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Research Article

Deregulation and productivity in healthcare

The introduction of provider competition in the Netherlands

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Abstract

Deregulation and the related rise in competition are generally believed to spur productivity growth. This relationship is one of the main arguments used for the liberalization of healthcare industry. But the exceptional nature of healthcare markets, the presence of asymmetric information and physician-induced demand casts doubt on whether this also holds for the provision of care. Using the healthcare reform of 2006 in the Netherlands, we evaluated how productivity changed when the market was opened to competition. Our results indicate that improvements in productivity were smaller after products were transferred to the liberalized-segment (by 9.5 and 6.6% in 2008 and 2009), suggesting a negative relationship between competition and productivity in healthcare. Our paper also shows that higher levels of productivity gains were reached using hospital budget financing compared to open competition. Competition in healthcare provision has several advantages, such as moderating the growth in product prices and improving patient-choice, but it is more susceptible to physician-induced demand. Meanwhile, budget financing has the advantage of boosting productivity, but the resulting economic gains are generally assumed by the provider. Therefore, we conclude that competition could be socially optimal if volumes and treatment activity could be effectively controlled, and likewise that budgets could be optimal if hospital savings earned through productivity gains could be passed on to society.

Practical relevance

When the competition is introduced in a healthcare market, it may lead to an increased effort in expanding volume and a reduction in productivity growth.

Keywords

Health care, Deregulation, Competition, Productivity

1. Introduction

1.1 Liberalization of the market

Whether or not a country's healthcare sector should be opened up to competition has been an often-debated issue. While the liberalization of the market will likely improve access and patient-centeredness, it often replaces a system with more control for the central government, not least the control to limit the volume of treatments provided (Hadad et al. 2011; Hussey and Anderson 2003). Nonetheless, the trend for the past few decades has been tending towards more competition in healthcare rather than less. In addition to improved access and choice, proponents of deregulation also refer to the productivity gains that can be expected thanks to the reform. These expectations generally build on results coming from other deregulated industries, such as gas and utilities, or

the retail industry that demonstrated strong productivity growths after liberalization (Competition and Markets Authority 2015).

In this paper, we refer to productivity as the change in the amount of inputs for a unit of output. We argue that more competition and the associated fall in prices may not result in productivity gains in the healthcare industry due to the presence of asymmetric information and the physician's ability to induce demand (McGuire 2000). We use the healthcare reform of 2006 in the Netherlands to evaluate how hospital productivity changed when the market was opened up to competition in the years following.

1.2 Deregulation of the Dutch healthcare industry

In 2006, the Netherlands embarked on a major transformation of its healthcare system from a centrally regulated scheme towards one that is based on the principles of managed competition. The reform was implemented in phases. In the initial phase, a pre-defined part of hospital services was transferred from the budgeted-segment (A-segment) over to the competition-segment (B-segment). In the B-segment hospitals competed for contracts based on price, volume and quality, while expenditure remained budgeted in the A-segment with fixed prices and no competition for contracts. In the years to follow, the market for hospital services was gradually opened up through a transfer of care from the budget-segment to the competition-segment. (See Table 1 for list of main diagnoses by segment).

The main objective of this reform was to control costs and induce improvements in the productivity of care by means of competition between providers. In the new system, hospitals remained private but not-for-profit institutions, while private clinics, also referred to as independent treatment centers (ITCs), were now allowed to provide outpatient and day clinical care and be profit oriented. Hospital physicians were mostly self-employed.

Table 1. A- and B-segment DTC-groups and main diagnoses by segment in total hospital care, 2006–2009.

DTC-groups	Main Diagnoses
A-segment	• All DTCs not included in the B-segment
B-segment	
B-2006	• Cataracts • Hip and knee replacement • Lumbar hernia
B-2008	• Obstetrics • Knee surgery for meniscus and distortion • Pacemakers
B-2009	• Heart failure • Cerebral vascular accident • Breast cancer

1.3 Payment by Diagnosis Related Groups

The reform also changed the way healthcare was financed. The previously used budget system was replaced by a system based on Diagnosis Treatment Combinations (DTCs), a variant to the Diagnosis Related Groups (DRG) system used internationally. Each DTC comprised two parts: one part reimbursing the hospital and its management, and another part compensating medical specialists based on a pre-estimated amount of time allocated for the treatment. Payments to the hospital were negotiated annually between providers and health insurance companies, while medical specialists' fees were fixed per hour and were centrally regulated. Physicians were paid using lump-sum cost controls up until the end of 2007. These cost controls were eliminated in 2008.

In practice, deregulation led to three important changes for providers: 1. treatment tariffs were now freely negotiated between providers and insurance companies, 2. new clinics were allowed to enter the market and provide care, 3. volume controls were eliminated. There is little doubt that deregulation led to a strengthening of the competitive environment, also apparent in the sharp slowdown in healthcare price-index in the competition-segment (4.8% in the B-2006 segment vs. 9.5% in the A-segment between 2006 and 2009 (Nederlandse Zorgautoriteit 2012), a rising number of new entrants to the market and an increase in hospital mergers. The number of ITCs increased from 37 to 125, while the number of general hospitals decreased from 89 to 87 between 2005 and 2009 (Nederlandse Zorgautoriteit 2009).

2. Theoretical Background

There is an extensive body of economic literature examining the impact of competition on productivity growth. Competition in industries such as gas and utilities, retail, transportation is shown to lead to productivity gains by reducing average product prices, which puts pressure on firms to improve their managerial practices and produce more efficiently (Competition and Markets Authority 2015). However, it is unclear whether the same effect can be expected in the healthcare sector. It has been shown that, instead of becoming more efficient, a reduction in (relative) prices (either as part of a centralized policy or due to a rise in competition) in the healthcare industry is often compensated by an increase in the provision of services by the provider, leading to a productivity decline. For example, in a natural experiment triggered by a change in Medicare reimbursement schedules in the 1970s, Rice (1983) found that a decrease in reimbursement rates led to a rise in the intensity and quantity of services provided and in the number of auxiliary services ordered. Hadley and Lee (1978) showed a considerable increase in the volume of services during the Medicare price freeze in 1972–74. Yip (1998) examined surgeons' behavior following a reduction in Medicare fees for "overpriced procedures" and found strong evidence for an increase in volume for both Medi-

care and for private patients. The overwhelming majority of these and similar studies argued that the rise in volumes is a result of "physician-induced demand" (PID). They reason that due to the asymmetry of information between provider and patient and provider and insurer, providers are able to induce the amount of care the patient receives. Hence, in the event of more competition, a physician might enhance production instead of becoming more efficient.

3. Initial Hypothesis

In this study we examined how the deregulation of the formerly budgeted system affected the performance of Dutch inpatient care in terms of productivity. Our data spanned from 2006 to 2009, but we focused on the transfers in 2008 and 2009. In line with the economic theory, we began with the hypothesis that the rise in competition led to productivity gain in the healthcare industry.

4. Data and methods

4.1 Data

DTC Registry

We used the national DTC registry for the years 2006 to 2009 to measure the change in the average value of inputs used of healthcare services provided per claim. This registry is normally used for billing purposes. A DTC was opened for every patient visiting a hospital or private clinic. DTCs were categorized by medical specialty. The maximum time a DTC can be open was one year; after one year DTCs were processed. For the year 2009 we only analyzed DTCs that were already processed on 31 December 2009. We excluded outpatient DTCs from our analysis, as in 2008 the category 'urgent care DTCs' (previously registered as outpatient DTCs) were abolished from the Dutch DTC system, leading to incomparable years for outpatient DTCs.

DTC groups

DTCs were grouped according to four segments: A, B-06, B-08, B-09. (See Table 1 for main diagnoses per segment).

4.2 Dependent variable

Average input value per claim

Every DTC contains information on the type of medical activity (operative, diagnostic, clinical, laboratory, etc.) that was conducted during the hospital stay. These medical activities were automatically generated or recorded by support staff when a procedure, diagnostic test was performed or when a patient was enrolled in a planning scheme for e.g. surgery.

We calculated the value of inputs per DTC by multiplying the number of activities times the average price per activity. The average price per activity was estimated by the predecessor of the Dutch Healthcare Authority (NZa) for the year 2005 for reimbursement purposes based on cost data from a representative set of hospitals. Activity prices were held constant for the period 2006–2009 without adjusting for inflation to obtain the *average value of inputs per claim*, a proxy for resources used and an indicator of hospital productivity (Plexus 2010).

4.3 Methods

We used a difference-in-difference approach with ordinary least squares (OLS) regression to evaluate how the average value of inputs per product changed when products were transferred from the A- to the B-segment. The difference-in-difference method quantified the effects of a policy change by comparing the average change over time in the outcome variable for the treatment group (in our case the group of products being transferred), compared to the average change over time for the control group (in our case the products in the A segment). In Model 2, we corrected for age and socio-economic status of patients to control for possible changes in the population of patients over time. B-2006 group was excluded from both models, since we had no observations on its 'before' transfer value. However, a similar regression was run to test our results including B-2006 and our coefficients remained robust. We used the 'average value of inputs per product' as our dependent variable and as a proxy for productivity. A decrease in the dependent variable indicates an improvement in productivity, and vice versa, an increase in the dependent variable implies a decline in productivity.

5. Results

Figure 1 illustrates trends in the dependent variable during the years 2006–2009 indexed to 2006. The rate of decline in the average value of inputs per claim is the steepest in the A-segment (in black) and in the B-2009

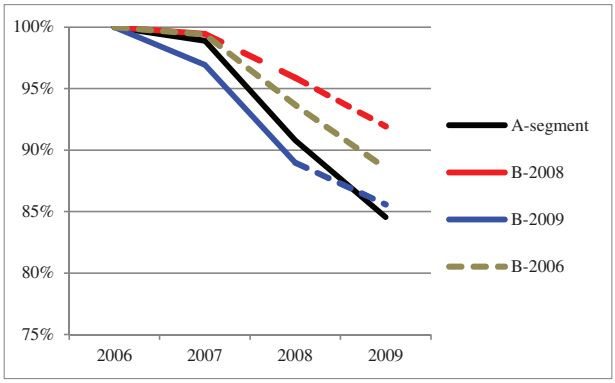

Figure 1. Change in average input value per claim (dashed line = post-transfer). Source: own calculations.

Table 2. Descriptive statistics.

	2006	2007	2008	2009*
A-segment				
Number of DTCs	1,155,568	1,345,179	1,536,181	924,019
Average input value per DTC (€)	2,431	2,405	2,208	2,056
Average age in years	50.3	50.9	51.6	51.9
Average SES**	0.204	0.196	0.210	0.212
B-2006				
Number of DTCs	306,377	364,461	398,019	225,179
Average inputs per DTC (€)	1,866	1,855	1,748	1,652
Average age in years	55.7	56.0	56.9	57.3
Average SES**	0.172	0.158	0.169	0.183
B-2008				
Number of DTCs	359,934	425,291	458,231	248,076
Average inputs per DTC (€)	1,705	1,696	1,635	1,568
Average age in years	39.1	39.5	39.9	39.4
Average SES**	0.143	0.144	0.163	0.184
B-2009				
Number of DTCs	214,144	243,778	268,348	144,814
Average inputs per DTC (€)	2,115	2,050	1,882	1,810
Average age in years	65.3	65.5	65.5	65.4
Average SES**	0.206	0.201	0.210	0.225
Total all groups				
Number of DTCs	2,036,023	2,378,709	2,660,779	1,542,088
Average inputs per DTC (€)	2,185	2,157	2,007	1,895
Average age in years	50.7	51.2	51.8	51.9
Average SES**	0.189	0.181	0.195	0.205

* Data for the year 2009 are incomplete, as only DTCs processed by December 31st 2009 are included.
**. The SES index was calculated by the Social and Cultural Planning Office (SCP) for the year 2010 at the 4-digit postal code level based on average income, poverty, level of education and employment figures.

(in blue) before its transfer in 2009, when it still belonged to the A-segment. The slope of the curve for the B-2009 segment increased at the point of the transfer. The rate of decline for the B-2006 and B-2008 segments remained above the A-segment for the entire period. See Table 2 for descriptive statistics. The decline in the average input value per claim signifies an improvement in productivity. Hence, productivity gains were highest in the A-segment.

Using difference-in-difference analysis we tested whether the negative relationship between competition and productivity also held statistically.

In Table 3 we presented the results of the difference-in-difference regression on the log-transformed variable 'average value of inputs per claim' with and without controlling for patient-mix (Model 1 and Model 2 respectively). As expected, the coefficient on the variables 'B-08' and 'B-09' were negative in both models demonstrating a lighter patient load that requires less inputs in those segments when compared to the A-segment. Likewise the coefficients on the year-dummies were also negative, indicating declining trends in inputs when compared to the reference-group (the year 2006). On the other hand, the coefficients on the interaction terms 'B-08 * Transferred' and 'B-09 * Transferred' were positive in both Model 1 and Model 2. These were our coefficients of interest and their positive sign indicates that the decline in inputs in these two segments was lower than in the

Table 3. Difference-in-difference regression results, 2006–2009.

	Model 1 Log (input value per claim)	Model 2 Log (input value per claim)
A-segment	0	0
	(.)	(.)
B-08 segment	-0.124***	-0.0166***
	(-91.53)	(-12.14)
B-09 segment	-0.0679***	-0.195***
	(-50.64)	(-145.85)
Year 2006	0	0
	(.)	(.)
Year 2007	-0.0604***	-0.0643***
	(-55.28)	(-60.11)
Year 2008	-0.149***	-0.159***
	(-131.41)	(-142.63)
Year 2009	-0.185***	-0.196***
	(-138.04)	(-149.26)
B-08 * Transferred	**0.0914*** **	**0.0955*** **
	(47.04)	**(50.14)**
B-09 * Transferred	**0.0587*** **	**0.0660*** **
	(18.19)	(20.87)
Age 1.(0–24 years.)		-0.613***
		(-520.52)
Age 2. (25–45 years.)		-0.409***
		(-362.93)
Age 3. (46–64 years.)		-0.236***
		(-240.23)
Age 4. (65 and above)		0
		(.)
SES-index		0.0226***
		(58.09)
Constant	7.230***	7.485***
	(8276.54)	(7295.83)
N	7323563	7323470
R-square	0.004	0.044
Adj. R-square	0.004	0.044

T-statistics in parentheses * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

A segment. Controlling for patient-mix seems to affect our results only slightly. The effect of age and SES-scores variables were negligible.

6. Discussion

Our research has demonstrated that the liberalization of the healthcare markets in the Netherlands, though successfully slowed the increase in healthcare prices, it did not lead to an improvement in productivity. In spite of the significant productivity gains experienced in the hospital inpatient sector overall during the researched period, productivity improvements were smaller for products that were transferred to the competition-segment. The most likely explanation is that, due to the presence of asymmetric information and moral hazard providers were able to respond to the relative slowdown in the price growth by an increase in the provision of care. In contrast, due to budget financing in the A-segment no such incentive was present, which led to steady improvements in productivity during the same time period.

The post-reform slowdown in productivity gains in the Netherlands is in line with the conclusions of other recent publications. Using DEA-methods, Van Ineveld et al. (2015) found that productivity declined significantly in the years 2008–2009 and 2009–2010, but due to the methodology used, causation between deregulation and the productivity loss could not be established. On a restricted database of four specialties, Krabbe-Alkemade et al. (2017) evaluated the changes in product volumes, total and average costs of care and the number of activities as a result of the transfer between A- and B-segment in 2008. Similarly to our paper, the variables total and average cost of care were calculated by multiplying the number of registered activities times the average value per activity. Their paper covered both outpatient and inpatient care on four selected specialties and found an overall 6% increase in average costs in inpatient care. As neither product volume nor the number of activities changed considerably, the authors concluded that the relative increase is due to more expensive activities. This supports our findings. However, the authors also found a drop in average costs for outpatient care (Krabbe-Alkemade et al. 2017). Therefore, there might be a difference in how the two sectors were affected by the reforms. Their paper also showed considerable variations in results between the four specialties in terms of the evaluated properties. Hence, they conclude, that different specialties responded differently to changes in competition.

An interesting auxiliary result of our research is that it illustrates that steady improvements in productivity can be reached in the budgeted-segment without the presence of competition. The probable driver behind this productivity growth is that providers can keep the additional funds left over at the end of the year, creating an incentive to becoming more efficient. However, there are several disadvantages of budget-financing: 1. if providers run out of funds at the end of the year, they tend to build up waiting lists, similar to Dutch experience before the reform (Schut and Verkevisser 2013); 2. it is unclear how the productivity gains reached by the hospitals could be passed on to society.

Although the findings of our study are supported by prior publications it has some limitations. First, we build on the assumption that care in the budgeted-segment and in the competition-segment are comparable. This might not be the case, as products in the budgeted-segment are, in general, more complex requiring more care, while products in the competition-segment are simpler and more homogeneous. Second, due to changes in categories in outpatient care, our study only focused on inpatient care (including day care). It is plausible, and suggested by other research, that competition may have affected outpatient care differently from inpatient care, which we cannot test in our database and may affect the generalizability of our results to outpatient care. Third, providers might have responded to the transition by shifting patients from the A-segment to the B-segment. In fact, as treatments provided in the A-segment were financed out of the hospital's budget while treatments provided in the B-segment were paid on a DTC basis, providers had a financial incentive to transfer at least some of the patient's care to the B-segment. This transfer would have led to an improvement in productivity in the A-segment, and to deterioration in productivity in the B-segment and which would affect our results. A similar shifting might have occurred from inpatient to outpatient care, as well. Fourth, due to changes in the regulatory environment our research is restricted to evaluating the transfer that occurred in 2008 and in 2009 and we are unable to evaluate the transfers that took place in 2006 and finally in 2012. Fifth, the cap on payments to physicians was eliminated in 2008 in the budgeted sector. This might have incentivized them to produce more. And finally, our dependent variable 'average value of inputs' encompasses the value of *registered* activities, and does not include activities that were performed but were not registered, for instance because they were not necessary to obtain reimbursement for a product. There is some anecdotal evidence that physicians are only diligent in registering activities that are essential for receiving reimbursement for a treatment, and tend to be laxer on recording auxiliary services. We have no reason to assume that it would affect the two groups (budgeted and competition segments) differently, and therefore do not expect it to bias our findings.

7. Conclusion

Our research is an attempt at examining how the deregulation in the provision of healthcare affected productivity in the Netherlands. Based on economic theory, this relationship was expected to be positive. Our findings show that this may not hold true in healthcare. We found that in the Netherlands the rate of productivity gains were lower in the competition-segment than in the budgeted-segment of care following the reform, which indicates that providers in the healthcare industry were able to expand the amount of inputs used for similar health conditions as a response to the rise in competition and the associated reduction in price-growth, instead of striving to become more efficient.

As a secondary finding, our paper has also shown that productivity gains can be reached using fixed hospital budget financing without the presence of competition. Providers are incentivized by allowing them to preserve the resulting savings. Productivity improvement increased financial margins for hospitals, as prices generally did not drop with production costs. In the competition segment, this improvement in product margins may have slowed down as the rate of productivity improvement declined after the products were transferred to the competition segment. This slowdown was partially offset by the increasing volume of products, and may also have been compensated by the economies of scale in the production of activities that were necessary to produce the products. This occurs when higher number of products are produced with the same number of activities, but the activities themselves require fewer inputs of capital and labor, because they are produced using the same number of staff

and using the same facilities. This, however, is not likely to be the case in the long run, as larger hospitals are generally not more efficient in their production. (Van Hulst 2016).

The two payment models also have different implications for producers. Hospital budgets may lead to an overall reduction in care provision, which could, in the long-term, lead to a reduction in hospital budgets. Meanwhile, a DTC-based financing allows insurers to have a better control over the volume of services provided per specialty, but may also lead to a fragmented DTC structure and incentivize providers to artificially induce demand.

Our findings are not to be interpreted as an argument against, or in favor of, deregulation in healthcare per se. Competition in healthcare provision has several advantages, such as diminishing price increases and improving patient-choices. It also shows that in order to work efficiently from a societal perspective, the appropriate institutional and regulatory environments need to be established to enable payers to have better control over volumes. Furthermore, our paper shows that different financing mechanisms can lead to different results in terms of productivity. While productivity-growth was slowing down in the competition-segment without volume controls, it was improving in the budgeted-segment. This indicates that competition with volume-controls could be an optimal combination. Therefore, we conclude that competition could be socially optimal if volumes and treatment activity could be effectively controlled, but we also conclude that budgets could be optimal if hospital savings earned through productivity gains could be assumed by society.

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