Deregulating the Norwegian Pharmaceuticals Market – Consequences for Costs and Availability

Niklas Rudholm[1]

The Swedish Retail Institute, Stockholm, Sweden

[1]Correspondence to: The Swedish Retail Institute, SE-103 29 Stockholm, Sweden. Tel.: + 46 70 625 46 27; e-mail: niklas.rudholm@hui.se

Abstract

The aim of this paper is to analyze the impact of the deregulation of the Norwegian pharmaceuticals market in 2001 on cost and availability of pharmaceutical products.

Data have been collected from the annual reports of a sample of Norwegian pharmacies before and after the deregulation of the market. In addition, data regarding the number of pharmacies in each region in Norway has also been collected. In order to study costs, a translog cost function is estimated. Regression models for the number of pharmacies in each region in Norway are also estimated.

The results show that the costs of the individual pharmacies have not decreased as a consequence of the deregulation of the Norwegian pharmaceuticals market. The deregulation of the market did, however, increase the availability to pharmacy services substantially. The number of pharmacies increased from 392 in the year 2000 to 524 in June 2004.

Key words: Deregulation, pharmaceuticals, translog cost function.

1. Introduction

Economists often argue in favor of competitive markets in allocating resources and producing goods and services. This is so because competitive markets bring about socially efficient outcomes, i.e. on competitive markets there are no deadweight losses to society due to regulations, barriers to entry or collusion among firms.

Despite of this, most European governments have chosen to regulate their pharmaceutical markets to some extent. The arguments for regulation have in most cases been safety in pharmaceutical use, and that a free market for pharmaceuticals would lead to inequalities in access and out-of pocket costs for pharmaceuticals (Almarsdottir et al, 2000a). In the Nordic countries, the regulation of pharmaceutical markets has been taken to its extreme. Before 1996, Finland, Iceland and Norway all had systems where the number of pharmacies, as well as their location, were strictly controlled by the government. In Sweden, a government owned monopoly (Apoteket AB) has been responsible for retail sales of pharmaceuticals since the 1970ties.

In 1996, Iceland was the first Nordic country to deregulate their pharmaceuticals market. After the reforms, the license to run a pharmacy would still only be issued to licensed pharmacists, but anyone could own the pharmacy. Almarsdottir et al (2000a) report that after the deregulation of the market, the number of pharmacies increased by 41 percent in Iceland as a whole, and by as much as 67 percent in Reykjavik. However, in a related study Almarsdottir et al (2000b) also reports that the out-of-pocket costs for pharmaceuticals did not decrease after the deregulation of the market.

In march 2001, the Norwegian market was deregulated in a manor similar to the Icelandic market. After the reform, anyone can apply for a license to own a pharmacy. Exceptions to that rule have been made for prescribing physicians and pharmaceutical firms who are not allowed to own pharmacies. In addition, the government has also decided that no pharmacy or pharmacy chain may have a market share in excess of 40 percent, as this would have a negative impact on competition.

The deregulation of the Norwegian market has been studied by Anell and Hjelmgren (2002), Holmerg et al (2003) and Anell (2004), using interview- or survey techniques. The findings from these studies indicate that the deregulation of the market did not lower pharmaceutical prices in Norway, but also that it did increase availability to pharmacy services through an increase in the number of pharmacies and opening hours. However, in a study by ECON (2004), the majority of the pharmacists surveyed reported that the workload had increased significantly after the deregulation of the market. In addition, 40 percent of the pharmacists also considered the workload to be unacceptable at times.

None of the studies mentioned above have investigated if the deregulation of the Norwegian pharmaceuticals market has lowered the costs of providing pharmacy services in Norway, although this was one of the main reasons a deregulation was suggested in the first place. As such, the purpose of this paper is to study the impact of the deregulation of the Norwegian pharmaceuticals market on pharmacy costs and availability of pharmacy services.

This paper contributes to the existing literature on the deregulation of the Norwegian pharmaceutical market by studying the impact of the deregulation on the cost structure of individual pharmacies, as well as reporting numerical measures regarding the effects of the deregulation on availability to pharmacy services in the Norwegian pharmaceuticals market.

The results show that the costs of the individual pharmacies have not decreased as a consequence of the deregulation of the Norwegian pharmaceuticals market. The deregulation of the market did, however, increase the availability to pharmacy services substantially. The number of pharmacies increased from 392 in the year 2000 to 524 in June 2004

The reminder of the paper is organized as follows; section 2 presents the datasets and regression techniques used in this paper. Section 3 reports the results from the empirical analysis. Finally, in section 4 the main results are summarized and discussed.

2. Material and Methods

Data

Annual reports have been collected for the three main pharmacy chains in Norway, Vitusapotekene, Alliance-Unichem and Apokjeden. In addition, the annual reports from a random sample of 14 different pharmacies belonging to the pharmacy chain Ditt Apotek has also been collected. This results in a dataset of 48 observations, relating to 17 different pharmacies in an unbalanced panel covering the years 1998-2003.

Data on the number of pharmacies by region (fylke) in Norway has been provided by Norges Apotekerförening. Data concerning the number of pharmacies are available for the years 1994-1995 and 1997-2003. Data concerning the population in each region was supplied by Statistics Norway for the period 1994 to 2003, making it possible to calculate the number of inhabitants per pharmacy in each region before and after the deregulation of the market.

Empirical Methods

The impact on pharmacy costs of the market reforms in 2001 will be studied by estimating a translog cost function for the Norwegian pharmacies included in the sample presented above.

It is assumed that the pharmacies are cost minimizing retailers of pharmaceutical products and that their cost function can be described by the transcendental logarithmic (translog) cost function developed by Christensen et al. (1971). This functional form can be seen as a second order Taylor series approximation to an arbitrary cost function, and can be written

$$TC_{it} = \alpha + \beta_{Dereg}*Deregulation_{it} + \beta_1*PL_{it} + \beta_2*PK_{it} + \beta_3*PM_{it} \quad (1)$$

$$+ \delta_{11}*((PL_{it}*PL_{it})/2)$$
$$+ \delta_{12}*(PL_{it}*PK_{it}) + \delta_{22}*((PK_{it}*PK_{it})/2)$$
$$+ \delta_{13}*(PL_{it}*PM_{it}) + \delta_{23}*(PK_{it}*PM_{it}) + \delta_{33}*((PM_{it}*PM_{it})/2)$$
$$+ \beta_Y*Y_{it} + \beta_{YY}*((Y_{it}*Y_{it})/2) + \beta_{PL}*(Y_{it}*PL_{it})$$

$+ \beta_{PK}*(Y_{it}*PK_{it}) + \beta_{PM}*(Y_{it}*PM_{it}) + \varepsilon_{it}$

where total cost for pharmacy *i* at time *t* (TC_{it}), price of labor (PL), price of capital (PK) and the price of goods (PM) are all in fixed prices and expressed in logarithms. Output, *Y*, is measured as the sales volume of the individual pharmacy, which is assumed to be determined by the health status of the inhabitants in the region and thus exogenous to the individual pharmacy. In addition, it will be assumed that the individual pharmacies act as price takers on the input markets, thus alleviating the potential problem of endogeneity in input prices. $Deregulation_{it}$ is an indicator variable included to capture the impact of the deregulation of the Norwegian market on pharmacy costs. The indicator variable is equal to one after the deregulation of the market, and equal to zero before. The cost function also contains an additive disturbance component, ε, reflecting factors affecting the cost function not observable by the researcher. This component should be interpreted as a realization from a distribution for a stochastic variable with zero mean and constant variance.

In addition, cost share equations for labor, capital and goods are derived by differentiation of the translog cost function, and included in the system of regression equations to be estimated. Each of the cost share equations includes an additive error term, which is the result of optimization errors by the individual pharmacies. Note that the error terms relating to the share equations do not contain the additive disturbance term of the cost equation. This follows since the cost share equations have been derived by differentiation of the translog cost function.

Joint estimation of the cost- and cost share equations has two main advantages; it results in more efficient parameter estimates, and makes it possible to determine whether retail sales of pharmaceuticals are characterized by economies of size. Economies of size can, according to Christensen and Greene (1976), be expressed as the proportional increase in cost associated with a small proportional increase in output, i.e. the elasticity of total cost with respect to output. In this paper, economies of size are calculated as one minus the derivative of the translog cost function with respect to output, and evaluated at the mean of the variables included. This results in a positive number if economies of size are present.

The impact on consumer availability to pharmacies in urban and rural areas of the market reforms in 2001 will be studied using descriptive statistics, as well as by regression analysis of the number of inhabitants per pharmacy. The regression model used to study the number of inhabitants per pharmacy can be written;

$$\text{Inhabitants per pharmacy}_{it} = \alpha_i + \beta_t + \beta_1 * \text{Urban}_{it} + \beta_3 * \text{Deregulation}_{it} + \beta_3 * (\text{Deregulation}_{it} * \text{Urban}_{it}) + \varepsilon_{it} \quad 2)$$

where α_i are region specific fixed effects, β_t are time specific fixed effects. Urban is an indicator variable equal to one if the number of inhabitants per square kilometer is above 50, otherwise zero. The regions Ostfold, Akerhus, Oslo and Vestfold are thus considered to be urban regions in this study. Deregulation is an indicator variable equal to one after the deregulation of the market in 2001, zero otherwise. Deregulation*Urban is an interaction variable included to capture if the deregulation had a larger impact on availability in urban, rather than rural areas in Norway. Finally, ε is an additive disturbance term reflecting factors affecting the regression equation not observable by the researcher. This disturbance term is assumed to have zero mean and constant variance.

3. Results

The results from the estimation of the translog cost- and cost share functions are presented in Table 1.

Table 1 about here.

The estimate of the indicator variable show that total costs are approximately 12 percent higher in the Norwegian pharmacies after the deregulation of the market. The own-price elasticities of labor, capital and goods have been calculated as described in Greene (1993, p. 506). The results show that the own-price elasticities are all negative (as expected) and range from –0.66 for labor to –0.15 for goods, with an own-price elasticity for capital equaling -0.39. Finally, the estimate of economies of size (evaluated at the mean of the variables) equals 0.32 (t-value = 2.60).

The number of inhabitants per pharmacy in urban and rural regions in Norway are presented in Figure 1. There were on average 12 239 inhabitants per pharmacy in the urban regions in Norway in the year 2000, before the market was deregulated. In June 2004, the number was instead 8652 inhabitants per pharmacy in urban regions, a decrease by almost 30 percent.

Figure 1 about here.

The availability to pharmacies has increased in rural areas as well. Before the deregulation of the market, there were 11 014 inhabitants per pharmacy on average. In June 2004, there were on average 8801 inhabitants per pharmacy in the rural areas of Norway. It should also be noted that the data show that the number of pharmacies in Norway increased from 392 in the year 2000 to 524 in June 2004, and that no Norwegian region has fewer pharmacies in June 2004 then they had before the deregulation of the market.

The results from the estimation of regression equation 2) are presented in Table 2, where the region- and time specific fixed effects are left out in order to save space.

Table 2. about here.

The results show that the deregulation of the market decreased the number of inhabitants per pharmacy by 3307 persons on average. In urban areas the number of inhabitants per pharmacy decreased by an additional 1027 persons as a result of the deregulation of the market.

4. Discussion

The results from this study can be summarized as follows; first, the costs in the Norwegian pharmacies have not decreased as a consequence of the deregulation of the Norwegian pharmaceuticals market. Second, the deregulation of the market did increase the availability to pharmacies substantially as the number of pharmacies increased from 392 in the year 2000 to 524 in June 2004.

The results from the estimation of the translog cost function show that the deregulation of the pharmaceuticals market did not reduce the costs in Norwegian pharmacies. On the contrary,

costs seem to be somewhat higher after the deregulation of the market. One possible explanation is that since prices are regulated in the Norwegian market, pharmacies that entered the market after the deregulation in 2001 choose to compete by increased consumer services instead of lower prices.

It should also be noted that Anell and Hjelmgren (2002), Holmberg et al (2003) and Anell (2004) all reported that after the deregulation there had been substantial horizontal integration (i.e. pharmacies merging or joining pharmacy chains) in the Norwegian market. The results from the translog model show that there are statistically significant economies of size in the Norwegian pharmacy industry, indicating that mergers should be common in order to increase the size of operations and thus decrease costs.

A potential caveat is that input prices might be endogenous if any of the individual pharmacies are large enough to affect the market prices on labor, capital and goods. This could also be the case for output, if individual pharmacies are able to affect the demand for pharmaceuticals to a significant extent. I have, however, not been able to find any valid instruments for output and input prices and have thus not been able to study this issue further.

Turning to the results regarding the number of inhabitants per pharmacy, the results show that the availability to pharmacies has increased substantially after the deregulation of the market in 2001. In fact, the data show that the number of pharmacies in Norway increased from 392 in the year 2000 to 524 in 2004, as well as that no Norwegian region had fewer pharmacies in June 2004 then they had before the deregulation. This could be explained by a contract between the Norwegian government and two of the pharmacy chains active in the Norwegian market. This contract states that the pharmacy chains will take over failing pharmacies in municipalities with only one pharmacy. However, according to a study by ECON (2004), only three takeovers have been done according to this contract after the deregulation in 2001. In addition, Holmberg et al (3003) and Anell (2004) report that there has also been an increase in the opening hours of the pharmacies after the deregulation of the market. As such, it seems that the deregulation of the pharmaceutical market in Norway was a success when it comes to providing access to pharmacy services in urban as well as rural regions of the country. A potential caveat is that this study uses region level data, and that there could be rural municipalities where the availability to pharmacy services actually decreased after the deregulation of the market. However, Anell (2004) report that although 17 pharmacies were

closed between 2001 and March 2004, none of these were located in rural municipalities in Norway.

References

Anell, A. & Hjelmgren, J. (2002) Implementing competition in the pharmacy sector: lessons from Iceland and Norway, *Applied Health Economics and Health Policy,* 1, 149-156.

Anell, A. (2004) Nya villkor för apotek och läkemedelsförsäljning – Erfarenheter från Danmark, Island och Norge (in Swedish). IHE Arbetsrapport 2004:2.

Almarsdottir, A.B., Morgall, J.M. & Björnsdottir, I. (2000a) A question of emphasis: efficiency or equality in the provision of pharmaceuticals. *International Journal of Health Planning and Management*, 15, 149-161.

Almarsdottir, A.B., Morgall, J.M. & Grimsson, A.(2000b) Cost containment of pharmaceutical use in Iceland: the impact of liberalization and user charges. *Journal of Health Services Research and Policy*, 2, 109-113.

Christensen, L.R, D.W. Jorgenson & Lau, L.J. (1971) Conjugate duality and the transcendental logaritmic production function, *Econometrica*, 39, 255-256.

Christensen, L.R. & Greene, W. (1976) Economies of Scale in the U.S. Electric Power Generation, *Journal of Political Economy*, 84, 655-676.

Econ (2004) Evaluering av apotekloven och indexprissystemet (in Norwegian). Rapport 2004:10.

Holmberg, C., Kjellberg, H. & Axelsson, B. (2003) Läkemedelsdistributionen i Norden – En komparativ studie av aktörer, resurser och aktiviteter (in Swedish). SSE/EFI Working Paper Series in Business Administration No 2003:10.

Greene, W. (1993) *Econometric Analysis*, Prentice Hall, New Jersey.

Table 1. Regression results translog cost function

Variable	Estimate	t-value
Constant	6.56	20.83
Deregulation	0.12	2.74
PL	0.04	1.52
PK	-0.17	-4.78
PM	1.01	9.62
PL*PL/2	0.03	12.06
PL*PK	-0.01	-5.51
PK*PK/2	0.07	24.37
PL*PM	0.02	1.66
PK*PM	-0.06	-4.66
PM*PM/2	0.04	11.09
Y	-0.69	-18.22
Y*Y/2	0.07	15.87
Y*PL	0.01	6.55
Y*PK	0.03	12.49
Y*PM	-0.02	-2.40
Observations	48	
R-squared	0.98	

Table 2. Regression results availability

Variable	Estimate	t-value
Constant	11783.51	35.64
Urban	158.58	0.55
Deregulation	-3306.9	-10.01
Deregulation*Urban	-1026.92	-2.32
Observations	209	
R-squared	0.83	

Figure 1: Inhabitants per pharmacy