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Impact of the excise tax on firm R&D and performance in the medical device industry: Evidence from the Affordable Care Act

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ABSTRACT

This article examines how the excise tax affects firms' R&D investment, performance, and market strategy in the US medical device industry. The Affordable Care Act imposed a 2.3% excise tax on medical devices beginning in January 2013, and thus this study compares the medical device firms with other high-tech firms before and after the tax incidence. Using COMPUSTAT data from 2006 to 2015, the author finds that the excise tax reduced R&D investment, sales revenue, gross margins, and earnings for medical device firms. In addition, the excise tax increased their global market sales intensity, global market diversification, and customer diversification in the US domestic market.

1. Introduction

When the Affordable Care Act (ACA) was enacted on March 23, 2010, the federal government included a 2.3% excise tax on medical devices to help cover the costs of the expanded health insurance coverage. Medical device manufacturers criticized this excise tax, insisting that the tax would harm their research and development (R&D) investment and performance and thus should be abolished (Gravelle and Lowry, 2014). According to a Research America (2016) report, total R&D spending in medical and health care industries was $158.7 billion in 2015, with the medical device industry as one of the top five R&D-intensive industries. One of the largest medical device manufacturers, Stryker Corporation, estimated that this new excise tax would cost it approximately $100 million in 2013. Yet no prior study has examined whether the medical device excise tax affects firms' R&D investment and performance in a negative way. In this article, I thus investigate how the excise tax affects R&D investment and various performance metrics (i.e. sales revenue, gross margins, and earnings) for medical device firms.

The excise tax could affect the medical device industry in different ways. On the one hand, the statutory incidence of the medical device tax on firms could increase the cost of production and shift the market supply curve upward. Then, the tax incidence would reduce firm sales, profits, and R&D investment if the price elasticity of market supply was relatively lower than market demand. On the other hand, if medical device manufacturers have high price elasticity with respect to the tax, they could pass the excise tax to consumers through prices (i.e. the tax is "passed forward") and keep their original profits and margins. Therefore, the effects of the medical device tax on firm R&D and performance could differ depending on the elasticity of supply and demand for medical devices (Harberger, 1962), which is worthwhile to investigate empirically.

To identify the effects of the medical device tax on firm R&D investment and performance, I use the difference-in-differences (DD) framework. Specifically, I compare a treatment group of firms producing medical devices with a control group of high-tech firms producing non-medical devices, such as pharmaceutical products (Barry, 2005; Wolf and Terrell, 2016), before and after the excise tax incidence. For the empirical analysis, this article focuses on four different types of firm-level variables: (1) R&D expenditures, (2) sales revenue, (3) gross margins, and (4) earnings (profits). Analyzing the COMPUSTAT data from 2006 to 2015, I find that the medical device tax significantly reduced R&D expenditures, sales revenue, gross margins, and earnings by approximately $34 million, $188 million, $375 million, and $68 million, respectively, for firms in the treatment group.

In addition, the empirical findings suggest that the excise tax

Abbreviations: ACA, Affordable Care Act; DD, difference-in-differences; FFDCA, Federal Food, Drug, and Cosmetic Act; IRS, Internal Revenue Service; M&A, mergers and acquisitions; NAICS, North American Industry Classification System; R&D, research and development; ROE, return on equity; ROA, return on assets; SIC, Standard Industry Classification

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affected operating costs and market strategies for medical device manufacturers. These firms reduced their operating costs to alleviate the excise tax burden. They also significantly increased the global market sales intensity (i.e. the degree to which their sales revenue comes from operations in foreign countries) and global market diversification (i.e. the degree to which they diversified their businesses across different foreign markets) after the tax incidence because medical device sales outside the United States are tax-exempt. Furthermore, these firms increased customer market diversification (i.e. the degree to which they diversified their major customers in the United States) in an effort to reduce market power of major customers, to facilitate the passing of the excise tax to consumers through price.

This article contributes to the literature in two major ways. First, to the best of my knowledge, this article is the first to assess the effects of the medical device tax on firm performance and R&D investment. One recent study (Schmutz and Santerre, 2013) forecasted how much the excise tax would reduce R&D spending in the medical device industry. This article differs in the way it estimates the *ex-post causal* effects of the excise tax on firm performance in addition to R&D investment. As the medical device industry is highly R&D intensive and R&D is a primary driver of firm productivity and economic growth (Minniti and Venturini, 2017; Siliverstovs, 2016), it is critical to understand how the government tax policy affects firm performance in the R&D-intensive industry. Yet previous research has mostly focused on investigating the impact of R&D subsidies or tax credits on R&D investment in non-medical device manufacturing industries (Bloom et al., 2002; Bronzini and Iachini, 2014; Czarnitzki et al., 2011) or the pharmaceutical industry (Grabowski and Vernon, 2000; Scherer, 2001; Vernon, 2005).

Second, as the medical device market has not previously been subject to an excise tax, the estimation results in this article help clarify how medical device firms respond to the ad valorem excise tax and pass their tax burdens to customers. In particular, the empirical findings for the reduction in firm gross margins due to the excise tax suggest that firms in the medical device industry cannot fully pass the tax to consumers through prices, and therefore they reduce their operating costs to alleviate the excise tax burden. In addition, in contrast with other government policies, such as R&D subsidy or tax credit programs, the sample firms in this study do not suffer from a self-selection bias from participating in government programs, because the ACA excise tax is applied to all manufacturers, producers, and importers in the US medical device industry.

The rest of this article proceeds as follows: Section 2 explains the introduction of the medical device tax by the ACA, reviews previous literature on the effects of government tax policy on firm R&D, and demonstrates how the medical device tax affects firm R&D investment and performance. Section 3 describes the COMPUSTAT data and presents the descriptive statistics of the sample. Section 4 establishes the empirical strategy for identifying the effects of the medical device tax on firm R&D investment and performance and presents the empirical results. Section 5 provides concluding remarks.

2. Medical device tax and firm R&D and performance

2.1. The ACA medical device tax and its effects on firm R&D and performance

The ACA, also known as “Obamacare,” was signed into law by the former US president Barack Obama on March 23, 2010. It included three key mandate provisions (i.e. employer, individual, and dependent coverage) to expand health insurance coverage to universal levels. To help cover the costs of the expanded health insurance coverage, the ACA also included several new taxes and fees imposed on several sectors.[1] One of the revenue-generating provisions is the new 2.3% excise tax on gross sales of all taxable medical devices by manufacturers, producers, and importers, which became effective on January 1, 2013 (Section 4191).[2] According to 21 U.S. Code Section 321(h) of the Federal Food, Drug, and Cosmetic Act (FFDCA), a taxable medical device is defined as an “instrument, apparatus, implement, machine, contrivance, implant, in-vitro reagent, or other similar or related article, which is intended for use in the diagnosis of disease or other conditions, or in the cure, mitigation, treatment, or prevention of disease.” Those medical devices are listed under Section 510(j) of the FFDCA and 21 Code of Federal Regulations Part 807. The types of devices that fall under this description are varied and include items ranging from syringes and needles to coronary stents, defibrillators, and irradiation equipment.

The Internal Revenue Service (IRS), however, set some exemption rules on the medical device tax.[3] First, taxable medical devices sold for use by the purchaser in further manufacturing or for resale by the purchaser to a second purchaser for use in further manufacturing are exempt from the excise tax. Second, medical devices that are purchased by the general public at retail for individual use and not intended primarily for use in a medical facility are also tax-exempt (i.e. “retail exemption”). Third, Section 4191 sets out a retail exemption for certain items, including eyeglasses, contact lenses, and hearing aids. Last, all medical device products sold outside the United States are tax-exempt. In December 2012, the IRS issued its final regulations regarding the excise tax.

Since the imposition of the excise tax on medical device manufacturers shifted the supply curve upward, I propose five scenarios in which the tax effects on firm R&D and performance would differ depending on the relative elasticities of market supply and demand for medical devices[4] (Harberger, 1962). First, as Panel A of Fig. 1 shows, when the supply curve is perfectly elastic to market price but the demand curve is not, the tax would be passed to consumers through prices (P^{ATD}), and thus the tax burden would fall entirely on consumers. Then, the tax would not reduce firm gross margins and profits per unit because firms would receive the same price (P^{ATS}) as before the tax incidence (P^{BT}), while it would reduce outputs, R&D investment, and employment in the medical device industry.[5] The magnitude of falling outputs, R&D investment, and employment would thus vary depending on the elasticity of demand. Second, when demand of medical devices is perfectly elastic and supply is not (Panel B), medical device manufacturers would bear the entire tax burden (i.e. the decrease in producer price is exactly the same as the tax size). Then, the tax would reduce firm profits and margins as well as output and employment. Third, when supply is perfectly inelastic and demand is not (Panel C), the entire economic incidence would fall on firms as in the second case, but the tax would only reduce firm profits and margins, not outputs. Fourth, when demand is perfectly inelastic but supply is not (Panel D), the entire economic tax incidence would fall on consumers as in the first case, but the tax would not reduce outputs, R&D investment, or firm

[1] For example, the ACA introduced a 40% excise tax on an unusually expensive health insurance plan (“Cadillac” insurance plan) and a 10% excise tax on indoor tanning services.

[2] The tax originally was proposed as a $4 billion annual fee to be imposed on the medical device manufacturing industry and has evolved into an excise tax after lobbying by large medical device manufacturers.

[3] More detailed information of the tax-exemption rules is available on the IRS website at https://www.irs.gov/uac/medical-device-excise-tax-frequently-asked-questions.

[4] In Fig. 1, I assume the demand curve is fixed at the time of the medical device tax incidence because the statutory incidence is on firms and also the time for the increase in demand (i.e. shift in the demand curve outward) was not exactly the same as the time of the medical device tax incidence in January 2013. For example, the ACA dependent coverage mandate, which increased the health insurance coverage and health care utilization for young adults aged 19–25 years, was implemented on October 23, 2010.

[5] Before the tax incidence, the price that consumers pay (P^{BTD}) is the same as the one that firms receive (P^{BTS}). With the decrease in output, R&D investment would decrease because it serves as input to a firm’s production.