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How to phase out regulation?

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Jan Boone *
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* TILEC, CentER, Netspar, Tilburg University. Email: j.boone@uvt.nl.

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Preface

The paper 'how to phase out regulation', is the second paper in the Research Paper Series by the Dutch Healthcare Regulator. The Research Paper Series aims at the enhancement of the knowledge en expertise in the regulation of and competition in health care markets. The papers in this series are written by invited authors and/or NZa staff.

In 2005, the segment of uncomplicated, elective outpatient care has been deregulated. Prices in this segment are subject to bargaining between insurers and hospitals. However, the major part of hospital production is currently still regulated by a budget system. The Ministry of Health is proposing to deregulate the remainder of elective hospital care (including inpatient elective care). Within the current competitive domain, insurers are unable to use their countervailing power in reducing inefficiency and profit margins and moving bargaining outcomes toward the competitive equilibrium. Therefore, regulation will be introduced as a transitory element on the road towards a more fully market oriented health care market.

The first paper in the Research Paper Series 'Yardstick competition for multi-product hospitals' analyzes the properties of possible regulation schemes for hospitals. If the market becomes more competitive over time, it may be no longer necessary to regulate hospitals. The market is expected to become more competitive over time as consumers get more aware of differences of quality and prices between hospitals and will choose their insurers accordingly. This paper deals with the monitoring of competition intensity as part of a policy to phase out regulation. In phasing out the regulation the degrees of freedom in the hospital-insurer bargaining will increase.

The paper argues that popular measures of competition, like concentration indices and price cost margins, are not well suited for monitoring the intensity of competition. Instead, the paper proposes an indicator that measures the profit elasticity. The indicator reflects the fall in profits after a reduction in efficiency. The paper provides how the indicator can be estimated using the available data for hospitals. The indicator can be used as part of the decision to start to phase out the regulation. Without a subjective assessment of the need to phase out the regulation, the regulator commits itself to the phase out policy. This commitment reduces regulatory uncertainty, giving the hospitals better opportunity to make long run investment decisions in quality of care and efficiency.

The paper is written by an invited author, Jan Boone, Professor of Economics at Tilburg University.

The paper has been discussed with economists of the NZa Council of Advisors. The authors would like to thank professors Henk Don, Sweder van Wijnbergen, Erik Schut and Jan-Willem Velthuijsen for comments that lead to many improvements. Rein Halbersma, Misja Mikkers and Ingrid Seinen (all NZa) gave useful suggestions.

Frank de Grave
Chairman of the Executive Board
Dutch Healthcare Authority

Samenvatting in het Nederlands

In 2005 en 2006 zijn er ingrijpende hervormingen in de Nederlandse gezondheidszorg doorgevoerd. In 2005 is een voorzichtig begin gemaakt met de introductie van vrije prijsonderhandelingen tussen ziekenhuizen en zorgverzekeraars voor 10% van de ziekenhuisproductie. Voor de overige 90% van de ziekenhuisproductie is er ook in 2007 nog geen prijsconcurrentie en worden de prijzen gereguleerd. De minister van VWS stelt voor vanaf 2008 het resterende deel van de electieve zorg verder te dereguleren zodat vanaf 2011 voor het leeuwendeel van de electieve zorg vrije prijsconcurrentie mogelijk wordt.

Op dit moment hebben verzekeraars nog onvoldoende onderhandelingsmacht om een betere prijs/kwaliteit verhouding af te dwingen. Daarom stelt de minister van VWS voor een tijdelijk prijsplafond te introduceren. Verwacht wordt dat de onderhandelingsmacht van zorgaanbieders in de loop van de tijd zal gaan afnemen. Als dat gebeurt dan zal de markt steeds competitiever worden en daarmee komt de noodzaak tot regulering door middel van een prijsplafond te vervallen.
De NZa heeft onderzoeker Jan Boone van de Universiteit van Tilburg uitgenodigd om een methode te ontwerpen waarmee de mate van concurrentie kan worden gemeten met het oog op het uitfaseren van de regulering door middel van het prijsplafond.

In dit artikel wordt betoogd dat traditionele indicators van de mate van concurrentie zoals de concentratie-indices en de prijs-kostenmarge niet altijd even geschikt zijn. Zo kan een hoge prijs-kostenmarge van efficiënte aanbieders of van innovatieve aanbieders met hoge investeringskosten tot een vertekend beeld leiden. In plaats daarvan zou het beter zijn om relatieve winstmarge te gebruiken om de mate van concurrentie te meten. In de relatieve winstmarge methode wordt een schatting gemaakt van winstelasticiteit, dat wil zeggen de verandering in de winst als gevolg van een stijging van 1% in de kosten. Een hogere elasticiteit is een indicatie voor toegenomen concurrentie en hoe hoger de prikkel voor zorgaanbieders om efficiënt te opereren.

De conclusie van het artikel is dat de relatieve winstmarge een geschikte methode is om de mate van concurrentie te meten en daarmee gebruikt kan worden om de regulering uit te faseren. Door het plafond jaarlijks stapsgewijs te verhogen, en jaarlijks te meten hoe de winstelasticiteit veranderd als gevolg van deze versoepeling, kan worden afgeleid in hoeverre de markt al uit zichzelf goed werkt, en in hoeverre de

prijsregulering de winstelasticiteit beïnvloed. De NZa is voornemens om deze indicator in toekomstige monitorrapportages weer te geven.

Executive Summary

This report suggests a way in which regulation (to be introduced) in the health contract market can be phased out in the future. The government plans to liberalize prices for more and more segments of the health care market. The idea is that competition on these segments will contain or even reduce prices and expenditure on health care. However, initially one would expect that hospitals' market power is substantial enough that this liberalization will lead to upward pressure on prices. Therefore the NZa considers the introduction of price regulation in the form of price caps based on yardstick competition.

There are a number of (expected) developments in the health contract market that leads one to believe that the market power of hospitals will decrease over time. If that happens, the market becomes more and more competitive over time. This implies that somewhere in the future it may no longer be necessary to regulate the health contract market. This report describes a way in which the competition intensity can be monitored in this market with an eye on phasing out the regulation.

First, we argue that popular measures of competition, like concentration and the price cost margin, are not well suited for this monitoring of competition intensity. Instead we propose to estimate the following elasticity for hospitals: percentage fall in profits due to a 1% increase in costs per unit of output. The higher this elasticity is, the more competitive the market and the higher the incentive for hospitals to reduce their costs. Since such cost reductions are an explicit goal of the price regulation, this measure is well suited to monitor the development of competition over time in the health contract market.

As shown by Boone et al. (2006), this elasticity is around 6 on average for the Dutch economy as a whole. Hence we argue that when this elasticity in the hospital sector approaches 6, one can start phasing out the regulation as other factors are intensifying competition in the sector.

1 Introduction

At the moment the Dutch health care sector is in the middle of a reform with the goal to stimulate competition. Until recently, containing costs was the main goal in shaping incentives in the health care sector.
The government fixed not only health care prices but also the budgets of hospitals, physicians and insurers. The market parties were left to negotiate (only) the quantities of health care. In 2005, some segments in the health care sector have been exposed to competition (about 10% of DBCs).
In May of 2006, CTG/ZAio published a policy document entitled 'De zichtbare hand' which proposed price regulation of hospitals based on yardstick competition. The main idea is to regulate hospitals which perform a variety of operations on the basis of an average price for each hospital. This price cap is based on the average cost cost level of (other) hospitals in the Netherlands. An alternative regime is where the price cap is based on the average price level of (other) hospitals. This new regulatory regime will be implemented in 2008 or later.
The rationale for this regulation is the market power that many hospitals in the Netherlands currently enjoy. The fear is that if hospitals and insurers would bargain about the price of more than 10% of DBC's, monopoly power would allow hospitals to increase prices. Therefore, price regulation is needed to contain prices. However, in the coming years there is a number of processes in the health care market that will decrease hospitals' market power. As more information about quality and costs in hospitals becomes available, consumers will tend to choose the best hospitals instead of the hospital that is close to home. Clearly, the NZa can play a role here in increasing transparency on the health care market. Further, many consumers now prefer the choice to go to any hospital that they like. This forces insurers to get contracts with almost all hospitals. One would expect consumers to learn over time that lower health insurance costs may be welcome even if it reduces their choice set of hospitals. This will allow insurers to bargain more aggressively with hospitals, credibly threatening to direct their customers away from expensive hospitals to cheaper and better hospitals.
Therefore, although regulation is clearly needed now, there is reason to believe that this regulation can be phased out in the future. Since regulation is costly (both in terms of organizing it and in terms of administration costs for hospitals), if it can be phased out, it is wise to do so. Moreover, in order to reduce regulatory uncertainty for hospitals, it is important that the phasing out is based on an objective measure of competition, not on a subjective assessment of the situation.

The criteria discussed in this report can all be calculated in a straight-forward way. This takes away uncertainty for hospitals and thereby does not negatively affect hospitals' investment incentives. The goal of this paper is to describe a way in which one can monitor the health contract market with an eye on phasing out regulation.
In particular, the questions are: 1. *What is a good measure of competition intensity in the health contract market?* and 2. *What is a relevant benchmark for this competition measure such that competition intensity above the benchmark allows the regulation to be relaxed?* The answer to the first question is to measure how quickly a hospital's profits fall when its efficiency is reduced. In a more competitive market, a given fall in efficiency is punished more harshly with a bigger fall in profits. The answer to the second question is based on a comparison with other sectors in the Dutch economy which are not regulated. When the health contract market has a competition intensity comparable with these sectors, the need for regulation is reduced. This allows the regulator to start the phase out of its regulation.
To explain these two answers, we start by sketching a simple model of a regulated health contract market. The main feature is that it gives a role to price caps even when these price caps are not actually binding.[1] Intuitively, stricter price caps reduce hospitals' bargaining power (even when the contracted price is eventually below the price cap). Using this model, we consider three ways in which one can measure how competitive the health contract market is: concentration, price cost margins and a profit elasticity. We argue that the first two are not really suitable in the market under consideration. The third measure is related to the idea above that we want to measure how quickly a hospital's profits fall if its efficiency slips. In particular, the profit elasticity is defined as: the percentage reduction in a hospital's profits as a result of a 1% increase in its costs per unit of output ('operation').
We then explain how the profits elasticity can be estimated using data on hospitals. We propose to use panel data techniques with fixed time and hospital effects. The benchmark value, based on the value of this elasticity in other sectors of the Dutch economy, turns out to be around 6. Given this benchmark value, we describe how the phasing out can be implemented. We conclude with some recommendations.

[1] For this it does not matter whether the price cap is based on hospitals' costs or prices.

2 A model of regulation affecting competition

The proposed regulation introduces a price cap p^{max} for each hospital. For a hospital, the average over both insurers and DBCs should be below this price cap. Hence, the proposed regulation introduces a price cap over a bundle of DBC's (proposal is not to have a price cap for each DBC separately, which would involve very high transaction costs). The price cap itself depends on developments in the sector. However, for our purposes we do not need this level of detail. We focus on the case of one (composite) product and symmetric insurers bargaining with hospitals. Phasing out is defined as, ceteris paribus, an increase in p^{max}.
To illustrate, if p^{max} equals the average cost level of all hospitals, $p^{max} = \bar{c}$, then relaxing the price cap to $p^{max} = 1.1\bar{c}$ is seen as phasing out regulation. Similarly, if regulation is based on average prices of hospitals, $p^{max} = \bar{p}$, then relaxing the price cap to $p^{max} = 1.1\bar{p}$ is seen as a phasing out of the regulation. For the arguments of this paper it does not actually matter how the price cap is calculated.
We assume that there are H hospitals. Hospital h has cost level per unit of output (`operation') c_h. Otherwise, hospitals are identical. That is, we do not model the difference between academic and regular hospitals, nor the difference between a city hospital and one in the countryside. Total consumer demand for operations equals Y and we assume that this is independent of price. This can be easily generalized, but in this context the assumption of exogenously given demand is not unreasonable (if someone has a broken leg, he needs treatment, no matter what the price is).[2] The symmetry assumption implies that without competition between hospitals, each hospital has to do Y/H operations.
We assume that there are I symmetric insurers. Each insurer needs to contract Y/I operations. We do not model the insurance sector in detail, but we make some `reduced form' assumptions on insurers. We assume that if prices differ between hospitals, insurers are able to (at least partially) direct patients to the cheaper hospitals.

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[2] If there is competition, the number of operations that one particular hospital does, is, of course, not independent of its price. Empirical evidence confirms this distinction. Folland et al. (2007: 188, 189) survey elasticities for both total quantity demanded and the quantity supplied by one particular physician or hospital. The former are below 1 (in abs. value) while the latter range from 1 to 5 (again in abs. value).

This implies that hospital h with price p_h gets $y(p_h)$ patients where $y'(.) < 0$. We assume that the elasticity

$$\varepsilon = -\frac{d \ln y(p)}{d \ln p}$$

increases over time.[3] This is one of the autonomous processes in the health care sector making this market more competitive over time. Hence although regulation is needed at the start, it can be phased out over time. The interpretation of ε increasing over time is that insurers will be become better able to direct patients to well performing hospitals. As more quality information about hospitals becomes available to consumers, one would expect that consumers themselves prefer to go to better and cheaper hospitals. As this information is missing at the moment, it is hard for an insurance company to convince its customer to travel 100 km more to go to another hospital. Hence we interpret an increase in ε as a change on the market for health care services. Moreover, the health authority and the ministry of health can stimulate this process. One can think of actively gathering and disseminating information about quality and costs of hospitals. If this information is more easily available, consumers will be more willing to accept being redirected by their insurance company to a better hospital. Below we also model a (related) change in preferences by customers on the health insurance market that makes the health care market more competitive.

We assume that hospitals and insurers bargain about the price p for an operation. We use a very simple bargaining model to keep things tractable. In particular, we assume a two stage bargaining procedure. If in the first stage, hospital and insurer do not get an agreement, then the bargaining moves to the second stage. In the second stage, with probability α the hospital makes a take-it-or-leave-it offer to the insurer (taking the regulation into account). With probability 1-α, it is the insurer who makes the take-it-or-leave-it offer. We can interpret α as the bargaining power of the hospital. We consider both cases in turn. If the hospital can make the final offer, it chooses p to solve

$$\max_{p} (p - c_h) y(p)$$

[3] As we will see below, this assumption makes sure that for given price cap p^{max} the regulation becomes irrelevant over time.

We denote this monopoly price by p_h^m. However, this price can exceed the price cap, which is not allowed. Hence, the hospital chooses a price equal to p_h given by

$$p_h = \min\left\{ p_h^m, p^{\max} \right\} \qquad (1)$$

For the case where the insurer makes the final offer, we introduce the insurer's profit function in reduced form. We assume that the insurer has some signal of the cost level of the hospital c and it offers a mark up μ above this cost level. The mark up offered by the insurer may be sufficiently high for the hospital to accept the offer. However, it can also happen that the hospital rejects the offer as insufficient. This can happen for a number of reasons. The signal c of hospital h's cost level c_h turned out to be too low. Hence the price offered by the insurer is below c_h and the hospital rejects the offer. Alternatively, the hospital may have certain costs (in addition to c_h) that it wants to cover and therefore it rejects the offer although it is above c_h. Further, the hospital may want to get a reputation for bargaining aggressively and rejecting offers that are not good enough. We denote the probability that the hospital accepts the offer μ by $F(\mu)$ with $F'(\mu)>0$. Now we write the objective function of the insurer as

$$\Pi(F(\mu), c + \mu)$$

where $p_i = c+\mu$ denotes the price that the insurer pays the hospital. The interpretation of $\Pi(F, p)$ is as follows. Consumers prefer to choose from more hospitals. Hence the more accepted offers an insurer has, the more attractive its contract for the customer. Thus we assume $\frac{\partial \Pi}{\partial F} > 0$ with $\frac{\partial^2 \Pi}{\partial F^2} < 0$. Further, the lower the price contracted with the hospital, the lower the costs for the insurer which will be (partly) reflected in the price for consumers. Hence $\frac{\partial \Pi}{\partial p} < 0$. The insurer chooses μ to solve

$$\max_{\mu} \Pi(F(\mu), c + \mu)$$

The first order condition can then be written as

$$\Pi_F' f(\mu) + \Pi_p' = 0$$

where f(.) denotes the density function of the distribution F(.). The bargained mark up μ then solves the following equation

$$f(\mu) = \eta(\mu) \qquad (2)$$

where we define the variable η as

$$\eta(\mu) = \frac{-\Pi_p(F(\mu), c + \mu)}{\Pi_F(F(\mu), c + \mu)} \qquad (3)$$

This variable captures the marginal rate of substitution for consumers between access to hospitals and the price of an insurance contract. We expect that initially η is quite small: consumers are hardly willing to substitute lower access for a lower price (i.e. $-\Pi_p'$ is small and Π_F' is big). Over time, we expect consumers to better appreciate that lower health care costs can be achieved by directing patients to cheaper hospitals. This change in the health insurance market (which mirrors the development of ε discussed above) makes insurers more aggressive when bargaining with hospitals. They are more willing to take the risk of an offer not being accepted, if this leads to lower prices. This is the second autonomous process leading to more competition in the market. Again, as with ε, this process leading to more intense competition can be facilitated by the health authority, say, by making consumers aware of the benefits in terms of lower costs because of the steering consumers towards better hospitals.[4] Another factor increasing η over time is an increase in competition in the health insurance market. If this market is not very competitive, because consumers can't be bothered to compare the different insurance contracts, then there is not much reason for an insurance company to lower its costs by bargaining aggressively. In particular, insurers can either bargain hard and enjoy supernormal profits or they can enjoy the 'easy life' of an oligopolist. As the insurance market becomes more and more competitive, the incentive to reduce costs for insurance companies goes up. This is another reason why $|\Pi_p'|$ can increase over time. This increased competition in the health insurance market can then spill over in the health contracting market.

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[4] From an economic point of view, the role of the insurer here is to solve a coordination problem among patients. Suppose there are two cities A and B each with their own hospital. The hospital in A is better (higher quality at lower cost) than the hospital in B. For citizens in B it would be optimal to threaten their local hospital that they will go to A if they need surgery. This threat would give the hospital an incentive to adopt the best practice routines used in A. However, for each individual citizen in B, once they need to go to a hospital for an operation it is more convenient to go to the local hospital. This makes the threat not credible.

The processes driving the increases in ε and η are clearly related. As consumers start looking for better deals on the insurance market (trading off less choice against lower costs: higher η), they will be more willing to travel to a better and cheaper hospital. Hence insurers can reduce y for a particular hospital h more quickly in response to a rise in the price, p_h (i.e. higher ε). As quality information about hospitals becomes more easily available, consumers will examine insurance contracts more carefully as they want to keep access to the best hospitals. This will intensify competition on the health insurance market.
Now move back to the first bargaining stage. Both parties know that when they do not come to an agreement, with probability α the price equals p_h and with probability 1-α the price is p_i. Hence risk neutral negotiators will settle for a price equal to

$$p=\alpha p_h+(1-\alpha)p_i \qquad (4)$$

in the first period of the bargaining game. This is the price that we will work with here.

2.1 Three regimes

The model above gives rise to three possible regimes. In the first regime, ε and η are so low that $p_h=p_i=p^{max}$. The regulation is binding. In the second regime, we still find $p_h^m > p^{max}$ and hence $p_h=p^{max}$. However, when the insurer makes the offer, η is high enough that $p_i<p^{max}$. Finally, when ε and η are both high enough we find $p_h^m < p^{max}$ and thus p_h, $p_i<p^{max}$.[5]
The regulation has become irrelevant and can be abandoned. Note that these three regimes are defined for given p^{max}; below we consider the case where p^{max} is changed over time.

In the first regime we find that the regulation is binding in the sense that the contracted price equals the price cap, $p=p^{max}$. In the second regime, we find that

$$p=\alpha p^{max}+(1-\alpha)p_i<p^{max} \qquad (5)$$

This is the interesting regime. Here, although the price cap is not binding, the regulation still affects the contracted price. Making regulation tighter by

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[5] The fourth case where $p_h<p^{max}$ and $p_i=p^{max}$ is not only unlikely but actually irrelevant. In that case, the insurer would always ask the hospital to make the take-it-or-leave-it offer. Both would be better off leaving all the bargaining power with the hospital.

reducing the price cap will reduce contracted prices although each of these prices is below the price cap. The idea is that tighter regulation increases the bargaining power of insurers vis-a-vis hospitals. Even if the hospitals have all the bargaining power, they can at most ask a price equal to p^{max}. Finally, in the third regime we find that $p<p^{max}$ and changes in p^{max} no longer affect the contracted price p.

For a fixed level of p^{max}, the regimes above can be interpreted in two ways. First, at the level of the health care sector. As ε and η are initially small, all hospitals have contracted prices equal to the price cap. Then as the market becomes more competitive over time, the contracted price gets below the price cap but the regulation still has an effect on the price outcome. Finally, prices are below the price cap and a change in the price cap has no effect anymore on prices contracted by hospitals and insurers.

A similar pattern will evolve for each individual hospital. First, its contracted price equals the price cap. In a second stage, its price p is below the price cap but still affected by it and finally its price is no longer affected by the price cap. Since a monopolist with lower costs, charges a lower price, one would expect a hospital with lower cost c_h to go through the regimes more quickly than a hospital with higher costs.

The idea of the elaborate bargaining model introduced above is exactly the second regime. In a simpler economic model, a price cap is either binding or it is not. Hence one way to check whether regulation is still necessary is to count the number of hospitals for which the price cap is binding. If it is binding for only few hospitals, the regulation may as well be phased out. In this way, there is no need to measure competition in the sector in order to decide whether regulation can be phased out.

There are two reasons why such a simple model does not give an accurate picture of the market. First, one would indeed expect that the price cap restrains hospitals from asking high prices, even if the price cap itself is not binding. Halbersma et al. (2006) suggest such a mechanism. In their bargaining model (both theoretical and empirical), the list price affects the contract price which is strictly below the list price. Second, in the proposed regulation the price cap at time t for a hospital is given by the average cost level in the sector at t-1. Hence when the scope for cost reductions has become small, this price cap is always going to be binding for a number of hospitals no matter how competitive the sector has become. Hence counting the number of hospitals for which the regulation is till binding (50% with a symmetric cost distribution) will never lead to a regulation phase out.

3 Measuring competition

In this report, we use the following notion of competition. In a more competitive health contracting market, hospitals are punished more harshly for being inefficient. One way to think about this is to say that as competition intensifies, inefficient hospitals lose (in terms of profits) relative to efficient hospitals. Efficient hospitals may gain or lose in profits due to more intense competition, but they always gain relative to inefficient hospitals. We argue that this notion (and the corresponding measure) of competition is particularly useful in this set up.
In the model above, there are three parameters that capture how competitive the health contracting market is: ε, η and the regulation p^{max}. We want to track how competitive the health contracting market is, using a measure of competition that unambiguously shows that competition intensifies as α and η increase and as p^{max} decreases. We first discuss two well known measures: concentration and price cost margin. We argue that they do not unambiguously show an increase in competition when we expect them to. Then we introduce the relative profits measure.

3.1 Why not simply use concentration?

Concentration measures, like the Herfindahl index (H) are often used in competition policy. An index like H correctly identifies an increase in competition if this is caused by an increase in entry in the sector, say due to a fall in entry barriers. However, more aggressive conduct tends to raise concentration thereby incorrectly suggesting that competition has become less intense.
The three parameters (ε, η and p^{max}) in the model above related to competition illustrate this effect. Consider a rather inefficient hospital. Then tougher regulation through a fall in p^{max} or more possibilities (ε) or more pressure (η) to reduce costs for insurers (at the expense of the number of hospitals with a contract) may cause this inefficient hospital to go bankrupt. Such bankruptcies of inefficient hospitals raises concentration in the hospital sector. More generally, the increase in competition will shift market share from inefficient hospitals to more efficient hospitals (even without bankruptcies) thereby raising concentration. This is the so called *reallocation effect*[6].

[6] Papers describing this effect include Vickers (1995a), Vickers (1995b) and Hay and Liu (1997)

Hence, concentration does not unambiguously show an increase in competition after an increase in ε, η and a fall in p^{max}. Therefore we do not propose a concentration index to monitor competition with the goal of phasing out regulation when competition is sufficiently intense.

3.2 Why not simply use price cost margins?

Another popular measure of competition is the price cost margin (PCM). The idea is to measure the extent to which firms are able to raise prices above costs. The higher the PCM, the more monopoly or market power firms have and hence the less competitive the sector is. The problem with this measure is the following general observation. Conditional on cost, the PCM is a measure of competition. However, conditional on price it is measure of efficiency. For the regulation model above, there are three problems with PCM in the hospital sector.

The first problem is the reallocation effect mentioned above. To see this in a simple example with price caps, consider a duopoly of hospitals, 1, 2, with a price cap p^{max} below the monopoly price for the most efficient hospital $c_1 < c_2$.

If hospitals have a lot of bargaining power, as we expect at the start, they will both price at p^{max}. Hence insurers pay the same price at each hospital and the market is split evenly between them. If initially $p_0^{max} > c_2$, the average PCM of the hospital sector equals

$$PCM_0 = \frac{1}{2}\frac{p_0^{max} - c_1}{p_0^{max}} + \frac{1}{2}\frac{p_0^{max} - c_2}{p_0^{max}}$$

If the price cap is reduced to $p_1^{max} < c_2$, the PCM equals $PCM_1 = \frac{p_1^{max} - c_1}{p_1^{max}}$. Now it is not hard to find parameter values such that $PCM_1 > PCM_0$ because the increase in competition due to the tightening of the price cap removes firm 2 from the market which has a relatively small price cost margin due to its inefficiency.

Alternatively, consider the case where the price cap stays at p_0^{max} but the hospital sector becomes more competitive in the sense that the bargaining power of hospitals is reduced (either through a rise in ε or η). This will reduce the price for hospital 1 below the price cap and below p_2. Hence insurers will direct more patients to the efficient hospital at the expense of hospital 2 (this effect is stronger, the higher is ε). This gives more weight to the PCM of hospital 1 in the calculation of the industry average PCM. This can also lead to an increase in PCM although, in fact, competition has intensified.

The second problem is that one of the reasons to introduce yardstick competition is to increase incentives to reduce costs. If one hospital does this more successfully than the average hospital in the industry, the PCM of

this hospital increases (as its price cap is given by the average cost level in the industry) and the overall PCM can go up as the market share of this hospital with a high PCM increases. Hence one would conclude that competition is reduced while actually the regulation works fine and does not necessarily need to be tightened (in the sense that p^{max} should be reduced from, say, $\bar{c}$ to 0:9 * $\bar{c}$). Clearly, with a p^{max} based on the average cost level in the industry, this cost reduction by the successful hospital will reduce next period's price cap for the other hospitals.
The third problem is the mirror image of the previous one. At the start when hospitals do not differ much yet, the average price cost margin could be quite small. This is due to the fact that price caps are determined by the average cost level and if variance in costs is small, the average price cost margin is (close to) zero[7]. This could give the wrong impression that the sector is rather competitive and regulation no longer needed.
Hence we suggest not to use concentration measures nor price cost margins to monitor competition in the health contract market.

3.3 A measure based on relative profits

The measure proposed in this report is based on the idea that an increase in competition increases the profits of an efficient hospital relative to a less efficient hospital. Consider two arbitrary hospitals 1 and 2 with $c_1 < c_2$. Then we can write the relative profits of 1 compared to 2 as

$$\frac{(p_1 - c_1)\,y(p_1)}{(p_2 - c_2)\,y(p_2)}$$

We will argue that an increase in ε, η and a decrease in p^{max} lead to an increase in these relative profits.
Let's start by considering regime 1 where $p_1 = p_2 = p^{max}$.
Consequently, $y_1 = y_2 = y(p^{max}) = Y/H$. Since all hospitals charge the same price p^{max} each has the same output level. Relative profits can now be written as

$$\frac{p^{max} - c_1}{p^{max} - c_2}$$

[7] If each hospital faces the same price cap (average cost level) then the average PCM is (abstracting from case mix issues) exactly zero.

Hence we find

$$\frac{d\left(\frac{p^{max}-c_1}{p^{max}-c_2}\right)}{dp^{max}} = \frac{c_1 - c_2}{(p^{max} - c_2)^2} < 0 \qquad (6)$$

as $c_1 < c_2$. Hence a decrease in p^{max} indeed raises the profits of the more efficient hospital 1 compared to 2. Clearly in this regime small changes in η and ε have no effect on profits as the price cap is binding for all hospitals. In regimes 2 and 3, an increase in either ε or η reallocates patients from inefficient to efficient hospitals. Patients become more willing to travel to a better hospital and consumers in the health insurance market demand cheaper contracts (accepting that consequently their choice of hospitals is limited). Both effects lead to more market share for more efficient hospitals.
Moreover, prices will fall for all hospitals. But as equation (6) suggests, this effect leads to a stronger fall in profits for inefficient hospitals. Hence also in regimes 2 and 3, more competition (due to ε, η) leads to an increase in profits for a hospital relative to a less efficient hospital.
A similar analysis shows that in regime 2 a fall in p^{max} leads to an increase of profits of a hospital relative to a less efficient hospital.

4 How to estimate the relative profits measure

This section explains how the relative profits effect of competition can be implemented empirically. We propose to estimate the following elasticity: the percentage fall in profits due to a 1% increase in costs. As explained in the appendix, in a standard model, the relevant concepts here are variable profits and marginal costs. Clearly, these are not directly observable and we discuss how they can be approximated.
Roughly speaking, to estimate the profits-elasticity we use the following specification:

$$\ln(\pi_h) = \alpha - \beta \ln(c_h)$$

where π_h denotes hospital h's profits and c_h its (marginal) costs. With this linear specification between $\ln(\pi_i)$ and $\ln(c_i)$ (this can be viewed as a first order Taylor approximation), the slope β can be interpreted as an elasticity. It indicates the percentage fall in a hospital's profits due to a one percent increase in (marginal) costs. We expect $\beta > 0$: hospitals with higher (per unit) costs earn lower profits. In the work that we have done with CBS data, this holds for almost all industries[8].
To interpret β we can write

$$\beta = -\frac{d\ln(p_h y_h - c_h y_h)}{d\ln c_h} = \frac{c_h}{p_h - c_h} - \frac{d\ln y_h}{d\ln c_h}\underbrace{\frac{p_h}{p_h - c_h}\left(\frac{p_h - c_h}{p_h} - \frac{1}{\epsilon}\right)}_{\text{price cost margin effect}}$$

where $\epsilon = -\frac{d\ln y_h}{d\ln p_h} > 0$ is the elasticity of demand and $-\frac{d\ln y_h}{d\ln c_h} > 0$ as more efficient hospitals do more operations. Hence, the closer the price cost margin is to zero (for given c_h), the higher β. In the limit, under perfect competition with $p_h = c_h$, we find $\beta = +\infty$. If p^{max} is so high and η so low that hospital h can charge its monopoly price, the price cost margin is equal to one over the elasticity of market demand and the price cost margin effect is zero. Under regulation, a higher demand elasticity ϵ leads, ceteris paribus the price cost margin, to higher β.

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[8] See Boone et al. (2006). If the market is not well defined in the data set, one occasionally finds $\beta < 0$.

In Boone et al. (2006), we implement this idea empirically, by estimating for each industry an equation of the form

$$\ln(\pi_{ht}) = \alpha_h + \alpha_t - \beta \ln(c_{ht}) + \varepsilon_{ht} \qquad (7)$$

where h denotes the firm and t the year of observation. We estimate this equation for time periods around 3 years (hence one elasticity β for a three year period for each industry). We define 'variable profits' π as firm's revenue minus variable costs which include labor costs, energy and intermediate inputs. The relevant cost concept for c_h is marginal costs, which we approximate by average variable costs defined as firm h's variable costs divided by its revenue.
As said, the interpretation of β here is the % change in profits due to a 1% increase in costs. We interpret higher β as saying that the industry is more competitive: firms are punished more harshly for an increase in their costs.
In the hospital sector we have the DBC classification.
The regulator knows for each DBC or cluster of DBCs for each hospital the total cost of the DBC. That is, the sum of variable and fixed costs like depreciation of buildings and depreciation of capital[9]. Total profits are defined as total revenue received from insurers minus the total costs of the DBC's provided.
The relevant economic cost is marginal cost and the relevant profit concept is variable profit (not total profit)[10]. For this it would be useful (if possible) to find the variable costs per (cluster of) DBC.These include wage costs, energy cost and cost of intermediate inputs used in the operation. Any cost that varies at the margin by providing one unit more of the DBC. Variable profit is then defined as total revenue minus total variable cost. If we cannot split up costs in this way, we can still use the proposed method, as we correct for observational errors in the profits and costs variables (see below).
Further, by plotting profits against average cost per unit of output (DBC) we assume that efficiency has only a cost dimension and that the output delivered is homogenous between hospitals. This is not necessarily correct. Some hospitals may provide higher quality (in a vertical sense) than others. If the method proposed by Dranove and Sfekas (Health Services Market Areas in the Netherlands) is implemented, we get a willingness to pay variable (WTP) per hospital. The relevant efficiency measure then becomes $WTP_h - c_h$ instead of just focusing on costs.
Now we turn to the details of the estimation technique.

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9 Depreciation of capital due to use ('wear and tear') is part of the variable costs.

10 Note that this is not only true for the profits elasticity proposed here but the same applies to the PCM - if calculated correctly.

We propose to estimate equation (7) for (up to) three year periods. This will give a more stable result than estimating it per year (although in the first two years, it can only be estimated for shorter periods). Estimating for a period of three years gives the opportunity to introduce hospital level fixed effects α_h which turn out to be very important in the data set that we have been working with. One can also introduce a time fixed effect αt. We now turn to the interpretation of these effects.

Theory suggests that an increase in competition increases the profits of a hospital relative to the profits of a less efficient hospital. We denote the profits and marginal costs at time t of this benchmark hospital by resp. $\bar{\pi}_t, \bar{c}_t$. The benchmark hospital could be the median hospital (in terms of efficiency or size) or the least efficient hospital in the market. The exact identity of this hospital does not matter as it will end up in the time fixed effects, as explained below.

Further, we allow for the fact that we cannot perfectly observe the relevant values for hospitals' profits and marginal costs. For instance, hospitals may differ in case mix in a way that we cannot (perfectly) correct. Or a hospital may generate higher quality for the same DBC's than other hospitals. Then we would incorrectly infer that the hospital was less efficient. Other examples are academic vs regular hospitals or location of hospital in city or countryside. If we can correct for this, then there is no problem. If we cannot correct for such problems, the hospital fixed effects pick this up. In particular, we denote the observed profit level for hospital h at time t by $\pi_{ht}u_h$. Hence the observation error equals $(u_h - 1)\pi_{ht}$. Similarly, the observed marginal costs are denoted by $c_{ht}v_h$. The assumption that we make is that these observation errors may differ between hospitals but are constant over time for the years in the (sub)sample that we consider. Clearly, the shorter the period under consideration, the more reasonable this assumption becomes. In a three year period this assumption seems reasonable enough.

Hence the equation we estimate is

$$\ln\left(\frac{\pi_{ht}u_h}{\bar{\pi}t}\right) = \alpha - \beta \ln\left(\frac{c_{ht}v_h}{\bar{c}t}\right) + \varepsilon_{ht}$$

or equivalently

$$\ln(\pi_{th}) = \alpha_h + \alpha_t - \beta \ln(c_{ht}) + \varepsilon_{ht}$$

where the hospital fixed effect equals

$$\alpha_h = -(\ln(u_h) + \beta \ln(v_h))$$

and the time fixed effect

$$\alpha_t = \ln(\bar{\pi}t) + \beta(\bar{c}t)$$

Note that β captures exactly the incentives to reduce costs which are seen as an explicit goal of the regulation. The elasticity β captures the percentage increase in profits due to a 1% increase in efficiency. If this elasticity is high, the hospitals have a big incentive to increase efficiency. As outlined above, the regulation helps to increase this elasticity. Question is, how high should this elasticity be? This we turn to in the next section.

5 Benchmark value for competition

Above we have described how the profits elasticity can be estimated. This is a positive analysis. A natural question is the normative one: how high should it be? Although some theoretical work is being done in this respect (see Boone (2003)) this work cannot yet be made operational in a case like the current one. Therefore we propose a different method.
The underlying idea is that there is no reason to regulate a sector in the Dutch economy which is as competitive as other sectors in the economy.
In Boone et al. (2006) we estimate β for roughly 115 Dutch industries (including both manufacturing and services) for the period 1993-2002.
We use firm-level data from a yearly survey carried out for the 'Productie-statistieken' by Statistics Netherlands (CBS) among enterprizes.
The survey gives complete coverage of firms with at least 20 employees, while firms with fewer than 20 employees are sampled.
Figure 1 presents 4 histograms of beta with big versus small firms and manufacturing versus services. As one can see, manufacturing sectors tend to be more competitive than service sectors and big firms (more than 50 employees) operate in a more competitive segment than small and medium sized firms. On average β is somewhere around 6 or 7 in the data that we use.
On the assumption that the Dutch economy works reasonably well, one could take a value of β around 6 as benchmark. Since most of the industries in our data with values of the profit elasticity around 6 are not regulated, there does not seem to be a justification for regulating the health contract market in case its elasticity is close to 6 as well.
Another way to derive a benchmark is the following. We ran regressions to explain β in a certain industry, size class and time period as a function of the characteristics of that industry and size class in the corresponding time period. Our estimated relation for β_{jst}, where j = industry, s = size class and t = time period, is given in table 1. By substituting the relevant values for the hospital sector, one gets another benchmark that can be used.
The variables used to explain β are the following (in brackets, mean and standard deviation in the CBS sample of Dutch industries):

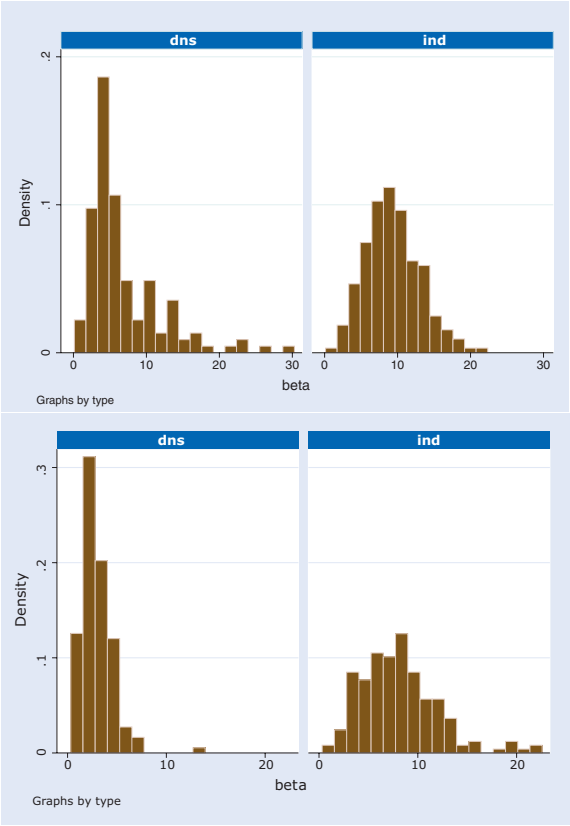

Figure 1: Distribution of β in Dutch economy. Left: services, right: manufracturing; top: SME, bottom: BE. Source: Boone et al. (2006).

— labor income share (0.6; 0.1) defined as labor costs over total revenue in the sector;
— average efficiency (60.7; 66.5) of firms in the sector defined as labor productivity;
— import quote manufacturing (27.6; 29.1) which is defined as the revenue from foreign firms in the sector over total revenue in the sector;
— import quote services (3.7; 9.0);
— manufacturing dummy;
— number of firms in the sector (249.2; 589.0);
— big enterprize dummy, defined as more than 50 employees;

— logarithm of the variance of average variable costs (-4.1; 1.3) defined as variable costs over revenue, where variable costs equal the sum of labor costs, energy costs and intermediate inputs;
— we split the total sample 1993-2005 into three subsamples; the dummy Period 2 (Period 3) equals one in the second (third) period and is zero otherwise.

	β
Labor income share	9.6 (8.1)*
Average efficiency	1.2 (5.5)*
Import quote manufacturing	0.8 (1.2)
Import quote services	0.1 (0.0)
Manufacturing dummy	0.5 (1.1)
Number of firms	-0.4 (2.1)*
Big enterprize dummy	0.7 (2.7)*
Variance AVC	-1.8 (12.2)*
Periode 2	-0.3 (1.2)
Periode 3	-0.2 (0.7)
$\overline{R}^2$ N	0.589 664

*Tabel 1: *:significant at 5% level, absolute t-statistics in parentheses. Source: Boone et al. (2006).*

Our interpretation of the relation found in table 1 is as follows. A higher labor income share is associated with more competition, in the sense that the elasticity β is higher. A higher labor income share is associated with lower capital income. As investments in capital form more often a barrier to entry than employed workers, we interpret this as saying that lower capital investments are associated with more competition. In more competitive industries, average efficiency of firms is higher. The causality can run here in two directions. More efficient firms tend to compete more fiercely than less efficient firms. Alternatively, in a more competitive sector, less efficient firms can no longer survive. This increases the average efficiency level of surviving firms. The latter interpretation also explains why the variance of average variable costs (AVC) of firms in the industry is correlated with less competition. The increase in competition weeds out inefficient firms thereby reducing the variance in efficiency levels. If instead of assuming that firms' types are exogenously given, we assume that firms can invest either effort to reduce X-inefficiency or in R&D to improve their

production process, the interpretation of the relation between β and average efficiency becomes as follows. Higher β implies that a given cost reduction leads to a higher increase in profits. Hence investments in cost reduction yield a higher return and we would expect firms to make more investments if the return is higher.
Then higher β leads to more investments to reduce costs and therefore to a higher average efficiency in the sector.
In manufacturing, more competition from outside the Netherlands is associated with a more competitive sector, although this effect is not significant at the 5% level. In services this effect is smaller and not significant at all. The manufacturing dummy turns out to be insignificant as well, although there is a tendency for manufacturing industries to be more competitive than service industries.
There is a negative correlation between the number of firms and β.
We interpret this as reversed causality: in more competitive sectors, fewer firms can survive (the inefficient firms are forced out of the market).
Big firms operate on a more competitive market segment in an industry than small firms. One explanation is that big firms compete on a national market while smaller firms sell on a more sheltered regional niche.
Finally, there is some indication that competition has become less intense over time in the Netherlands, although the period dummies are not significant.
Although, as mentioned, another benchmark for β can be derived by substituting the relevant values for the variables in the hospital sector in the estimated equation in table 1, we do not have these values at the moment. Therefore, in what follows, we continue to work with a benchmark value of 6 for convenience.

6 Phasing out regulation

The regulation proposed by the NZa is based on costs. Perhaps this cannot be introduced directly but has to be phased in. For instance, to start with a price cap above the average cost level of the hospitals and then over time make this price cap tighter (i.e. closer to the average cost level). Similarly, with a price cap based on average prices, one may want to give hospitals time to adjust and start with a cap above last year's average price (although this would seem less of an issue compared to price regulation based on costs).
This is illustrated with fictional data in figure 2. In 2008, say, the regulation is introduced with a price cap above average costs. The market is then not very competitive with a β around, say, 2.

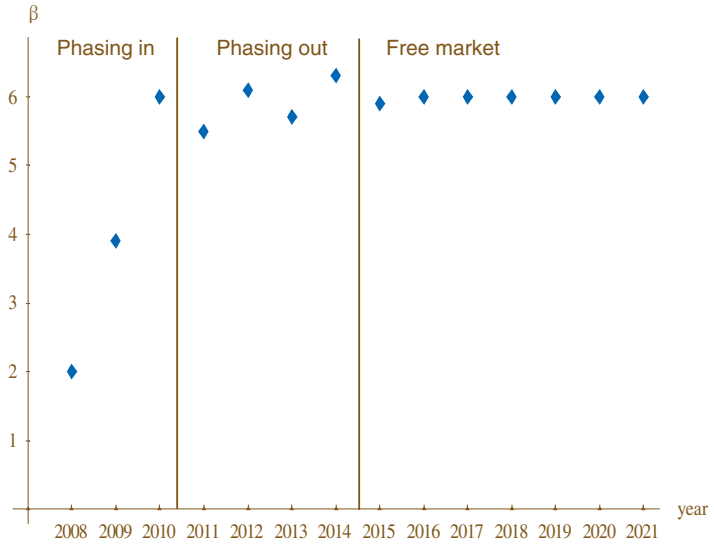

Figure 2: Fictional timing of phasing in and phasing out of the regulation.

Over time, the market becomes more competitive due to the tightening of the price cap and the process in the market that raises both ε and η.
After three years, in 2010 the phase in is complete. This corresponds to the period the minister has proposed after which the regulation is to be evaluated. In the example in figure 2, with a β close to 6, the market is competitive enough that the phase out range can start. Then the price cap is made less tight (say, 10% above the average cost -or price- level of the

hospitals). Then competition is expected to fall in the next year, but the increase over time in ε, η intensify competition again. This allows for another increase in the price cap. Finally, the regulation is completely phased out (in the figure around 2014) and the market has become free of (price) regulation.
The market has reached a stable level of competition with β around 6, although this can vary a bit over the years (as it does in other Dutch industries).
Clearly, this is an illustration of how things can go. In reality, the fine tuning will be less precise. However, the important elements are that tightening the price cap (at the start) makes the market more competitive. Then once the price cap is fixed, the autonomous process
in the market increasing the bargaining power of the insurer, should make the market more competitive for hospitals. Once the benchmark value for β is reached, it is possible to carefully phase out the regulation. Each phase out step will be accompanied by a fall in competition.
If this were not the case, the market is in regime 3 where the price cap has no effect anymore on the market. In this case the regulation can be removed completely. After each reduction in competition, the processes governing ε, η will intensify competition again such that regulation can be phased out even more until the free market outcome is reached.

7 Recommendations

In this report we have described a way to monitor the competition intensity of the hospital sector. We argue that one should estimate the following elasticity: percentage reduction in hospitals' profits in response to a 1% increase in variable costs (per unit). This elasticity can be estimated with hospital level data on revenues and variable costs (such as labor costs and energy). We suggest to estimate this relation between log profits and log variable costs using hospital fixed effects.

We expect that -for given regulation- the health contract market becomes more competitive over time. Consumers become more aware of differences between hospitals and will choose more actively for cheaper and better hospitals. They will accept that in exchange for lower health insurance costs, they will be redirected towards better hospitals at the expense of lower quality hospitals (that might sometimes be more convenient). These processes make the health contract market more competitive over time and allows for the phasing out of price regulation. This is irrespective of the way the price regulation is organized (e.g. whether a price cap is based on average costs or on average prices).

Since, on average, the profits elasticity is around 6 in the Dutch economy, there is no need to regulate the health contract market if its elasticity is (close to) 6 as well. Hence, as this elasticity approaches 6, the regulation can be phased out in steps. As the regulation will still have an effect on the intensity of competition, each phase out step will be accompanied by a fall in competition intensity. However, the processes described above will intensify competition again allowing for a further step in the phase out of regulation.

The advantage of basing the phase out on a clearly defined statistic and benchmark value is that the procedure becomes objective (the method of calculating the elasticity can be replicated by others without any ambiguity). With a subjective assessment to phase out regulation, the uncertainty for hospitals to predict what the regulator will do increases. This may negatively affect investment incentives for hospitals.

An objective procedure makes the phase out more deterministic, giving hospitals the confidence to make long run investment decisions.

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Appendix A.

The relative profits measure in a standard market model

Consider an industry where each firm i produces only one symmetrically differentiated product and faces a demand curve of the form

$$p(x_i, x_{-i}) = a - bx_i - d\sum_{j \neq i} x_j,$$

and has constant marginal costs c_i. The parameter a captures the size of the market, the parameter b captures the market elasticity of demand and the parameter d captures the extent to which consumers see the different products in a market as close substitutes for each other.
Firm i chooses output x_i to solve

$$\max_{x \geq 0}\{(a - bx - d\sum_{j \neq i} x_j)x - c_i x\},$$

where we assume that $a > c_i > 0$ and $0 < d \leq b$. The first order condition for a Cournot Nash equilibrium can be written as

$$a - 2bx_i - d\sum_{j \neq i} x_j - c_i = 0 \qquad A.1$$

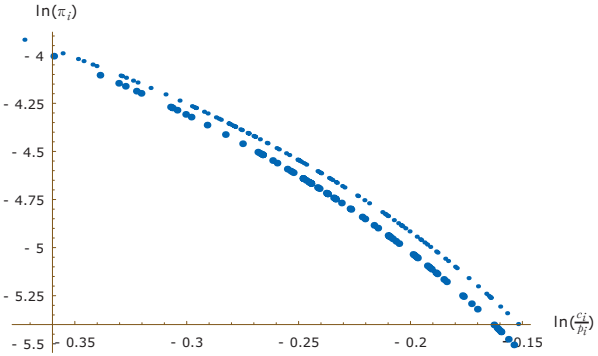
Assuming N firms produce positive output levels, one can solve the N first order conditions (A.1). This yields

$$x(c_i) = \frac{(\frac{2b}{d} - 1)a - (\frac{2b}{d} + N - 1)c_1 + \sum_{j=1}^{N} c_j}{2b + d(N - 1))(\frac{2b}{d} - 1)} \qquad A.2$$

We define a firm's variable profits as $\pi(c_i) = (a - bx(c_i) - d\sum_{j \neq i} x(c_j))x(c_i) - c_i x(c_i)$. These are variable in the sense that they do not include the entry cost f. In other words, a firm with marginal costs c_i enters the industry if and only if $\pi(c_i) \geq f$ in equilibrium. This fixes the number of firms N that enter in equilibrium where we assume that more efficient firms enter first.

Since we cannot directly observe c_i in the data, we approximate marginal costs with average variable costs defined as $\frac{c_i x_i}{p_i x_i}$. The relation we are interested in is then between $\ln(\pi_i)$ and $\ln\left(\frac{c_i x_i}{p_i x_i}\right)$. This is illustrated in figure 3. This graph is drawn for the case with a = 40, b = 30, d = 20, f = 0:004 and we draw randomly 110 firms out of lognormal distribution with mean 0.7 and variance 0.08. Then we increase competition by making goods closer substitutes: raising d from 20 to 30. We calculate again the Cournot equilibrium.

The small dots in the figure give the relation between $\ln(\pi_i)$ and $\ln\left(\frac{c_i x_i}{p_i x_i}\right)$ before the increase in competition and the large dots the relation after competition has become more intense.



Figuur 3: Relation between $\ln(\pi_i)$ and $\ln\left(\frac{c_i}{p_i}\right)$ with d=20 (small dots) and d=30 (large dots).

After the increase in competition, the relation becomes steeper. Doing a simple OLS in this graph yields β = 6:78 before and β = 7:50 after competition was intensified. The number of active firms before and after equals 101 and 74 resp. Hence under the more competitive regime, inefficient firms can no longer enter and concentration increases.
The price cost margin falls here from 0.22 to 0.21. where we define PCM as

$$PCM = \frac{\sum_{i=1}^{n}(p_i x_i - x_i c_i)}{\sum_{i=1}^{n} p_i x_i} = \sum_{i=1}^{n} \frac{p_i x_i}{\sum_j p_j x_j} pcm_i$$

where

$$\text{pcm}_i = \frac{\text{p}_i - \text{c}_i}{\text{p}_i}$$

is the price cost margin of firm i. Hence β and PCM correctly indicate that competition has increased after d goes up. Concentration incorrectly suggests that competition has become less intense.

The Dutch Healthcare Authority (NZa) is the regulator of health care markets in the Netherlands. The NZa is established at October 1, 2006 and is located in Utrecht.

The NZa promotes, monitors and safeguards the working of health care markets. The protection of consumer interests is an important mission for the NZa. The NZa aims at short term and long term efficiency, market transparency, freedom of choice for consumers, access and the quality of care. Ultimately, NZa aims to secure the best value for money for consumers.

The Research Paper Series presents scientific research on health care markets and addresses an international forum. The Research Paper Series offers NZa staff and invited authors an opportunity to disseminate their research findings intended to generate discussion and critical comments. The goal is to enhance the knowledge and expertise on the regulation of health care markets.

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