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A Win-Win-Win? Motivating innovation in a knowledge economy with tax incentives☆

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ABSTRACT

In this study we explore effects of two distinct tax policies on innovation in a pure knowledge economy: an 'IP box' incentive and a (hypothetical) tax incentive on compensation earned by agents from profit sharing schemes (PSS). In contrast to the conventional assumption that firms decide on whether to innovate or not, we focus on a bottom-up innovation process (sometimes also called 'bootleg innovation'), where firms set incentives to fulfill different tasks, but the final decision on whether to make the more innovative task is taken by an employee. We compare the two tax incentives under several distinct specifications demonstrating that the tax incentive on PSS can be a powerful mechanism fostering innovative activity and benefiting at the same time workers, firms and the economy as a whole. This study shows that the more critical for firms is attracting and motivating highly skilled workers, the larger the expected gain from employing the tax incentive on agents' compensation. We also find that the relative efficacy of this tax incentive is moderated by labor mobility and the extent of knowledge spillovers.

1. Introduction

Innovation plays an increasingly prominent role in shaping competitive advantages of firms and countries: skilled employees generate new knowledge, which is later incorporated into better products or processes. Numerous policies have been proposed to foster innovation, ranging from regulatory reforms of the intellectual property (IP) rights (Boldrin and Levine, 2008) to tax incentives designed to obtain the maximum boost in innovation with the least loss in tax revenues. Previous tax research has paid considerable attention to tax incentives for innovation in the form of credits or deductions related to corporate income taxation (good examples are Hall and Van Reenen, 2000; Myles, 2009; Griffith et al., 2014; Gemmell et al., 2014), as these are the types of incentives most commonly used in practice. The limits of such policies have been as well highlighted: volume-based tax incentives may induce a reclassification of accounting items and lack additionality (Dimos and Pugh, 2016), while incremental incentives may entail large administrative costs and cause distortions to the inter-temporal allocation of the investments. 'IP box' incentives have gained momentum and have been adopted in several EU countries (Evers et al., 2015), however researchers have documented that IP boxes mostly cause a relocation of existing R & D activities rather than fostering domestic innovative efforts (Alstadsæter et al., 2015). The latter point also makes IP boxes unsustainable in the long run as they might trigger a form of tax competition and a race to the bottom of IP-related tax rates.

Given the aforementioned issues, the challenge is to find alternative policy designs able to stimulate innovation (while entailing small losses in tax revenues), and to compensate the behavioral distortions caused by other existing policies. The research on the link between labor income taxation and innovation, though, is not well developed. Moreover, tax incentives to innovation on the side of labor income are adopted in few countries and are also limited in extent. The tax wedge on labor income in more advanced countries is often high and, because of the progressivity of the personal income tax, is even higher for any

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increase in pay that might stem from a valuable innovation. If one considers that about 60–70% of R & D costs are used for labor (Harhoff et al., 2003; OECD, 2015), the extent to which the existing personal tax systems can be hampering innovation by making labor more costly for firms becomes clear. Regardless of the source of financing (internal cash flow, or external financing) used to support R & D outlays, the additional costs due to the combined effects of the personal and corporate taxes might restrain innovation and lead to socially sub-optimal levels of investment. Furthermore, the decision-making process in innovative firms is often complex and combines top-down with bottom-up approaches, centralized with decentralized decisions, and relevant degrees of information asymmetry between management and employees involved in technical functions. A consequence of the latter observations is that the way personal taxation affects the overall outcome of innovative efforts within companies is not immediate to foresee.

In a recent contribution d'Andria (2016a) proposed a novel (hypothetical) form of tax incentive on profit sharing schemes (PSS) based on the grounds of theoretical arguments. By PSS is meant any form of compensation to employees (e.g., direct participation to profits, bonus pay, stock options and stock grants) that links compensation to measures of company's success and, specifically, of innovation. The idea of a tax incentive on PSS stems from the empirical observations that R & D intensive firms offer PSS compensations to employees who are capable to innovate (Balkin and Gomez-Mejia, 1984; Ittner et al., 2003; Lerner and Wulf, 2007), and that inventors' pay rises on average around the time of a patent application (Depalo and Di Addario, 2014) or grant (Toivanen and Väänänen, 2012). d'Andria (2016a) demonstrated that a policy mix that includes some level of tax reductions on PSS income could better foster innovation in a setting where information asymmetry between managers and employees is a relevant issue. Another appealing property of this tax incentive is that it does require neither any *a priori* definition of what an R & D expenditure is (as it is for standard R & D tax credits and deductions), nor the innovation to be subject to intellectual property rights (as it is the case for IP box incentives). All innovations that increase the profitability of the firm can be captured by PSS monetary incentives, and as a consequence, a tax incentive on PSS is capable to affect a wider set of potential innovative behaviors. Our contribution is to study the performance of this PSS incentive and compare it with an IP box incentive under a rich set of scenarios. The flexibility of our simulation environment allows to enable a large number of market features (of special relevancy, features related to dynamic characteristics of firms' behavior) providing a large set of possible markets where the two incentives may be introduced. The aim is then to better understand under what observable conditions a PSS incentive may be a viable policy to support innovation.

The political attention to the topic has increased recently. A good example is the US presidential candidate Hillary Clinton's proposal for a Profit Sharing Tax Credit announced in July 2015, whose supposed beneficial effects are ascribed to its ability to foster innovation.[1] The proposal is motivated, among others, as PSS "makes businesses more productive and innovative. Studies find that [PSS] on the whole result in increased business productivity and innovation. This makes sense: when employees share in profits, they have a stronger stake in the company's success" advocating "a win-win situation [..] good for workers and good for business". Given that innovation and subsequent economic growth are a major concern, this study explores the possibility of a 'win-win-win' situation (for workers, business and economy as whole) modeling a design of the incentive that provides a tax reduction to employees directly rather than a tax credit to the employing company. To this end, we develop an Agent-Based Model (ABM) representing, in a stylized way, a market for product innovations made by inventors who are employed in private firms, where the latter compete to attract the best workers and offer them profit-maximizing compensation contracts. Under the assumptions of the model, a PSS-based incentive is shown to outperform an IP box incentive as a means to induce more innovations. The interactions between the PSS-based incentive and different labor mobility regimes are studied as well. Anticipating here some of the conclusions, our main result is that a tax incentive on the PSS part of employees' compensation can be a useful addition to the arsenal of policies stimulating innovative activity, particularly for those countries where the transition to a knowledge-based economy is at an advanced stage.

The paper is organized as follows. Section 2 reviews the links with existing literature. Section 3 describes the 'baseline' model, while in Section 4 we present its simulation results and gradually add complexity by allowing firms to accumulate their technological capabilities and additionally introducing R & D investments. In Section 5 we provide a quantitative assessment of the tax incentives' efficacy and Section 6 concludes.

2. Previous literature

In knowledge-intensive firms PSS compensations are offered to employees for multiple reasons. A survey done by Ittner et al. (2003) on US firms from the 'New Economy'[2] reports that one of the major reasons they offer stock options and stock grants is to attract and retain skilled staff. A similar conclusion follows from a larger sample of European firms (d'Andria and Übelmesser, 2014). PSS is used also to provide incentives to employees to participate in product or process improvements (so-called pay-for-innovation motive). The latter motive directly links the use of PSS to agent-led (sometimes also referred as 'bootleg') innovations.[3] Thus, incentives that directly affect on-the-job choices of employees may affect a company's innovative output at least as much as the incentives provided at the level of management.

Knowledge-intensive labor markets also present serious issues related to asymmetric information. As already pointed out in Acharya et al. (2013) in relation to managers in the financial sector, the ability of these employees to generate higher returns often requires time to be properly identified by employers. We argue that the same problem arises more generally with knowledge workers such as R & D managers, researchers and technical workers (also defined overall as 'technologists' in Cohen and Sauermann, 2007). When labor mobility is high (as it was for example during the 'New Economy' boom during the second half of the 1990s) or when workers' skill is qualitatively very heterogeneous due to high specialization (as in superstar models like Rosen, 1981 and Baranchuk et al., 2011), the assessment of a worker's ability becomes difficult: workers change employers often, they have lots of alternative opportunities to their current job, and the nature of fast changing technology makes it hard to properly understand and evaluate how well an employee's talent and human capital fit into the current market for ideas.

The present research allows for both pay-for-innovation and attraction motives in offering PSS. As in the superstar models, we study a market where firms compete by altering the design of the compensation packages offered to candidate employees with the double aim to attract the best workers and to motivate them once they are working for the firm. Different objectives (to attract and to motivate workers; to maximize profits) can conflict against each other, and fierce competition over talent may lead to socially sub-optimal contracts under given

[1] See https://www.hillaryclinton.com/briefing/factsheets/2015/07/16/profit-sharing/ (accessed on 2016-03-02).

[2] We adopt in the following the same definition of 'New Economy' firms used by Ittner et al. (2003): "*organizations competing in the computer, software, internet, telecommunications, or networking fields*".

[3] Ample evidence has been provided for the existence and frequency of so-called bootleg innovations meaning "research in which motivated individuals secretly organize the corporate innovation process. It is usually a bottom-up, non-programmed activity, without official authorization from the relevant management, but nevertheless for the benefit of the company" (Augsdorfer, 2005).

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