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Liberalization of health services in Europe – Who benefits from cross-border care?

Vera Dietrich

November 1999

Abstract

Traditionally, health care systems in the EU had been excluded from intra-European competition. The paper analyses the economic impact of a leading decision of the European Court of Justice which recently applied the principle of free movement to the health care sector. Depending on interregional differences in the price and quality of health services, patients will now be able to choose between European health care providers. Since in all EU-memberstates prices and qualities are strongly determined by regulations, patients "voting by feet" will induce endogenous pressure on the current institutional design in the health care sector, in particular the financing schemes. The paper examines the effects of liberalization under the current regulatory framework. Comparing welfare before and after liberalization, in a model it is shown that deregulation will not only yield welfare gains for low-quality regions but might also improve welfare in EU-memberstates which are subsidizing health services in order to guarantee a high quality of medical treatment. Net welfare gains from subsidization, however, proove to be sensible to the extent domestic health care facilities are used by foreign patients. Therefore, since patient migration cannot be controlled after full liberalization, high-quality EU-memberstates cannot be expected to support a complete liberalization.

JEL classification: L5, I11
Keywords: European Integration, Health Services, Regulation, Competition

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1. Introduction

Economic integration in Europe is creating new problems for social security systems. Until recently the national health care systems in the European Union had been widely excluded from liberalization and intra-European competition. Patients were restricted to domestic providers of health care. This ruling was changed last year by a leading decision of the European Court of Justice (ECJ) who applied the principle of free movement to the health care sector. Depending on their mobility and preferences, individuals will now be able to choose between European providers of health services. Since the prices and the quality of health services in the EU-memberstates are strongly determined by regulations, patients „voting by feet" will induce regulatory competition among heterogenous European health care systems, generating endogenous pressure on the institutional design, in particular the financing schemes of health services.

The implications of the verdict are currently subject to negotiations among European memberstates. At the last EU-council meeting of European Ministers for Health in June 1999, the council adressed the tension between the rules of the internal market and the organisation and delivery of health services in the memberstates.[1] Most governments still seem to be reluctant to the ECJ´s decision, arguing it endangers the stability of national health care systems. This attitude partly reflects the concern of loosing control in a policy field which represents important socio-economic goals, as national health care systems cleary reflect heterogeneous social values and historically rooted traditions. Even more relevant might be the fact that still very little is known about the economic consequences of implementing free movement to the European health care sector. This can be attributed to shortcomings in research. Research in health economics has been more concerned with the question how to enforce competition *within* a given health care system than analyzing the impact of competition *among* heterogeneous national systems.

The existing literature in health economics provides some insight in the determinants of consumers´ choice regarding health services, indicating that patients´ incentives to seek care abroad depend on their perception of interregional quality differences, on the individual expenses which have to be borne for medical treatment, and on transaction costs.[2]

Recent work on the field of cross-border care in Europe has focused on the determinants of patient migration and the extent and nature of cross-border transactions in the past. These cases took place on the grounds of very limited exemptions from current regulations, allowing the use of health care facilities abroad in the cases of migrant workers, temporary stays and after pre-authorization of the domestic health insurer. Crivelli and Zweifel (1996) try to explain patients demand for foreign care, employing a

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1 Resolution of the Health Council meeting, Luxemburg, 8.6.1999.

2 See Burns, L. (1992); Crivelli, L; Zweifel, P. (1996); France, G. (1997); Garnick, D.W.; et al. (1989), Luft, H.S.; et al. (1990); Manning, W.G.; et al. (1987); Werden, G. (1990).

conditional choice model and testing results against empirical data concerning applications for pre-authorization in different European countries. France (1997) investigates the determinants of patient mobility from a microeconomic perspective. Hermesse et al. (1997) assess the relevance of cross-border care and the volume of interregional financial flows among social security systems due to cross-border care. Various empirical studies investigate the attitude of patients towards using health care facilities abroad [Starmans et al. (1997); Calnan et al. (1997)] or investigate intra-national mobility of patients in order to draw more general conclusions with respect to the European Union [Crivelli (1998); Kyriopoulus et al. (1998)]. Generally, due to a lack of EU-wide micro data, empirical literature concentrates on border regions and country case studies. However, theoretical and empirical research in the field of cross-border care still seems to be quite in its beginnings, particulary with respect to the economic impact for the EU-memberstates after full liberalization.[3]

The aim of this paper is therefore to investigate the welfare effects of the ECJ decision under the assumption that the current financing scheme for cross-border care in Europe is maintained. Special attention is drawn on the impact of interregional quality differences and the effects of subsidization in the health care sector. Patient mobility - as the driving force behind the competition process - is determined by transaction costs and interregional differences in prices and the quality of health care services. According to the results of the simulations liberalization will stnot only yield welfare gains for low-quality regions but might also improve welfare in EU-memberstates which subsidize health services in order to guarantee a high quality of medical treatment. Net welfare gains from subsidization, however, proove to be rather sensible to the extent domestic health care facilities are used by foreign patients. Therefore, since interregional patient migration cannot be controlled after full liberalization, high-quality EU-memberstates cannot be expected to support a complete liberalization.

Section 2 summerizes the basic facts about the current regulatory framework and the financial settlements regarding the consumption of foreign health care services in the European Union. Section 3 examines the determinants of patient mobility and the impact on allocation and financial flows in the European health care sector. In section 4 a model, allowing for different qualities of health services, is introduced to analyze the impact of cross-border care on welfare. Conclusions are drawn in section 5.

2. The legal framework for cross-border care in the European Union

The verdict of the ECJ implies a fundamental change in the organization of health care markets in the European Union. Traditionally, the national health care systems in the

[3] The economic impact of introducing freedom of choice to the European health services sector, in particular with respect to EU-enlargement, is subject of a current research project at the Institute for Economic Research Halle (IWH).

EU had been widely excluded from the basic principles of European Integration, the free movement of labour, capital, goods and services. This is due to the fact that member states insisted on having control on domestic health care provision, the design of health insurances and benefit schemes and the financial impact of health protection. As a result health care systems in Europe differ extremely with respect to insurance schemes, benefit packages, co-payments, the proportion of public and private provision of health care services and the prices and quality of health goods and services.[4]

In order to ensure subsidiarity in the field of health policy the so-called „Principle of Territoriality" was applied to the health care sector. As a general rule it says that European citizens are restricted to domestic providers of health goods and services and that they are solely entitled to the benefit packages emumerated by the domestic health insurance system.[5] There are only very limited exemptions from this ruling in order to guarantee the mobility of labour in the Single Market. These exemptions are specified in EU-coordination rules.[6] According to EU-regulation health care coverage in a non-resident EU-memberstate is only given either in the case of migrant workers or, during temporary stays (i.e. tourists, professionals) if immediate care is necessary or, after a pre-authorization by the domestic health insurer. The aim of the latter is to overcome structural gaps and capacity problems of domestic health care providers, especially in border regions.

The nature of the medical treatment which can be obtained abroad and the billing rules in cases of cross-border are also subject to European law.[7] These regulations can be considered to be very important with respect to the microeconomic and macroeconomic effects of introducing freedom of choice in the health services sector. Essentially, there are two rules which influence patients´ incentives to seek care abroad. Firstly, the costs of health care provided abroad have to be borne by the social security system of the treated person.[8] Secondly, the medical treatment follows the rules of the providing state: patients receive the benefits which are enumerated by the health care system of the host country and they are obliged to co-payments according to the rules of the providing health care system.

As empirical evidence shows, due to the Principle of Territoriality and the restrictive use of pre-authorization by national insurer, cross-border care has been of minor importance in the past. The use of medical facilities abroad has been institutionalized

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4 See for example van Kalisch, D.W.; Aman, T.; Buchele, L. (1998), OECD (1998), van Kemenade, Y.W. (1997).

5 Privately funded health insurances do allow medical treatment abroad but still play a minor role in Europe.

6 Regulations 1408/71 and 574/72.

7 These EU-regulations are added by bilalateral agreements of the memberstates.

8 Generally, full cost claiming is applied by the providing state, but in some cases (i.e.pensioners) flat rate claims are applied (Hermesse, J.; Lewalle, H.; Palm, W., 1997, 6). Member states can also alter the rules of billing by bilateral agreement. Some member states agreed on waiving their claims.

mainly by two countries, Italy and Luxembourg.[9] Luxembourg as a small country relies to some extent upon health care services across the border. In Italy, dissatisfaction with the quality of medical treatment with regard to serious diseases seems to be responsible for the relatively high importance of cross-border care.[10] But, all in all, the financial transfers from cross-border care amounted only to 1,1 billion ECU in 1993 which represents about 0.25 % in terms of total EU health care expenditure.[11]

This situation can be expected to change significantly in the future, as the ECJ´s verdict might imply a general entitlement for EU-citizens to medical treatment across the whole territory of the European Union.[12] The health insurance associations of two Luxembourg citizens who had purchased medical goods and services in Germany refused reimbursement, arguing they had not submitted themselves to the pre-authorization procedure before going abroad. The insured claimed their right of free movement was affected, which is guaranteed by the European Treaties. The court in Luxembourg referred the case to the ECJ for a preliminary interpretation of Community law. The ECJ emphazised free movement as the fundamental principle of the Single Market, at the same time denying the relevance of the Articles 36 and 66 of the European Treaties, which enable memberstates to restrict free movement of goods and services in order to protect public health.

European governments and health-institutions might be so alert about the ECJ-decision because it explicitely referred to pre-authorized care, wich counts responsible for the financial core of cross-border care: 60% of claims were related to the rather costly pre-authorized (hospital) care.[13] There is also some evidence that the allocation of cases treated abroad seem to follow medical knowledge and biomedical know-how, meaning some countries absorb patients with particular (serious) diseases.[14] Memberstates claimed that the judgement endangers the financial stability of health care systems and restricts their ability to plan capacities. This would give rise to inefficiencies in the health care sector. The ECJ generally accepted the argument of efficiency problems in the in-patient sector but rejected it for the amulant care. However, it seems likely that this will not protect the hospital sector from cross-border mobility.[15] Therefore, the economic impact of the ECJ´s decision is of major importance for the member states.

9 Hermesse, J.; Lewalle, H.; Palm, W. (1997), 7pp.

10 France, G. (1997), 23.

11 Crivelli, L; Zweifel, P. (1996), 377.

12 Cases C-120/95 and C-158/96.

13 Hermesse, J.; Lewalle, H.; Palm, W. (1997), 7.

14 Kyripoulos, J.; Gitona, M. (1998), 313.

15 Wismar, M.; Busse, R. (1998), 14.

3. The impact of patient mobility on allocation and financial flows in the European health care sector

Although beeing extremely heterogeneous, in all European health care systems the prices and the quality of medical treatment are more or less regulated. Depending on the properties of medical services, introducing freedom of choice will induce changing patterns of consumption, reallocation of resources in the health care sector and alter financial flows among the European social security systems. This will finally generate endogenous pressure on the regulatory design of the national health care systems. The effects on overall welfare can be expected to depend firstly on the patients´ motivation to migrate and, secondly, on the financing schemes.

3.1 Determinants of patients´ mobility

From a microeconomic perspective, the allocative effects depend on the degree of patients´ mobility. Hence, the crucial question is which the variables are, that determine patients´ incentives to move. The existing literature in health economics indicates that consumers´ choice of health services is strongly influenced by three variables: individual expenses that have to borne by the patients, differences in the quality of medical treatment, and transaction costs.[16] Their relevance for our problem shall be briefly discussed.

To analyze the influence of individual expenses on EU-citizens´ incentives to use health care facilities abroad it is important to keep in mind that, under the current regulation, the costs for medical treatment have to be borne by the domestic health insurance. Patients only have to cover potential co-payments in the host country. Therefore, the individual insurance tarif represents an exogenous variable with respect to the patients´ decision to seek care abroad. Instead, foreign cost-sharing rules should be taken into account.

Public authorities do not only determine the fees but also the quality of domestic health services. In all EU-memberstates regulations impose quality standards and give binding recommendations regarding the benefits which are covered by the national health service or health insurance. The quality of services is also influenced by educational and training standards for the workforce and regulations concerning the diffusion of high-cost medical devices.

The third variable which can be considered to influence patients´ willingness to seek foreign medical treatment, but is not influenced by regulations, are transaction costs.[17]

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[16] See Burns, L. (1992); Crivelli, L. (1998); Crivelli, L; Zweifel, P. (1996); France, G. (1997); Garnick, D.W.; et al. (1989), Luft, H.S.; et al. (1990); Manning, W.G.; et al. (1987), Werden, G.J. (1989). According to the literature, physicians incentives to provide care to migrating patients can also be expected to relate to billing rules (Ellis, R.P.; Mc Guire; T.G. (1986); Reinhardt, U. (1987)). Since supplier behaviour is of minor relevance under the current regulatory framework for cross-border care, this aspect is neglected.

[17] See France, 1997.

If patients, following the ECJ´s verdict, will be allowed to choose among different European providers, they have to spend information costs in order to compare the quality of medical treatment, as well as the benefit-schemes and co-payments in different health insurance systems. The transaction costs will also include travel costs. Since information cost can be assumed to decrease by linguistic and ethnic homogeneity, both information and travel cost should be related to distance. Hence, it can be assumed that especially EU-neighbourstates with large differences regarding the benefits and the co-payments of health services are likely to be concerned about and to have to deal with patient migration.

3.2 The influence of financing schemes

On the macroeconomic level the existing financing schemes for health services represent a focal point with respect to the economic impact of cross-border care. In particular, two aspects have to be considered for analysis: Firstly, public subsidizing of health care capacities will create externalities among the memberstates. Secondly, incentives resulting from the current regulations regarding cross-border care can be expected to induce patient migration and alter financial flows among European social security systems. This will lead to distributive externalities in the national social security systems.

Though differing in extent and nature, the provision of health services is subsidized in all European countries. In some countries, like Great Britain, a tax financed public health service provides medical treatment. In other EU-memberstates the state takes financial responsibility for investment in the hospital sector (Germany) or gives financial support through grants to public health insurances (Belgium). From an allocative perspective these subsidies can partly be justified with market failure arising in the health care market. Even more relevant for governments and health-institutions are certainly distributive and socio-political goals, in particular to ensure universal access to medical treatment for the whole population, independently of the individual income. The proportion of public spending in the health care sector varies considerably among the EU-memberstates[18] and might be interpreted as reflecting social preferences for a public good „health care“.Yet, the question arises how European governments will handle liberalization under these circumstances.

Subsidizing the provision of health services implies that prices do not reflect real costs. It is obvious that cross-border care will lead to externalities among the EU-memberstates as the health insurances of migrating patients will profit from subsidized services which are financed by the providing state. Therefore, under the current financing scheme, governments or health institutions in EU-memberstates with low spending in health care might have an incentive to support the use of health care facilities abroad by their citizens. At the same time, European countries which subsidize

[18] See OECD (1998).

the provision of health care in order to guarantee a high quality of medical treatment might reject the use of domestic capacities by non-residents.

The second important aspect with regard to financial settlements, which generates externalities, are the effects on the social security system in the home country of migrating patients. According to the current billing rules the costs have to be borne by the domestic health institution and the patients will not take these costs into account. What will be the impact on the domestic health care system? It can be assumed that high quality treatment - especially in the hospital sector – relies on a costly high-tech endowment and is positively correlated with high fees. Furthermore, it can be expected that first of all patients with serious diseases will be attracted by foreign high-quality treatment. Therefore, the social security systems of low-quality states can be expected to face a substantial increase in costs. Sooner or later these additional costs will lead to rising insurance tariffs or taxes in the home country of migrating patients. Given a non-proportional distribution of the benefits from cross-border care (because not all individuals will take advantage of it) this will create negative externalities among the insured in the domestic social security system.

The results from analysis at this point can be summarized as follows: Patients´ mobility after introducing freedom of choice can be expected to depend on total individual costs (including co-payments and transaction costs) and on differences in the quality of the health services. The current financing scheme of cross-border care creates negative externalities in a twofold way. Firstly, subsidizing health care facilities leads to negative externalities in the providing country because residents have to finance subsidized services which are consumed by non-residents. Secondly, distributional externalities arise in the home country of the migrating patients, if only a part of the population takes advantage of foreign care, but costs have to be borne by all individuals. In terms of making the model managable, the distributional aspects shall be ignored in the following welfare analysis; instead it is assumed that migrating patients have to bear all costs of the received medical treatment.

4. The welfare effects of cross-border care: A simple model

4.1 The model

The model analyzes the welfare effects of cross-border care in a two country case with different quality levels in medical services. The aim is to investigate the externalities which arise if a high-quality country subsidizes health services which are also consumed by migrating patients from a low-quality country.

Crucial questions regarding the deregulation of health care in Europe are firstly wether introducing freedom of choice under the current regulatory framework will improve welfare and, secondly, which countries will finally benefit from cross-border care. In particular, the outcome of negotiations at the EU-level concerning future deregulation in

the health care sector will depend considerably on the expectations of the memberstates about the distribution of welfare among low-quality and high-quality regions. Especially high-income EU-memberstates which subsidize health services in order to guarantee a high level of quality might be rejecting the use of domestic health capacities by foreigners.

In the model, country 1 (2) offers a high-quality (low-quality) service. In both countries, medical treatment is provided by an organization which can be interpreted as a public health service. Before free movement is introduced to the health care sector the situation is regarded as two national monopolies, since consumers can only purchase health services which are offered by the domestic provider.[19] Introducing free movement leads to duopolistic competition in a Cournot setting.[20] That means, providers of health services will compete in quantities, both assuming that the output of the foreign supplier will remain the same in each market. For simplicity, fixed costs are sunk and marginal costs are normalized to zero. The model may not perfectly suit the stylized facts in health service provision in general, but will help to understand the effects at work.

In both countries, individuals derive utility from the consumption of health services (x, y) and other goods which are represented by a numéraire *z*. The utility function is additive and separable in the consumption of health care and the numéraire *z* and can be written as[21]:

[1] $U(x,y,z) = U(x,y) + U(z)$

[2] $U(z) = z$

[3] $U(x,y) = ax - 0{,}5x^2 + y - 0{,}5y^2 - bxy$ a >1, b = 1

where z is the numéraire, x is the high quality service provided by country 1, y the low quality service of country 2, and a is a positive coefficient for quality. Assume b = 1 for perfect substitutes.

An asymmetric structure is introduced to the model in order to compute the incentive structures resulting from current regulations which were described in the previous section: once free consumer choice is given, it is assumed that only patients of the low-quality region will switch to the foreign provider because they will profit from

[19] As monopoly represents a clearly unefficient way to provide goods – even if producer rents are redistributed - the welfare effects of liberalization tend to be overestimated in the model. But, for our purpose and taking into account the inefficiencies which are stated for most of the health care systems, this setting is considered to be more realistic than the assumption of a welfare maximizing planner.

[20] The basic structure of the model follows a work by Brander, J.A. (1981), in which the effects of intra-industry trade are analyzed in a Cournot setting.

[21] This assumption implies that income effects are zero, which can be justified if only a small fraction of the income is spent on health care. This is the case for cross-border care since under the current regulation patients only have to pay for the co-payments.

subsidized high-quality services whereas inhabitants of the high-quality region do not have an incentive to move.

Therefore, consumers´ benefits depend on the market structure, as shown in the scheme below: Before deregulation, patients in both countries can only obtain medical treatment by the domestic provider which means the utility functions only contains the domestic service (x = 0 for residents of country 2, and vice versa). After deregulation, patients of the low-quality region may also benefit from consumption of the foreign service.

	High-quality country 1	**Low-quality country 2**
Monopoly	$y = 0 \Rightarrow$ I $U_1(x,z) = ax - 0{,}5x^2 + z$	$x = 0 \Rightarrow$ II $U_1(y,z) = y - 0{,}5y^2 + z$
Duopoly	$y = 0 \Rightarrow$ III $U_1(x,z) = ax - 0{,}5x^2 + z$	$U_2(x,y,z) = ax - 0{,}5x^2 + y - 0{,}5y^2 - bxy + z$ IV

The properties of the employed utility function shall be discussed briefly. Marginal benefits from health care are positive and decreasing with rising quantities until the total benefit function reaches its maximum. After that point total benefits will fall because, in contradiction to other goods, the consumption of medical treatment does not spend utility itself. Instead, benefits depend on the health status. Hence, the consumption of additional services (i.e. X-rays, heart surgeries) exceeding the optimal level of treatment can be expected to reduce total benefits for the patients.[22]

The financing scheme of health services is modeled as follows: In both countries, the price *p* of health services is subsidized by the amount *s* per unit. Subsidies are financed by taxes. Excluding deficit-spending, subsidies have to equal tax revenues in each sector (country). Since the introduction of taxes and subsidies to an equilibrium generally leads to allocative distortions the problem arises, how to isolate those welfare effects from the externalities which emerge specifically from migrating patients. This problem is solved in the model by postulating that taxes are also levied on a per unit basis on the price of health services. The result is that in the case of non-tradable services (cases I – III) a given per unit subsidy rate $s = sx/x$ corresponds with an identical tax rate $t = tx/x$; so $(p - s + t)$ equals p and the net effect on the price and demand of health services is zero. This is not the case in the tradebles sector (the high-quality service x after deregulation) as a rising consumption of the subsidized high-quality service by foreigners will enlarge the tax burden of the population of country 1. Hence, the tax will exceed the subsidy ($t - s > 0$) and this in turn will increase the price of health services. An interesting question to be examined is wether this potentially negative impact on welfare in country

[22] A hyperbolic utility function describing patient´s benefits from hospital services was introduced by Ellis, R.P.; McGuire, T.G. (1986).

1 is offset by an increasing production, since subsidizing the domestic service has the same effect as an export subsidy.

Consumers maximze utility, given the general budget constraint $M = p_x x + p_y y + p_z z$ (in monopoly $p_y y = 0$ for inhabitants of country 1, and vice versa).[23] After deregulation the expenses for the high-quality service will be altered for residents of country 1 and 2 in a different way:

– Migrating patients from the low-quality country 2 will have to bear transaction costs *k*, arising from information and travel costs. Therefore, transaction costs will increase the price of the foreign service. At the same time these patients profit from the fact that health services are subsidized by the amount *s* per unit in the high-quality country 1.
– For inhabitants of the high-quality region the price of domestic health services will rise because migrating patients will enhance aggregate demand for domestic services, increase in value the subsidies and therefore the tax burden *t*.

In the following, the equilibria before and after liberalization are determined first. After this the welfare effects resulting from cross-border care under the current regulatory regime are investigated.

4.2 Equilibrium before liberalization (Monopoly)

Before liberalization consumers are solely entitled to medical treatment which is provided by the domestic health organization. Maximization of the utitlity functions under the budget constraint leads to the inverse demand functions px in country 1 and py in country 2[24]:

[4] $$p_x(x) = a - x$$

[5] $$p_y(y) = 1 - y$$

Profit function of providers of health services are:

[6] $$\pi_x(x) = (a - x)x$$

[7] $$\pi_y(y) = (1 - y)y$$

Deriving the first order conditions $\frac{\partial \pi_x(x)}{\partial x} = \frac{\partial \pi_y(y)}{\partial y} = 0$ and solving the model leads to a symmetric solution ($x^* = \frac{a}{2}, y^* = \frac{1}{2}, p_x^* = \frac{a}{2}, p_y^* = \frac{1}{2}$). Equilibrium sales and prices in country 1 are positively correlated to the quality level *a*.

[23] See Appendix.

[24] For derivation of demand functions see Appendix A.

Overall (European) welfare in monopoly (W^m) is defined as the sum of consumer and producer surplus in country 1 and country 2:

[8] $$W^m = \int_0^{x^*} p_x(x)dx - p_x^* x^* + \pi_x(x^*) + \int_0^{y^*} p_y(y)dy - p_y^* y^* + \pi_y(y^*)$$

In monopoly, the level of European welfare W^m depends only on the quality a of health services in country 1:

[9] $$W^m(a) = \frac{1}{8}(3a^2 + 3)$$

4.3 Equilibrium with cross-border care (Duopoly)

Introducing free movement to the model will only induce changing patterns of demand by the residents of country 2 because, due to the current EU-regulation, inhabitants of European high-quality countries do not have an incentive to go abroad. Therefore, in the model it is assumed that residents of the high-quality country 1 will only purchase services in their home country.

In duopoly, the inverse demand functions derived from equations [1] - [3] under the budget constraint are[25]:

[10] $$p_x(x,y) = a + s - \tfrac{1}{2}(t + k + x_1 + x_2 + y)$$

[11] $$p_y(x,y) = 1 - y - x_2$$

Due to b = 1 in equation [3], each unit of x_2 consumed by patients of country 2 will exactly reduce demand for the domestic service y by one unit. Demand for x is positively related to quality a and subsidies s, and negatively to transaction costs k, which have to be borne by consumers from country 2, as well as to the tax, which has to be financed by residents of country 1. This is because growing aggregate demand for x increases the net price inhabitants of country 1 have to pay for health services.

Profit functions of the health care suppliers in each country are:

[12] $$\pi_x(x,y) = \left[a + s - \tfrac{1}{2}(t + k + x_1 + x_2 + y)\right] \cdot (x_1 + x_2) \quad \wedge x_1 + x_2 = x$$

[13] $$\pi_y(x,y) = \left[1 - y - x_2\right] \cdot y$$

The first order conditions $\frac{\partial \pi_x(x,y)}{\partial x_1} = \frac{\partial \pi_x(x,y)}{\partial x_2} = \frac{\partial \pi_y(x,y)}{\partial y} = 0$ maximize profits.

Equilibrium output and prices are[26]:

[25] For derivation of demand functions see Appendix B.

[26] The second order condition for a global maximum is fulfilled since the profit functions are continuous and strictly concave.

[14] $x_1^* = \frac{1}{5}(1 + 2a + 2k + 2s - 4t)$

[15] $x_2^* = \frac{1}{5}(-3 + 4a - 6k + 4s + 2t)$

[16] $y^* = \frac{1}{5}(4 - 2a + 3k - 2s - t)$

[17] $p_x^* = \frac{1}{5}(-1 + 3a - 2k + 3s - t)$

[18] $p_y^* = \frac{1}{5}(4 - 2a + 3k - 2s - t)$

where x_1^* (x_2^*) is the quantiy of the high-quality service which is consumed by the patients of country 1 (2), and $x^* = x_1^* + x_2^*$.

A higher quality of health services in country 1 induces substitution of *y*, leading to increased sales of x_2. At the same time, this raises the tax burden of the residents in country 1 and reduces demand for x_1. Nevertheless, in terms of aggregate sales

[19] $x^* = x_1^* + x_2^* = \frac{1}{5}(-2 + 6a - 4k + 6s - 2t)$

the positive influence of quality and subsidies clearly outweights the negative effect of taxation.

Transaction costs *k* have a negative impact on the consumption of the high-quality health service by residents of country 2. For a given quality *a* and subsidy *s*, distance and information asymmetries can therefore be expected to create a clear barrier to the migration of patients. For clearer results of welfare analysis, transaction costs shall be ignored in the following.

4.4 Welfare Effects

The welfare effects of liberalization represent a focal point regarding current negotiations among the EU-memberstates and future deregulation in the European health care sector. One would intuitively expect efficiency gains from an intensified competition. Still, it remains open how these welfare gains will be distributed, how they are influenced by interregional quality differentials, and wether subsidizing high-quality regions will be worse off or might even gain from liberalization since subsidizing a tradeable service might to some degree work as an export subsidy.

Therefore, the investigation of welfare effects from liberalization shall focus on two aspects:

1. The comparison of overall (European) welfare before and after liberalization depending on the level of subsidization in the high-quality country 1, and
2. The assessment of welfare in the high-quality country 1 after liberalization, comparing the situation with and without subsidization of health services.

Hence, in both cases *a* and *s* are the independent variables and welfare is the dependent variable.

Overall welfare

Analogously to equation [8] welfare in duopoly (W^d) is defined as the sum of consumer and producer surplus in both countries:

$$[20] \quad W^d = \int_0^{x^*} p_x(x,y)dx - p_x^* x^* + \pi_x(x^*) + \int_0^{y^*} p_y(x,y)dy - p_y^* y^* + \pi_y(y^*) .$$

Unlike the case of monopoly (see [9]), W^d not only depends on the quality parameter *a*, but also on subsidies *s* and taxes *t*, so $W^d = W^d(a,s,t)$.[27]

At the same time, *s* and *t* are corresponding variables (s is a function of t and vice versa). Therefore, the model has to be closed by implementing the macroeconomic budget constraint of country 1

$$[21] \quad t = \frac{s(x_1 + x_2)}{x_1}$$

Inserting the equilibrium output x_1^*, x_2^* from equations [13] and [14] into [21] leads to the equilibrium tax rate t*

$$[22] \quad t^* = \frac{1}{8}\left(1 + 2a + 4s - \sqrt{(-1 - 2a - 4s)^2 - 16s(-2 + 6a + 6s)}\right)$$

which fulfills the macroeconomic budget constraint for all given values of a and s.[28]

The welfare function $W^d(a,s)$ which can now be calculated from [20] by substituting t describes overall welfare after introducing competition to the health care sector. It depends on quality differentials between country 1 and 2, and the level of subsidization in country 1. To investigate the welfare gains from deregulation, a welfare function $W^{net}(a,s) = W^d(a,s) - W^m(a)$ is defined, where $W^m(a)$ describes overall welfare before liberalization (see [8]).

Results show, that – independently of the quality level in country 1 – welfare gains from liberalization are always positive, given a realistic value of the subsidy rate. This can be attributed to efficiency gains from competition, an increased production in country 1 and the fact that residents of country 2 realize welfare gains from a higher quality of medical treatment, which is provided at comparable low (subsidized) prices. The outcome from simulations of $W^{net}(a,s)$, varying the quality parameter *a*, is illustrated in Graph 1.

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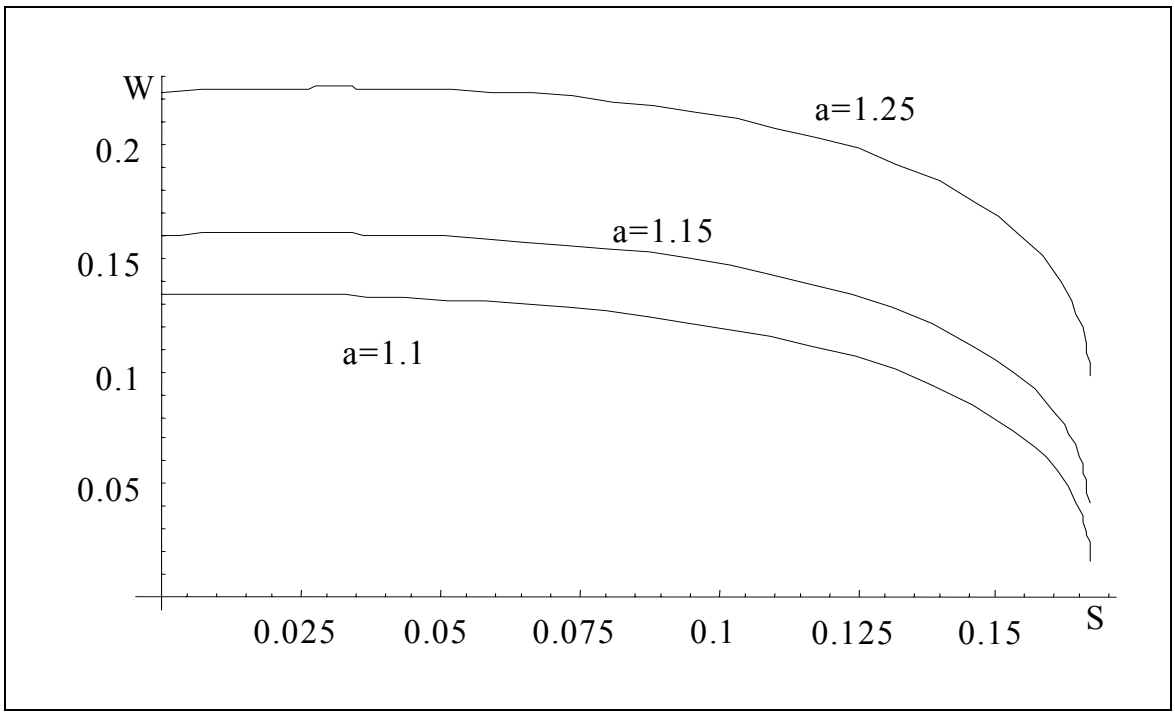
27 This can be easily seen by having a look at the equations [10], [11], and [14] – [18].

28 Due to a square root term, two mathematical solutions exist for t*. The second solution proposes a negative correlation of s and t which does not make sense economically and is therefore neglected.

Graph 1: Net-Welfare from Liberalization (W^{net})



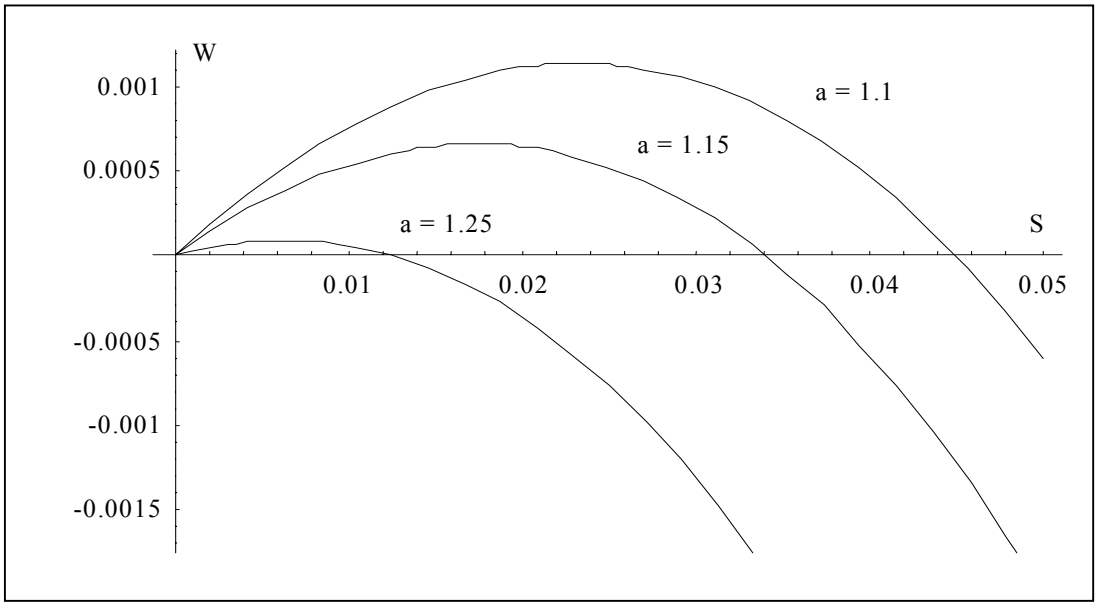
Results also proove that in terms of overall welfare the positive impact of an improved care for patients from the low-quality region is clearly dominating the potentially negative impact of subsidies. Welfare gains from liberalization rise with interregional quality differentials.

Welfare gains from subsidization in the high-quality country

Even more interesting than overall welfare gains from deregulation might be the pay-offs of high-quality (and presumably high-income) regions which subsidize health services. To isolate the effects of subsidies on the welfare of country 1, the welfare function $W_1^{net}(a,s) = W_1^d(a,s) - W_1^d(a)$ is defined. Both $W_1^d(a,s)$ and $W_1^d(a)$ describe welfare in country 1 after liberalization, but $W_1^d(a)$ represents the hypothetical welfare that would have been realized in a duopoly without subsidizing x. In other words, W_1^{net} describes welfare gains of country 1 from subsidization.

Again, running simulations of W_1^{net} for different quality levels of x shows that subsidizing health services can even lead to a net welfare gain in the high-quality region (Graph 2). This can be explained by the fact that s works as an export-subsidy, thus increasing production in country 1. Still, welfare gains from subsidization proove to be quite small. The maximum net welfare gain in Graph 2 is 0.001, which is so small that it would hardly be visible in Graph 1.

Graph 2: Net-Welfare Gains of Country 1 from Subsidization (W_1^{net})



The results also show that for each quality level *a*, there does exist a critical value *s** where welfare gains from subsidization W_1^{net} get zero. Note that *s** and W_1^{net} are negatively correlated to quality: With a rising quality, net welfare gains from subsidization and *s** decrease. How can this be explained?

The reason is that a higher quality of *x* leads to enhanced sales of x_1 and x_2 which in turn increase the tax burden in country 1, and therefore reduce welfare. To get a better understanding of the significance of *s**, the equilibrium values of *s** in Graph 2 have been set into proportion to the corresponding market price for health services provided by country 1. It turns out that *s** is about 10% of the price at a rather small quality differential (a = 1.1) among country 1 and 2, and 2% if there are substantial differences in the quality of medical treatment among both countries (a = 1.25). In other words, the high-quality country will realize a net welfare gain from subsidizing if s lies within a realistic range with respect to the market price.

It can be summarized that subsidizing health services in high quality regions after liberalization can lead to a net welfare gain in these countries. But, at the same time, this welfare gain diminishes with a growing use of domestic health care facilities by non-residents. The latter cannot be controlled after introducing freedom of choice. Therefore, high-quality countries will not have an incentive to support full liberalization in health services under the existing regulatory and financing scheme for cross-border care.

5. Conclusions

The paper examines the welfare effects of introducing freedom of choice to the health services sector in the European Union. For interpretation of the results it has to be kept in mind that welfare effects from liberalization tend to be overestimated due to a rather inefficent reference situation before introducing cross-border care. On the other hand, the degree of patient mobility and therefore the intensity of competition tends to be underestimated because patients are assumed to bear the whole costs for medical treatment. These two effects might compensate each other.

Nevertheless, according to the results the following conclusions can be drawn from analysis:

– Cross-border care can be expected to improve efficiency and welfare in the health services sector. The intensity of competition depends on patient mobility, which is determined by quality differences in medical services and individual costs, including fees and transaction costs. Since transaction costs can be expected to be related to distance, neighbourstates are more likely to get involved into competition.
– Welfare gains from liberalization are strongly determined by interregional differences in the quality of health services. Compared to the influence of quality, the impact of subsidization on overall welfare prooves to be of minor relevance.
– Subsidizing health care capacities which are also used by migrating patients from low-quality regions does not necessarily lead to welfare losses in the high-quality state. On the contrary, for realistic subsidy rates a net welfare gain can be realized. Still, simulations show that these welfare gains are rather small and their significance prooves to be sensible to the extent domestic capacities are used by foreign patients. Since, after full liberalization, patient migration cannot be controlled by the national governments, high-quality regions cannot be expected to support a complete liberalization under the current regulatory regime.

APPENDIX

Derivation of demand functions

A. Monopoly

Country 1

Consumers maximize utility

[A1] $U_1(x,z) = ax - 0{,}5x^2 + z$ given the budget constraint

[A2] $M_1 = (p_x - s + t)x + p_z z$, $s = t$.

In the non-tradeables case before deregulation, the per unit subsidy equals the per unit tax (s = t) , so the net effect on the price of health services is zero (see page 10).

The price p_z of the numéraire z is normalized to 1 and the optimalization problem is solved by substitution:

[A3] $z = M_1 - p_x x$ inserted in [I] leads to the equivalent objective

[A4] $O_1(x) = ax - 0{,}5x^2 - (M_1 - p_x x)$

Maximization of [A4] with respect to x leads to the inverse demand function:

[A5] $\frac{\partial O_1}{\partial x} = a - x - p_x = 0$ =>

[A6] $p_x = a - x$

The case of country 2 is solved analogously.

B. Duopoly

Country 1

[B1] $U_1(x,z) = ax_1 - 0{,}5x_1^2 + z$ is maximized under the budget constraint

[B2] $M_1 = (p_x - s + t)x_1 + p_z z$, $s \neq t$.

Since $s \neq t$, substitution of z yields

[B3] $O_1(x) = ax_1 - 0{,}5x_1^2 - [M_1 - (p_x - s + t)x_1]$

and maximization of the equivalent objective

[B4] $\frac{\partial O_1}{\partial x_1} = a - x_1 - p_x + s - t = 0$ =>

leads to the demand function

[B5] $p_x = a - x_1 + s - t$

Country 2

After deregulation the benefit function also includes the high-quality service x

[B6] $U_2(x,y,z) = ax_2 + y - 0{,}5x_2^2 - 0{,}5y^2 - bx_2 y + z$ a > 1, b = 1

The price of the high-quality good depends on transaction costs k and subsidies s.

[B7] $M_2 = (p_x - s + k)x_2 + p_y y + 1 \cdot z$

The equivalent objective

[B8] $O_2 = ax_2 + y - 0{,}5x_2^2 - 0{,}5y^2 - bx_2 y + M_2 - (p_x - s + k)x_2 - p_y y$

is maximized with respect to x_2 and y, which leads to the inverse demand functions

[B9] $p_x = a - x_2 + s - k$

[B10] $p_y = 1 - y - x_2$

Adding [B9] and [B10] leads to aggregate demand for $x = x_1 + x_2$ in duopoly:

[B11] $p^d(x) = a + s - \frac{1}{2}(t + k + x_1 + x_2 + y)$

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