Analyses of Direct and Indirect Impacts of a Positive List System on Pharmaceutical R&D Investments

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ABSTRACT

Background: The South Korean government recently enacted a Positive List System (PLS) as a major change of the national formulary listing system and reimbursed prices for pharmaceutical products. Regardless of the primary goal of the PLS, its implementation might have spillover effects by influencing the pharmaceutical industry's research and development (R&D), potentially leading to a variety of responses by firms in relation to their R&D activities.

Objective: We investigated the spillover effect of the PLS on R&D investments of the pharmaceutical industry in Korea through both direct and indirect channels, examining the influence of the PLS on sales profit and cash flow.

Methods: Data from 9 years (5 before and 4 after PLS implementation) were drawn from the financial statements of firms whose stocks were exchanged in 2 official stock markets in Korea (526 firms) and additional pharmaceutical firms whose financial performance was officially audited by external reviewers (263 firms). Longitudinal analyses were conducted, using the panel nature of the data to control for permanent unobserved firm heterogeneity.

Results: Our results showed that the PLS was directly associated with R&D investments. In contrast, its indirect impacts stemming from the influence on sales profit and cash flow were minimal and statistically nonsignificant. The gross impact of the PLS on R&D investments increased moving further from the enactment year; R&D investments were reduced by 18.3% to 25.8% in 2009–2010 (compared with before PLS implementation) in the firm fixed-effects model. We also found that such negative direct and gross impacts of the PLS on R&D investments were significant only in firms without newly developed chemical entities.

Conclusion: Considering the gross negative impact of the PLS on R&D investments of pharmaceutical firms and the heterogeneous response of these firms by the R&D activities, governmental efforts of cost-containment may need to consider the spillover impact of the PLS on pharmaceutical innovation. (*Clin Ther*. 2013;35:941–949)

Key words: pharmaceutical industry, Positive List System, R&D investments, South Korea.

INTRODUCTION

In the midst of the ongoing rise of pharmaceutical and total health care expenditures worldwide, regulations on the reimbursement costs of pharmaceutical products have been widely enacted globally.[1] In South Korea (hereafter called Korea), which has a national health insurance system, governmental pharmaceutical policies have mainly focused on quality control, particularly after the landmark reform to separate prescription and dispensing in 2000. However, rapid increases in the cost of drugs since the reform, to the extent of a quarter of the total health care expenditures,[2] led the Korean government to enact a comprehensive policy measure at the end of 2006 with the aim of controlling pharmaceutical expenditures.

Changing the listing system for the national formulary to a Positive List System (PLS) was the key component of governmental efforts to contain pharmaceutical expenditures. In the previous negative

Accepted for publication May 7, 2013.
http://dx.doi.org/10.1016/j.clinthera.2013.05.002
0149-2918/$ - see front matter

list system, drugs were automatically listed in the national formulary, with only a few exceptions, once they received market approval. The generosity of the old listing system is clear in a report showing that >21,000 drugs were listed on the Korean National Health Insurance (KNHI) reimbursement list, whereas only 3000 to 8000 drugs were listed in the insurance formularies of most Organisation for Economic Co-operation and Development (OECD) countries in 2005.[3] The Korean government also formerly adopted new drugs very early in the old listing system compared with other global markets; >67% of the new drugs listed by KNHI were adopted by Korea second or third in the world between 2003 and 2005.[3]

The new listing system, PLS, was designed to more selectively include new drugs in the national formulary. Under the PLS, pharmaceutical firms must submit results of an economic evaluation to show the cost-effectiveness of a new drug before it can be listed in the national formulary. Firms also have to go through a negotiation process with the National Health Insurance Corporation (NHIC) about the listing price. The drugs listed before the enactment of PLS were reviewed to determine whether they should be eliminated from the national formulary or remain listed but with price cuts.[4,5] The rate of formulary listing indeed decreased after the implementation of the PLS, from 62.0% and 76.0% in 2005 and 2006, respectively, to 34.8% and 54.5% in 2007 and 2008.[6]

The stark reform in the listing system in Korea has been of particular interest to pharmaceutical firms, given that the NHIC serves as a monopsony public insurer in the Korean market, with nearly all (97%) of Koreans being covered as beneficiaries.[3] Although the primary goal of the PLS was to control for pharmaceutical utilization through selective listing and lower listing prices, its implementation can have spillover effects by influencing the research and development (R&D) activities of companies in the pharmaceutical industry.[4] The PLS can directly influence R&D investments if firms account for the change in expected returns following the PLS by adjusting their R&D activities. There could also be indirect influence of the PLS on R&D investments through its impact on profit and cash flow, both of which provide actual financial resources for R&D activities. Such impact might be expected to vary by firm characteristics with regards to R&D abilities. Firms with greater R&D resources may consider the PLS a positive incentive in favor of firms with R&D investments, expecting less market competition than pre-PLS, once they successfully enter the market with new drugs.

In this study, we investigated whether the PLS had any impact on the R&D investments of pharmaceutical firms either through a direct impact on R&D investments or through an indirect impact on sales profit and cash flow, which in turn influenced R&D investments. We also explored whether the impact of the PLS on R&D investments varied in relation to firms' R&D activities. We used a panel database at the firm-level for 9 years (2002–2010), and used longitudinal data-analytic techniques to control for unobserved permanent firm-level heterogeneity that would be correlated with R&D investments. Assessing the impact of the PLS on firms' R&D investments can be helpful in finding the optimal balance between cost containment and innovation in drug development in Korea, providing examples for other countries with similar concerns.

PATIENTS AND METHODS

Empirical Models

We modeled the relative extent of R&D investments as a function of sales profit and cash flow in the previous year within a pharmaceutical firm. Sales profit and cash flow were reported as the 2 key determinants of R&D investments.[7] The higher the sales profit of pharmaceutical products, the more each pharmaceutical firm is presumably motivated to invest in R&D activities to develop new drugs. Also, firms with greater cash flow are likely to more readily invest in R&D activities than are firms with tight cash flow, assuming that internal financing from cash flow is less costly than external financing with loans.[7–9]

Profitability was reported to significantly influence the extent of R&D expenditure.[10] The fact that countries with stricter patent-protection systems have shown higher aggregate levels of R&D investment also indicates the importance of expected return on a new chemical entity in a firm's decision-making regarding the level of R&D investments.[11–15] Therefore, we can assume that any price-regulation policies that affect the growth in gross margins for pharmaceutical products might also affect growth in R&D expenditure.[16]

Larger cash flows provide a readily available and relatively low-cost source of funding for R&D.[7]