per year relative to general inflation (Cutler, McClellan, Newhouse and Remler 1999). Indeed, when the value of improved health is estimated, it is often found to exceed the increased cost, in this case of heart attack care (see Cutler and McClellan 1998 and Cutler, McClellan and Newhouse 1998). After carefully evaluating the different factors involved and weighing in new evidence (after the Boskin report) Gordon (2000) concludes that the upward bias in the CPI for medical potential of health care services estimated by the Boskin report may even be an underestimate.

The United States has the highest health care costs in the world (NBER's Reporter, Summer 1999, p. 6). New technology and new drugs have dramatically improved the quality of life for people that earlier suffered from debilitating diseases. The conclusion should, therefore, be that *the long-run increase in health care expenditures in the US reflects an increased demand for quality of health services.*¹⁶

3.3 Personalized medication

The low accuracy of drugs, not more than 20 percent on the average, means that a significant number of patients will only experience cumulative negative side effects. New knowledge of the genome not only makes precise diagnoses available but also personalized medication that

¹⁴ For instance, Cutler and McClellan (1996) find that essentially all the growth in costs for the treatment of heart attacks can be attributed to the diffusion of intensive technologies, "insurance generosity" being one important explanation to the diffusion. The price for a given quality-adjusted treatment has, in fact, been constant or falling. Cutler, McClellan and Newhouse (1998), studying the treatment of cardiovascular disease, conclude that the cost of living for heart attack victims is actually falling and that new medical treatment and intensive procedures (in that order) are the explanation.

¹⁵ The value of one additional year of life can be estimated by (1) asking people what they are willing to pay, (2) finding out how much higher pay they demand for an increase in job risks of injury or death and (3) observing how much they spend on safety devices. Consensus from literature (see Cutler et al., 1999) suggests the value to be (on the average) \$100 000 and that an extra \$ 25 000 should be added above the average for a year in perfect health. Lichtenberg (2004) puts the value of a statistical U.S. life –year " in the neighbourhood of \$ 150,000 ".

¹⁶ Here Nordhaus (2002) argues that measures on health status are much better than output quality adjustments of particular medical technologies and proceed to correct US GNP data for improvements in human health that have so far gone unmeasured. He finds that " the economic value of increases in longevity in the last hundred

fits the patient's genetic specification and, hence, raises the accuracy of medication and the possibilities of keeping people healthy and out of hospital.

The five most promising product (therapeutic) areas in age related diseases for which an increased private demand should be expected appear to be: (1) diagnostics, genetic testing, (2) cardiovascular disease, (3) cancer of the breast and prostate, (4) other forms of cancer, and (5) neurodegenerative diseases (Alzheimer's and Parkinson's). These five product areas offer promising opportunities for advance in life quality enhancing product development and preventive medication that will also keep people at work longer. Product development in all areas is expected to be heavily supported by biotechnological advance. A careful look at each of these areas, however, reveals that the number of different technological approaches to each particular disease within each category is enormous.¹⁷ While opportunities are great the risks of focusing on the wrong method are also large, so development will have to be an experimental flow of winners, the main cost of developing these substances being mistaken projects. Two factors hold the realization of that technology below a feasible technical rate; badly designed costing and pricing systems in health insurance and care, notably in publicly run systems, and limited interest from the less innovative large scale pharmaceutical companies, that realize that personalized medicine will not – at least until threatening competitors show up – make earnings come as easily as before.

4. Entrepreneurship in the health industry

Competence bloc theory emphasizes the critical role for industrial development of other factors than technology and other actors than innovators. If the competence bloc is not vertically complete and horizontally varied winners may be lost and winning technology may not lead to successful industrialization. Such required actors with competence are the entrepreneur (this section), the venture capitalist and the industrialist.

The Swedish health industry is dominated by large, socially oriented and publicly financed and run hospitals embedded in a socialized health insurance system, and a few successful

years is about as large as the value of measured growth in non-health goods and services".

¹⁷ Prostate cancer, for instance, is being approached using at least eight completely different technologies (Eliasson 1997c, pp. 6f); radical surgery, radiation therapy, cryosurgery, chemotherapy, diet, biotechnological diagnostics and early targeting methods, and photosensitive chemical targeting of cells.

private medical instrument and pharmaceutical companies. There is also an increasing number of small private biotechnology start-ups around university campuses.

Despite a long history of "technical" interactions with the medical devices and equipment and pharmaceutical industries, explaining some of its commercial success stories, most of the public hospitals are still operated as large centralized administrative systems. This has not been a good environment for entrepreneurship. Hospitals have also been reluctant to outsource care services, and their principal governing bodies, politically elected in Sweden, generally resist change towards privatization and fee based profit-oriented care provision. As late as July 2002 the ruling social democratic party of Sweden has taken a negative position on for-profit hospital care. Similar political sentiments prevail in much of Europe and apparently also in some quarters among the medical profession in the US (see below). This blocking of commercialisation of the hospital care has been reinforced through the (socialized) health insurance schemes and price regulation that makes it difficult or impossible to get paid for innovative product development. Hence, an environment that discourages entrepreneurship has been created.

The pharmaceutical success stories Pharmacia and Astra have now merged respectively with US UpJohn and Monsanto into Pharmacia Corp. to be acquired by US Pfizer in 2002 and with UK Zeneca into AstraZeneca (see below). They belong to the global giants and have begun to suffer the standard problems of lack of internal innovative new product development. In medical instruments the situation is different. Here (for instance) Swedish fine mechanical engineering prowess has merged successfully and commercially with medical know how. When close to existing Swedish manufacturing know how and ample industrial funding, entrepreneurship seems to work.

Entrepreneurship in biotechnology is mixed. The Swedish start was early. In fact, Pharmacia was heralded in the early 1980s by the US venture capital community to be (together with Danish Novo) potential global winners in the budding biotechnology industry (Eliasson 1997c). The history of both companies during the 1980s, however, was disappointing to the venture capital community. The Swedish biotechnology industry, despite its excellent academic foundation, has been lagging behind. The reorganization of, and closing down of (parts of) Pharmacia, however, appear to have released significant biotechnology and

pharmaceutical management competence in the Uppsala area to start new and innovative firms and the long-term growth outlook in the Uppsala region may even be positive (Eliasson 2004a,b). The cases of titanium implants in Sweden (Nobel BioCare) and in the US (AcroMed) are interesting. When two very similar and innovative technologies (Fridh 2000) were "dropped into" two very different competence blocs the complete US competence bloc carried the innovation to industrial scale production and distribution five times as fast¹⁸ as was the case in the incomplete competence bloc in Sweden where a badly functioning exit market finally has turned Nobel Biocare into a cheap acquisition for a Swiss company (BB Medtech). The judicial domicile of Nobel BioCare has been moved to Zürich for tax reasons, while its corporate headquarter remains in Gothenburg (*Dagens Industri*, April 10, 2002).

5. Venture capital and exit markets

While the Swedish industrial policy discussion has gone from a complete neglect of the role of the entrepreneur in economic growth until well into the 1980s to a concern about the lack of entrepreneurship in the 1990s, the real problem appears to have been lack of competent venture capitalists (Eliasson 1997c). Public financing, bank credits and big company "venture finance" have been in fairly abundant supply since the 1970s, but availability of such finance has been mistakenly interpreted as availability of critical venture capital coupled with industrial competence. What has been lacking is the competence to identify winners and to understand their industrial potential and the capacity to offer funding at reasonable terms. Provision of financial resources for commercialization of new technology unrelated to existing big firms between the early research stage and industrialization has been almost nonexistent in Sweden for a long time. And the situation in Europe, excepting the UK, has not been much better (Eliasson 1997c). The required diversity of competence has not been there to guarantee that potential winners are not lost. The improvement in venture capital provision for biotech and health care that has been observed recently in Sweden is a larger supply of finance channelled through the same very narrow portals of industrial competence as before (Eliasson 2000a, 2001b, 2004a). That situation will raise the rate of business failure more than the rate of creation and identification of winners. In general it is extremely difficult to distinguish between bad projects and long-term winners, which is the task of venture

¹⁸ The sequence discovery, company start and break even was 1960-65, 1981 and 1988 in the case of Nobel Biocare, and 1981, 1983, 1986 in the case of Acro Med.

capitalists. This competence requires related industrial experience and, hence, takes a long time to develop. Here, the US has an advantage in most of the new industries, since it began earlier, and probably also because of a more entrepreneurial culture. The situation is somewhat better on the exit or IPO market side. Here, financial market competence matters more than the competence to assess industrial potential, since IPOs wait until potential industrial performance has been demonstrated.

Åsa Eliasson (2002) investigates the different financing risks involved in going from the innovation stage through the entrepreneurial stage and on to industrial scale production. Should the innovator/entrepreneur (1) do it alone, slowly, and risk going bankrupt or being imitated at an early stage by a big competitor? Should the entrepreneurs (2) share the risks and profits with a venture capitalist to be able to move faster, (3) push further along to be acquired at some later stage by a big company, or (4) should he/she opt for safe, but not so profitable contract work. To minimize the risk of rejecting winners a viable competence bloc should offer all four alternatives. Lack of venture capital competence in Sweden makes (4) a common option in Sweden. Opportunities are growing under (3) but to be strategically acquired the high-tech firm has to become an innovative entrepreneur in the global markets for technology and finance where the big customer firms operate (Eliasson 2001b, c). Such markets have been developing in pharmaceutical technology but incentives have narrowed because after the many mergers fewer big pharmaceutical companies are competing for innovative biotechnology firms (G.Eliasson – Å.Eliasson 2002a). So far, and for some time to come Swedish health care will not be exhibiting the viable entrepreneurship it is technologically capable of because (mainly) of lacking requisite local venture capital competence.

6. Industrialization phase

During the industrialization phase winners are moved to industrial scale production and distribution. Even though Swedish industry excels in big business leadership (Eliasson 1984, 1990), its competence base is concentrated to mature industries or industries involving mechanical engineering. The experience is that a different industrial competence is needed to initiate and build radically new industry, for instance in health services. The industrialization phase signifies the ultimate outcome of a successful project selection through the competence bloc. But the health care competence bloc is extremely complex, based in a large number of

technologies (or technological systems; Carlsson 1995) ultimately oriented towards the final product of keeping the individual in good health.

6.1 Customer driven innovative organization of health care

A particular feature of health care, not typical of manufacturing, is the dominance of professional specialists. The integrated nature of health products from the diagnostics to the treatment stage, often involving the entire competence range for each patient, however, makes extreme specialization counterproductive and not rarely produces a chancy outcome. The industry, nevertheless, is highly specialized both technically and organizationally making suboptimization the rule rather than the exception, a consequence competition has taught manufacturing industry to avoid. Thus, for instance, preventive medicine is often discouraged because of inconsistent charging systems leading to costly hospitalisation and corrective treatment. The immense complexity of health care diagnostics and effective medication has confronted European socialized medicine with an immense organizational problem which the logic of this essay tells can only be solved in the market.

The family doctor was assigned to be a competent substitute customer, responsible for the whole situation of the patient and capable of outsourcing specialist care. The family doctor has been rationalized away from large scale Swedish health care. To some extent the private insurance companies in the US, including also the HMOs have taken on the economic side of that responsibility, being concerned about minimizing the costs of keeping their insured clients healthy. These organizations shop competently for health care services that benefit both their own and patient interests, for instance by supporting preventive medication to keep patients out of costly hospital care. Attempts to enforce "systemic optimization" through centralized bureaucratic management of integrated cooperation among all specialties involved often encounter impossible complexity. Many competing private health insurance operators driven by economic interests in a rationally distributed organization are far more effective. Competition has already forced manufacturing industry to develop competence in distributing that allocation over the market. Protected industries exhibit less of that competence and also a larger variation in product quality for the same price.

The task of keeping people healthy is a complicated service product involving a large number of specialties including the "specialty of the generalist" who integrates the package of

specialties relevant for that particular patient. Competence capital embodied in the staff, therefore, is the most important technology in health services, the level of technology being, as we have shown, very much a matter of the efficient allocation of that competence. The care provided depends critically on the skills of the doctor. The consequence, hence, of a bad allocation of competence in health industry is a considerable randomness in the provision of quality of care. Stern and Trajtenberg (1999) also observe a large variation in physicians' diagnostic abilities.¹⁹

With the family doctor gone in Sweden the individual has been increasingly left to guide him or herself through the large "industrialized" hospitals, offering hundreds of specialist services.²⁰ Responsibility for the "whole" of the patient's health care problem is increasingly left with the patient. Since health care efficiency and quality in a large measure lies in the ability to assess and attend to that "whole situation" of the patient the quality of Swedish health services has been lowered by standardization and rationalization and a consequent reduction in product variation.

6.2 For-profit health care – will competition raise productivity?

Health care and health insurance have conventionally, notably in Europe, been seen as a public, non-commercial responsibility, with the US as an exception. Managed care, for instance, provides an interesting private solution in the intersection of health insurance and health care, where a company signs up to manage your health. Politicians in Europe, being a large part of the substitute customership prevailing there, on the other hand, seem to have great difficulties understanding that well organized private health services supplied in competitive markets can be both profitable and more efficient and generate better care of higher quality than public health care in protected (from competition) markets.

¹⁹ They find that physicians with top-notch skills would prescribe a more diverse portfolio of drugs than the average doctor, a prescription that is optimally selected for the particular patient and illness. Less skilled physicians would tend to rely more on what other doctors do, advertising, popularity and "other low-cost sources of information" for their judgment. What is worse, incentives for doctors to invest in understanding subtle differences in drug effectiveness vary considerably between insurance systems and "markets".

²⁰ While the large Swedish manufacturing firms have reorganized since the 1970s from large centrally planned "machines" to decentralized profit-driven organizations, the protected (from competition) Swedish hospitals are still top down planned entities best suited for delivering standardized volume services (see Borgenhammar 1993, Borgenhammar and Fallberg 1997 and Fölster et al. 2002).

While a sizable private for-profit hospitals industry exists in the US, Europe is dominated by government-run or regulated health care systems. Dorsey, Ferrari, Gengos, Hall, Lewis and Schetter (1996) compared the treatment of four diseases – diabetes, gallstones, breast and lung cancer – in the US, in Germany and in the UK. The US took the lead in productivity, despite spending most on health care per capita. Competition explained most of the difference. These results are supported by Duggan's (2000) study on the response of not-for-profit hospitals to increases in the number of for-profit hospitals in their local market.²¹ Interpreting the data is, however, difficult. Silverman, Skinner and Fisher (1999) have compared the medical costs of quality-adjusted health care services in for-profit and not-for-profit hospitals in the US. They find that for-profit care is significantly more expensive than not-for-profit hospital care; and the editor of the *New England Journal of Medicine* is quick to point out (p. 445) that "the competitive free market described in textbooks does not, and cannot exist in health care". This conclusion is, however, premature. The difference is not that great and could easily depend on not yet thought of measurement errors or selection biases. One such error is differences in quality provided, and these are large (see below). Another is that hospital care cost measures in Silverman et al. only cover costs per bed which is not a good measure of services provided. At least three selection biases creep into such a comparison. First, if for-profit hospitals, or doctors referring patients to for-profit hospitals, are intensive in their use of preventive care and medication, or in using high-tech treatment to keep patients out of hospitals, the for-profit hospitals would receive a disproportionately high share of difficult and costly care patients in their beds. This might still be both profitable for the for-profit hospitals and for the health care insurer and an efficient allocation of resources. Second, the introduction of competition from for-profit hospitals is likely to affect the cost performance also of not-for-profit hospitals in the area over the observation period (1989-1995) and, hence, lower costs through competition also among not-for-profit activities. In a dynamically competitive market there should be only negligible differences in costs between the two types of hospitals in the long-run. Third, as observed in a recent Swedish study, socialized health care with no or little competition among care providers in Canada, England,

²¹ Duggan uses the change in financial incentives created by California's Disproportionate Share (DS) program and concludes that the presence of for-profit hospitals raises competition through often lower prices in the area and make not-for-profit hospitals significantly more responsive to financial incentives in order not to lose patients and be hurt financially, in fact taking in more low-income patients now covered by insurance. This, however, does not appear to have lowered profitability of hospitals. Possibly, not-for-profit hospitals, by behaving "more like profit-maximizers", have been "able to offset the effects of the greater competition. One reason, Duggan suggests, may be that the not-for-profit hospitals have raised the share of physicians on their boards and lowered the share of politicians, to act more like the for-profit hospitals.

Sweden and Denmark shifts costs over to the patient in the form of long waitlists (Fölster, Kahrlström and Morin 2002). These biases have not been controlled for in the Silverman et al. study.²²

Another interesting explanation of the higher costs per bed in for-profit hospitals is that they offer a higher quality service (as judged by the patients) on average. The increasing presence of health care maintenance organizations (HMOs) has meant a parallel increase in the profit motive behind provisions of health care services. Baker and Corts (1995) found that this increase has been associated with declining premia for traditional indemnity health insurance. Similarly, Cutler and Sheiner (1997) observe that increased managed care significantly reduces hospital cost growth. Competition appears to matter for industry performance and growth, and competition is moved primarily through new entry (see Table 2). In fact, hospital competition appears to improve product quality and lower cost (Kessler and McClellan 2000). On this Heidenreich, McClellan, Frances and Baker (2001) report that managed care has significantly affected the delivery of medical care in the US partly directly and partly through "spillover effects" to fee-for-service insurance patients who reside in areas with highly managed care activity and are treated by the same providers.²³

(6.3 Supporting industries)

Pharmaceuticals are a technological input in hospital care, often substituting for hospital care. Biotechnology industry is, in turn, increasingly becoming a technology supplier to the pharmaceutical industry, as is laboratory equipment to biotechnology industry. These supporting industries are critical for the realization of a higher quality life at the later stages of the life cycle. To understand the role of biotechnology in health care provision and the

²² Here McClellan and Staiger (1999a,b) observe that on average for-profit hospitals have higher mortality among elderly patients with heart disease than not-for-profit hospitals, but that this can be explained by the fact that for-profits tend to locate in areas with higher costs and worse outcomes. Not controlling for these selection effects, an error commonly done in literature, the authors observe, makes it appear as if for-profits have higher costs. In fact, they observe, they tend to do a little better.

²³ For instance, patients with acute myocardial infarctions, controlling as well as possible for other factors, had a relatively high use in areas with high levels of managed care of β -blockers during hospitalization and at discharge, and aspirin during hospitalization and at discharge consistent with more appropriate care. On the other hand, they were less likely to receive angiography even though this result was only marginally significant. This result is, however, compatible with other findings (see e.g. Cutler and McClellan 1996) that increases in HMO market share are associated with reductions in the availability of costly medical services. This finding is also supported by Baker's (2000) study of the use of new and expensive magnetic resonance imaging equipment. On survival probability there was a small difference favoring areas with high managed care market share.

outcome in terms of improved health, all actors in the competence bloc, including the substitute customers who influence the direction of health services, have to be analyzed in one organizational context.

Pharmaceutical industry

The Swedish pharmaceutical industry was long considered much too small for a country featuring such an advanced health sector and was often referred to as an example of the bad conditions for entrepreneurs in Sweden. Since some 10-20 years the industry has expanded rapidly to become internationally large in relation to the country's GNP and the size of the health sector. This expansion, however, depends on two success stories, those of Pharmacia and Astra. The stomach ulcer drug Losec, in particular, catapulted Astra from a small pharmaceutical company to an internationally large company, and Losec for some time was the world's best selling prescription drug²⁴. The interesting problem is whether the partial withdrawal of Pharmacia and Astra Zeneca from Sweden means the end of a successful industrial development or that the release of advanced innovative competence in the local market will open up opportunities for entrepreneurship that were earlier contained within the hierarchies of the big companies. Competence bloc analysis would indicate a boom of new establishment provided a complete competence bloc is in place. The negative factor would be a reduction in competent local customership for the biotech industry. On balance, evidence so far points to a positive long-term growth outcome in the Uppsala region (Eliasson 2004a,b).

Biotechnology industry – a pure science-based industry

Biotechnology industry is the only industry of any size founded directly in academic labs (G. Eliasson – Å. Eliasson 1996, 1997; Eliasson 2000a, b). In its modern form, it is based on five

²⁴ This illustrates the critical role for growth of identifying winners and moving them on through the competence bloc to industrial scale production. Losec (Prilosec in the US) was approved in 1988 and became the world's best selling prescription drug in 1996. Considering its rocky, almost killing road to success Losec, however, hardly counts as an entrepreneurial success (G. Eliasson – Å. Eliasson 1997, p. 162). The competitor Tagamet was introduced in 1977 by Smithkline, but Tagamet was overcome in 1988 by Zantac (Glaxo) to become the world's best selling prescription drug in 1992. But things move fast. Berndt, Bui, Reiley and Urban (1994) were not even aware of the existence of the new competitor substance Losec, approved in 1988 and just about to overtake Zantac in its own market. Since the mid 1990s both Astra and Pharmacia have, however, entered the global gigantization game of Big Pharma. Astra merged in 1999 with British Zeneca and Pharmacia has gone through three mergers, with US UpJohn (1995) and again with Monsanto to emerge in 2000 under its original name Pharmacia Corp., only to be acquired by US Pfizer in July 2002.

*methodological discoveries*²⁵ in university laboratories, the invention of two of which have been awarded Nobel prizes. The methods are in turn directly based on the Watson and Crick (1953) theoretical achievement (Eliasson, Å., 2002). Practically all of this new industry has been established in the form of new firms formed around a new idea developed by a group of researchers around an "academic star" who is, as a rule, a well-known academic with many publications (Zucker – Darby 1996). During the last few years large biotech competence blocs have developed in the Uppsala and Lund/Copenhagen regions, together making Sweden one of the most advanced players in this technology. Advanced hospitals and pharmaceutical companies have been instrumental in this development as competent and interested customers.

Medical and Laboratory Equipment

Very early on Uppsala University and Pharmacia established a successful cooperation in developing *laboratory equipment* for biotech industry, notably filtering techniques that exercised a critical leverage in turning Pharmacia into a global company. Sweden also features a number of *medical equipment* establishments within the medical instrument and laboratory equipment industries that have been attracted because of the strong competence bloc in that particular area. On the medical instrument side success stories can be observed in the intersection between care and medical engineering industry, with Elekta, Gambro, Elema (the pace maker)²⁶ and Pharmacia Amersham²⁷ as outstanding examples.

Sweden also offers another attractive feature, namely a speedy and efficient drug authorization process, well organized statistical patient records for clinical research, and excellent facilities at hospitals for clinical testing. Here Sweden has a competitive advantage compared to the US, which, for instance, features an excessively cautious and slow authorization process that has for long been criticized for being welfare reducing, because the

²⁵ They are: (1) rDNA technology, (2) the use of antibodies, (3) protein engineering and (4) fermentation and volume production of biological substances. To this should be added supporting (5) filtering and selection laboratory technology. See (Eliasson, Å. 2002)

²⁶ The pace maker is now part of St Jude Medicals.

²⁷ Perbio Science – the biotech division of Perstorp- attempted in 1999? To acquire Pharmacia Biotech, to sell out its large and not very profitable instrument activity to create a global cell culture firm with Sweden as a base. It did not work out and there were no other potential mates in Sweden. In 2003 Perbio Science, now a listed company, was acquired at a high price by US Fisher Scientific. Pharmacia Biotech merged in XXXX with UK Amersham into Pharmacia Amersham, changed its name to Amersham Biosciences, only to be acquired in 2003 by US General Electric.

benefits from an earlier arrival of new substances might dominate over the risks for undesired side effects (Pelzman 1973). This supply of superior services has attracted foreign pharmaceutical companies to Sweden²⁸.)

7. Comparison of Swedish and US health industry performance

²⁸ On this Azoulay (2003) observes that “information is acquired more easily within and across firm boundaries”. Hence, “knowledge intensive projects are more likely to be assigned to internal teams, while data-intensive projects “ such as clinical testing are more likely to be outsourced. Even though the term “tacit knowledge” and Polanyi (1966) is referred to in passing and in a less relevant context, Azoulay has difficulties with the standard economic terminology which makes no distinction between knowledge and information. What Azoulay really demonstrates is that tacit knowledge is mnore easily transferred within firms than between firms but that coded knowledge or information and data-intensive activities can be monitored across firm boundaries.

Despite a dramatic reduction in resources (in percent of GNP) spent on health care, Sweden still has one of the world's most advanced health (hospital) care systems featuring a number of world known specialties. The award of the Nobel prize in medicine has made the Karolinska Institute world famous. Sweden still also features the perhaps most advanced supply of dental services in the world (Arvidsson and Jönsson 1991). As a consequence Culyer et al (1995) having studied the centralized and publicly administered Swedish system sympathetically entitled their book "Swedish Health Care – best in the world?" At the same time the presentation of US health care in Arvidsson and Jönsson (1991) focused critically on its base in individual responsibility, incomplete insurance coverage and cost inflation – the moral being that there was not much to learn for Sweden. While technology and availability of highly competent substitute customers (the hospitals) are still plentiful in Sweden, from our perspective and from there on conditions and incentives to transform the sector into a competitive industry appear missing. Health care provisions are regulated, large scale, standardized and heavily subsidized and the system discourages innovative product competition. Even though changes allowing for more variations have been instituted recently, there is not much to learn by studying differences between Swedish health care providers when it comes to critical factors in the industrialization process. The situation is not much different in the rest of Europe. In the US, on the other hand, differences in approaches are much greater making the US health care competence bloc fundamentally more innovative than the European health care systems. A much larger part of health care than in Europe, and notably in Sweden is supplied through the market. Hence, a comparison between the US and Sweden offers the needed interesting contrast, while Europeans and Swedes have little to learn by looking at each other.

7.1 Health insurance and managed care in the US – a new health care product?

Compared to Europe, the US health care market offers a great variety of services. Above all, health insurance and care often come as an integrated package. The insurer, therefore, plays a different role as substitute customer than in Europe and an active role. At one extreme some 15 percent of the US population, mostly unemployed, has no health insurance²⁹. There is a

²⁹ See Cutler and Zeckhauser 1999, p. 7 and Perry – Rosen 2001. Non-employment and self-employment are the main reasons for not being covered by health insurance. Some of the uninsured (perhaps 4 percent) have chosen not to take up an insurance they are eligible for. Hospitals are required to provide "uncompensated" care in well defined cases, notably emergency treatment. In addition to that state imposed minimum requirements of "Cadillac coverage" and health insurance in some states not only raise the cost of insurance for individuals but also make employers that would be willing to offer "bare bones" insurance abstain, and offer no insurance at all

variety of pure health insurance contracts and combinations of insurers and providers. At the other extreme insurers and providers form a single entity.³⁰ Managed care by a large number of competing *Health Maintenance Organizations* (HMOs) and *Preferred Provider Organizations* (PPOs) may be what comes closest in practice to a service defined to maintain a certain agreed upon quality of life.

The HMOs and the PPOs are the most important providers, but the more recent *Independent Practice Associations* (IPA) or *Network Model* HMOs are an innovation in that they do not employ their own physicians or run their own hospitals, but rather outcontract to local providers. PPOs consist of teams of physicians who run HMO type organizations. They are often linked to private insurance plans, and offer private family solutions. In addition, the US offers a Swedish type *medicare* program for all above 65, and a low benefit *medicaid* program for the poor. Furthermore, many people below 65 who are not *very* poor (then they are covered by medicaid) and unemployed or self-employed seem to have chosen voluntarily to be without health insurance. However, as mentioned, health care costs in the US are to some extent tax deductible. It can therefore be said that the US health care market offers a variety of customized health insurance/care solutions compared to the uniform standard offered in Sweden. The real customer (the potential patient) has a broad choice in the US compared to no choice in Sweden, and the market of combined insurance and care has all the characteristics of an innovative experimental market. HMO enrollment of all forms has increased significantly, from 8 percent of the population in 1980 to nearly half of the privately insured population today (Cutler and Zeckhauser 1999). The fact that private health insurance in the US is predominantly provided through the employment relationship and regulated at the state level (Gruber 1992) explains this variation in health care solutions, compared to the vaguely expressed standardized contracts offered by nationalized schemes in Europe. The consequences of this industry dynamics have been far reaching and forced a restructuring of the hospitals as well. Hospitals in the US have gone through a merger movement similar to that in other industries and it is still an open question if the outcome has been all that good. One problem, however, that relates directly to our definition of the health services product is that none of the HMOs take on a contracted responsibility beyond a year or so, and practically

(Gruber 1992). According to the *1991 Economic Report to the President* (p. 141) as much as one-quarter of non-insurance is due to state regulation.

³⁰ For an overview see Cutler and Zeckhauser (1999).

all are employer-funded and relate to the customer through a standard (for all, or groups of employees of the firm) benefit contract.³¹

The nature of the health insurance contract influences the demand for health services. The causal links are, however, tricky to sort out. Meer-Rosen (2003) conclude that insurance is associated with greater utilization of health services, but that this does not necessarily mean that insurance leads to better health. However, insurance coverage appears to raise the demand for preventive care procedures. The fall in health insurance coverage in the 1990s in the US can be explained by increased costs to employees (Cutler 2002). However, the often advocated solution to subsidize employer-provided health insurance premiums may not be a good solution. Gruber-Washington (2003) found that the after-tax elasticity of insurance take up³² was small and did not induce much of an additional insurance take up, but rather induced those which already were covered to select more expensive plans and thus primarily raised Government health care expenditures³³.

In general Remler-Zivin- Glied (2002) demonstrate through simulation that the consequences of policies to expand health insurance are quite complex, very sensitive to the specification of the models used and, hence difficult to predict. This “undermines effective policy making” the authors conclude.

An even more serious concern is the macro economic effects of such policies. Health insurance in the US normally comes as an ingredient and an attractive part of the job contract. From their survey of literature Gruber-Madrian (2002) conclude that health insurance is a central determinant of retirement and labor supply decisions, notably the supply decisions of secondary earners. Relate that to Prescott’s (2004) results that much of the 50 percent larger per capita labor supply in the US compared to Europe can be explained by lower taxes, and in addition, I am inclined to add overly generous social security and health insurance benefits

³¹ Tax subsidized health insurance by the employer has increased group insurance, notably among union members and employed persons (Thomasson 2000). In contrast to Sweden health care costs in the US are to some extent deductible (against income). In some cases the individual has the opportunity to buy (privately) special benefits. It is, however, very unusual and quite costly to design and pay privately for your own family health care plan. Here Gruber and Madrian (1995) found that uninsured (notably non-employed) were very sensitive to limited subsidization of the cost of insurance.

³² of such subsidies to postal employees in 1994 and to all Federal employees in 2000

³³ Analysing Canadian data Smart-Stabile (2003) conclude that Canadians who can deduct the cost of health care and health insurance from their private income have been quite responsive to changes in the tax price of health care. The delay in capturing the benefits, furthermore, does not seem to matter that much. A lowering of the tax price of healthcare, as should be expected, appears to increase spending on health care but reduce spending on health insurance. One should also expect that the incidence of employer provided health insurance will be on the employee in terms of lower wages, as econometrically documented on Japanese data in Komamura-Yamada (2004).

that reduce incentives to work. Since in the long-run those benefits are largely underfunded, and cannot be financed through higher taxes a looming potential crisis of the European welfare economies can easily be conjured up.

7.2 *The Swedish experience*

The US health care industry was the largest (as a share of GNP) in the world 1983 and has increased since then. Swedish care came in second but has dropped significantly (see Table 3). To judge from the price studies referred to, the volume (including quality) of health care services provided to US citizens has increased even more than the cost. Even though the Swedish drop may be exaggerated because of some statistical reclassifications³⁴, it is still very large. The ways Swedish health care is organized, furthermore, suggest that the quality increases benefiting US citizens may not benefit Swedish citizens, and for reasons explained below. The reduction in Swedish health care expenditures, furthermore, have all been mandated by political decisions. The public part of US health care expenditures (6.5 percent of GNP in 1997) was almost as large as public health care expenditures in Sweden the same year (7.2 percent in Table 3), and in the US both private and public health care provisions have increased as a percentage of GNP. Since GNP per capita is higher in the US than in Sweden the average Swede receives less in terms of \$ worth of public health care than the average US citizen. The above mentioned price-quality analysis gives no reason to believe that the US health care services were less efficiently delivered. On the contrary, the US citizens receive significant high quality, life quality enhancing health care that the Swedish citizens do not receive. Similarly, except for the political problem of non-insurance in the US, there is no reason to believe that *public* health care expenditures are less fairly allocated in the US than in Sweden.

The reduction in health care provisions in Sweden is unique for the wealthy industrial countries (see Table 3), but not as extreme as when compared with the US. It may very well

³⁴ Part of this lowering is said to be attributable to an increased efficiency in hospital care, but the same then has to be true for the US. Another, more unique (for Sweden) reason is a lowering of relative wages in the hospital care sector notably of high quality staff (which might signal a longer term reduction in the quality of care), and a change in statistical classification that means that part of the costs for the caring of the elderly has been taken out of the health care accounts. Finally, and most important, appears to be the reduction of public spending on health care (see Eliasson 1997b, p. 34) and a reduced capacity, resulting instead in the longer wait lists for medical service, typical of socialized health care protected from competition.

reflect the relative decrease in standard of living the Swedes have experienced since the mid-1970s, an interpretation quite in keeping with Erik Höök's (1962) above mentioned observation.

[The recent privatization of care, notably in emergency care, and the opening up of the market for some competition (see, for instance, Öhrming and Sverke 2001) has stirred the political debate but has also revealed the same kind of benefits and problems that have long been observed, discussed and researched in the US. Privatization of some hospitals and homes for the elderly has loosened up regulations somewhat. Since the mid-1980s increased freedom to organize the production of health services has been given to the country council districts, but in health insurance standard national principles apply. The public hospitals cannot generally provide privately paid for treatment. A few private hospitals can receive privately paying patients but if they want something beyond standard treatment or faster service it is not covered by the national-public insurance. They have to pay the whole cost, not only the extra cost. Hence, such extra service in practice is only available to the very rich or to top executives whose companies value their health so high that they pay. Hence, incentives to provide new innovative health services are missing. Incentives in Swedish health care stimulate process cost reductions for given health care products. Such reductions are achieved through standardization, rationalization and economies of scale in larger production units and faster flows.]

8. Transforming public Swedish Health service into an internationally competitive industry

The base problems of this essay have been industrial, or how to transform a publicly provided non-market service into a market based industry. We have observed that the three most pronounced changes in health care markets are (a) a dramatic increase in the share of the elderly (65+) in the population of the rich industrial nations, (b) a widening of income and wealth distributions and (c) that the biotechnology revolution will make dramatic quality of life improvements possible, quite possibly even at the expense of further extensions of life, the latter being the major achievement of health care in the 20th century. The consequence will be a corresponding surge in demand. Innovative product development and

entrepreneurship will, therefore, characterize a successful, transforming and developing health industry.

Transferring the Swedish health care public service sector into an internationally competitive industry involves reorganizing the entire production system in Figure 1, not only parts of it, into a market based industry. This notably involves the health insurance and care sectors. Insurers and care providers act as sophisticated and competent customers and are critical for the transformation process, even though the diminishing resource inputs in recent years have influenced that position negatively compared to the rest of the industrial world. On the state of Swedish health industry we have observed six things. *First*, adjusted for size Sweden appears to occupy a technologically leading position in Europe when it comes to all the technologies needed (Figure 1) to make up a complete health industry. That technological leadership originates in a lucky combination of industrial and medical technology, but above all in early and generous spending on medical services and the development of a base of sophisticated customers (“the hospitals”). As resources devoted to medical service provision have been reduced and ideological fundamentalism characterized the organization of health care this leadership position is, however, being gradually compromised. *Second*, Sweden suffers from the “European problem” in two ways. The substitute customership imposed through socialized health insurance and regulation has created a “market” environment that discourages entrepreneurship based on innovative product development. *Third*, socialization of the care sector has meant centralization and the development of large-scale standardized care which runs counter to the personalised services research indicates will be a reality in the future. *Fourth*, Sweden lacks the downstream (in the competence bloc) competence, notably venture capital competence needed to commercialize the technology. Hence, both the *incentives* and the competencies needed to exploit the opportunities industrially, notably through new firm entry, are lacking and potential commercial winners tend to be locked up as “technologies” or relocated abroad. *Fifth*, health care is generally thought of as a regulated public service or responsibility, and rarely as a market based industry. Innovative advanced provisions of medical service to an exclusive group of customers willing to pay, being instrumental for the development of advanced product technology elsewhere is effectively blocked through socialist insurance and regulation. *Sixth*, and finally, you are not supposed to earn money on the caring for the sick, and law, regulations and medical practice have seen to it that it is difficult to become rich in an extremely conservative care business in Europe.

In conclusion then, even though Swedes have the necessary upstream requisites of sophisticated technology and advanced customers it lacks the downstream commercial and industrial competence to turn the upstream advantages into an internationally competitive industry. And time is running out. The reduced spending on health care in Sweden will soon cut the current advantage in technology and competent customers and technology will be economically induced to reallocate abroad.

[These problems Sweden, however, shares with the other European countries, all lagging behind the US which is unique when it comes to allowing its health care to function as a market based industry. Europe has political difficulties recognizing health care as a potential industry characterized by innovative product development that may become both more efficient and profitable when reorganized in dynamically competitive markets. If European countries do not act rationally on the facts of increasingly costly health care sectors, facing increasing demands from an aging society they will certainly encounter a devastating fiscal crunch.]

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Table 1. Actors in the competence bloc

1. Competent and active *customers*
2. *Innovators* who integrate technologies in new ways
3. *Entrepreneurs* who identify profitable innovations
4. *Competent venture capitalists* who recognize and finance the entrepreneurs
5. *Exit markets* that facilitate ownership change
6. *Industrialists* who take successful innovations to industrial scale production

Source: G. Eliasson - Å. Eliasson, 1996. The Biotechnological Competence Bloc, *Revue d'Economie Industrielle*, 78-4⁰, Trimestre

Table 2. The four mechanisms of Schumpeterian creative destruction and economic growth

1. Innovative entry
enforces (through competition)
 2. Reorganization
 3. Rationalization
- or
4. Exit (shut down)

Source: "Företagens, institutionernas och marknadernas roll i Sverige", Appendix 6 in A. Lindbeck (ed.), *Nya villkor för ekonomi och politik* /SOU 1993:16) and G. Eliasson (1996a, p. 45, 2001a).

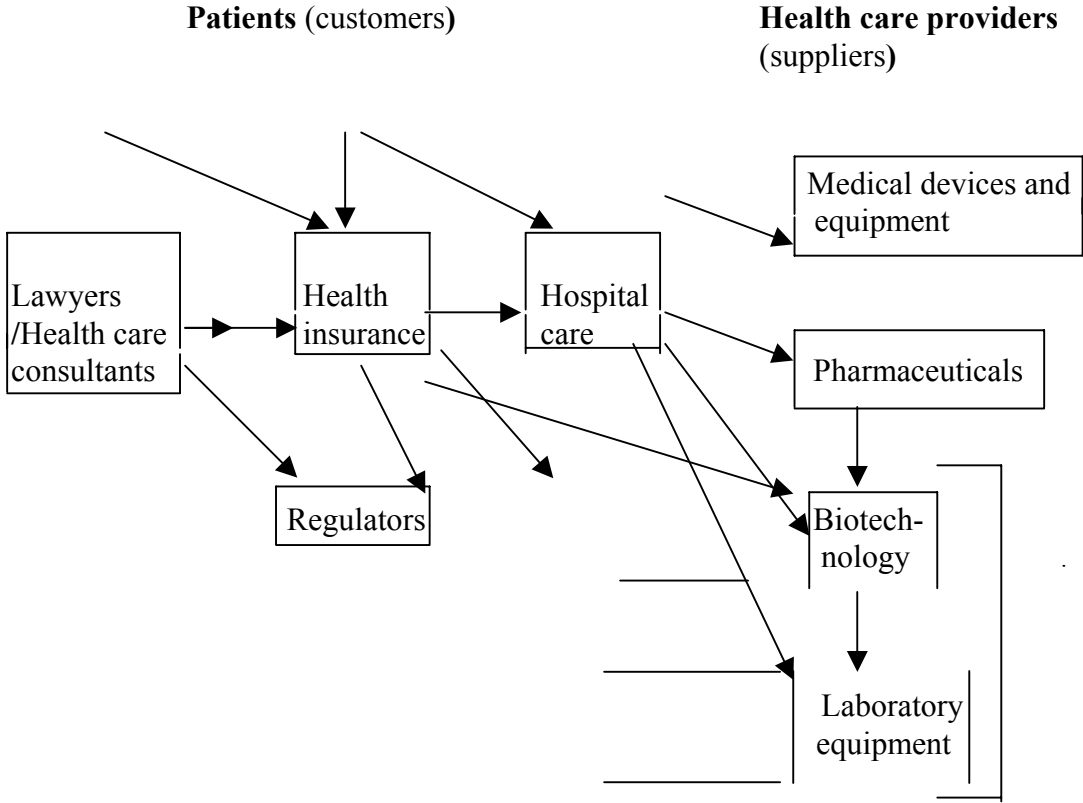
Table 3. Health care costs as a share of GNP 1983, 1993 and 1996

Country	1997			1993		1983
	Total Expenditures % of GNP	Public Expenditures % of GNP	expenditures % of GNP	Public expenditures % of GNP	Total expenditures % of GNP	Public expenditures % of GNP
USA	13.9	6.5	14.2	6.1	10.4	4.3
Canada	9.2	6.4	10.1	7.3	8.4	6.5
Germany	10.7	8.3	9.9	7.7	8.5	7.0
The Netherlands	8.5	6.2	9.0	7.0	8.3	6.2
Finland	7.4	5.7	8.5	6.5	6.9	5.5
Australia	8.4	5.6	8.4	5.7	7.6	4.9
Island	7.9	6.7	8.3	6.9	7.3	6.5
Sweden	8.6	7.2	8.9	7.7	9.5	8.7
Ireland	6.3	4.9	7.4	5.5	8.2	6.4
Portugal	7.9	4.7	7.5	4.7	5.8	3.0
UK	6.8	5.8	6.9	5.8	6.0	5.2
Turkey	4.0	2.9	3.7	2.5	3.0	n/a

Källa:

Health Data 99.

Figure 1. The Health Care Industry



Source: G. Eliasson 1997c. *Hälsa och sjukvårdsindustrin – ett kompetensblock med stor affärspotential*. TRITA-IEO R 1997-0