Entrepreneurial innovations and taxation

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A B S T R A C T

Stimulating entrepreneurship is high on the policy agenda of many countries. We study the effects of tax policies on entrepreneurs' choice of riskiness (or quality) of an innovation project, and on their mode of commercializing the innovation (market entry versus sale). Limited loss offset provisions in the tax system induce entrepreneurs innovating for entry to choose projects with inefficiently little risk. The same distortion does not arise when entrepreneurs sell their innovation in a competitive bidding process to an incumbent before the uncertainty is revealed. Tax systems which systematically favor market entry of entrepreneurs can thus lead to welfare losses due to inefficient quality choices, despite leading to more competition in the product market.

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1. Introduction

How to stimulate entrepreneurship is one of the pressing policy challenges facing many countries in the world today. In Europe, the European Commission (2008) launched the "Small Business Act for Europe" in response to this challenge. This document sets out a comprehensive policy framework for the EU and its member states to create an environment that rewards entrepreneurship, specifically mentioning taxation in this context. At the same time, several EU countries are reforming their tax systems to make them more compatible with entrepreneurship. In the Netherlands, for example, the 2011 Tax Plan comprises a whole set of measures explicitly aimed at encouraging entrepreneurship. Another example is Sweden, which is currently making the largest investigation of its tax system in 20 years, with the main objective of making it more conducive to entrepreneurship.[1]

One of the main reasons for the support of entrepreneurs is the important role they play in fostering 'qualitative' innovations. Cohen (2010, p. 137), who reviews the empirical literature on firms' size and R&D, concludes that small firms tend to account for a disproportionately large share of innovations, and that – where data exist – they also tend to pursue more significant innovations than incumbents.[2] A further qualitative decision taken by entrepreneurs is that they commercialize their inventions or business ideas not only by entering the product market, but also by selling them to incumbent firms. Indeed, a substantial share of inventions made by independent innovators is commercialized through the sale or the licensing of a patent.[3]

Against this background, the present paper aims to increase our knowledge about how the tax system affects these qualitative dimensions of entrepreneurship. It is well known that taxation will reduce the amount of entrepreneurial activities; see Henrekson and Sanandaji (2011) for a recent survey of this literature. However, little is known about the effects of taxes

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[1] As one of the measures already signed into law, half of the costs of buying shares in young and small firms have been made tax-deductible as of 1 December 2013. The tax-deductibility is granted up to thresholds of 1,300,000 Swedish kronors per individual and up to 20,000,000 kronors per firm.

[2] This conclusion is confirmed by Henkel et al. (2010) in a recent empirical study of the electronic design automation industry. The importance of small entrepreneurial firms in the innovation process in the United States is documented in Baumol (2004).

[3] Serrano (2010, Table 1) reports for the United States that entrepreneurs sold 17.5% of their patents during the period 1983–2001, and this share increases to 24% if the patents are quality-weighted with the number of citations received. Furthermore, a large-scale survey carried out in six EU countries suggests that roughly 10% of all patents are licensed (Giuri et al., 2007).

on either the risk-taking behavior of entrepreneurs, or on their decision of how to commercialize their innovation. Our analysis incorporates both of these decision margins and we show that they are interrelated.

In studying the effects of tax policies towards entrepreneurship, we focus on two fundamental features of existing tax systems. First, most countries provide various support schemes for start-ups and small businesses that cover all stages of the firms' development and range from initial research grants to the provision of subsidized loans and state guarantees. Financial support and cheap credit in the marketing stage are thus an important part of this policy package, in order to overcome asymmetric information in credit markets. However, entrepreneurs can typically only take advantage of subsidized loans when they enter the product market.[4] These provisions imply that many countries in Europe and elsewhere grant fiscal advantages to entrepreneurs who market their inventions themselves, rather than selling out to an incumbent firm. Depending on country-specific tax rules, further tax advantages may arise when the entrepreneurial start-up firm is incorporated and the corporate tax rate on its profits in the product market is below the personal tax rate applicable on the firm's sale.[5]

The second important feature for our analysis is that tax systems in all OECD countries incorporate a fundamental asymmetry as positive earnings are taxed immediately, whereas losses can only be offset against positive incomes.[6] The rationale for this asymmetry, which we take as given in our analysis, is to prevent tax revenue shortfalls and fraudulent claims for tax refunds. In an empirical study based on U.S. corporations for the period 1993–2003, Cooper and Knittel (2006) estimate that only about 50–60% of tax losses are used over a ten-year window, whereas the remaining 40–50% of tax losses are either never used, or are still unused after a period of 3–10 years.

Incorporated start-up firms are particularly affected by loss offset restrictions, because they cannot carry back current losses and, in many countries, are also not allowed to offset corporate losses against positive incomes taxed under the personal income tax. Small, incorporated entrepreneurs, who are developing a single business idea, will therefore often not be able claim a tax refund when they invest in a project that turns out to be unsuccessful. In contrast, restrictions on loss offset opportunities are less important for mature and diversified firms, which are more likely to be able to offset the losses against positive profits in other business lines (see Cooper and Knittel, 2006; Mirrlees et al., 2011, p. 454). Therefore, selling a start-up firm to a mature incumbent increases the likelihood that tax losses can indeed be used.

The tax and business conditions for entrepreneurs in Germany provide a good example of these effects. On the one hand, Germany subsidizes entrepreneurial market entry by business start-up grants and, in particular, by subsidized loans.[7] At the same time, the possibility (since 2008) to incorporate as an 'entrepreneurial firm' (*Unternehmergesellschaft*, similar to the *Limited Company* in the United Kingdom), has proved to be the most attractive organizational form for entrepreneurial start-ups in Germany. A central issue for entrepreneurs in Germany arises, however, from limited loss offset opportunities. In addition to the general restrictions mentioned above, a specific

feature of the German tax law is that tax losses cannot be transferred from one firm to another. This restriction also applies to venture capital firms that finance different stages of a start-up's development and it is particularly relevant for industries that incur high initial losses, such as the biotech industry. The German Expert Commission for Research and Innovation (EFI) therefore regard limitations on the tax deductibility of losses as one of the most important obstacles for the development and growth of small, innovative businesses (see EFI, 2011, p. 19).

To capture these effects, we develop a model where a European-style tax system influences the decisions of the entrepreneur to select an R&D project, and to choose the mode of commercializing the innovation. In the initial research stage, the entrepreneur chooses the quality, or riskiness, of an innovation, trading off higher returns against an increased probability of failure. The entrepreneur can then sell the project at an early stage, or keep the innovation until its success is known. The trade-off faced by the entrepreneur is that selling before the uncertainty is lifted will ensure a positive sales price, thus allowing her to deduct the initial research investment with certainty. On the other hand, if the entrepreneur keeps the project and it turns out to be successful, she can add further value to the project in the ensuing development stage. At the end of the development stage, the entrepreneur can then once again sell her project to one of the incumbent firms, or enter the product market herself.

A core element of our model is that the equilibrium sales price of the firm or patent is explicitly derived from the valuation of the risky innovation by both the incumbents and the entrepreneur. These valuations are affected by the features of the tax system described above. In particular, the entrepreneur can benefit from lower effective taxes when entering the product market, but only if the project has proven successful.

We first establish that whenever the entrepreneur enters the market in equilibrium, she will choose an innovation that involves too little risk, in comparison to the socially desirable project. This distortion arises because there is an extra cost of failing for the entrepreneur in terms of forgone tax deductions, and hence she finds it optimal to reduce the risk of being left with non-deductible investment outlays.[8] In contrast, when the entrepreneur sells her invention in a competitive bidding process before the uncertainty is revealed, she will be guaranteed a full deduction of her investment costs and hence chooses a discretely more risky project in the initial research stage.

Based on these results, we then evaluate the welfare effects of tax policies towards entrepreneurship. We find that promoting entrepreneurial market entry by means of low effective profit tax rates is indeed the optimal policy when consumers value the additional variety produced by the entrepreneur, and when the value she can add in the development stage is potentially large. In contrast, if the entrepreneur has only a small comparative advantage in developing her own innovation, then the welfare-maximizing equilibrium is one where the entrepreneur sells her project at an early stage and chooses the more risky research project. Reaching this equilibrium requires, however, that there be no substantial tax disadvantage from selling the project to an incumbent firm, as compared to product market entry. Hence, we find that discriminatory tax policies aimed at promoting entrepreneurial market entry can be counterproductive in an environment with imperfect tax loss offset, if the quality dimension of entrepreneurial innovations is critical.

Our findings are in line with recent empirical results showing that lower corporate taxes induce entry by new firms (Djankov et al., 2010; Da Rin et al., 2011), but also reduce the size and the capital intensity of the new entrants and thus lead to 'weaker' firms, on average (Da Rin et al., 2010). Moreover, our conclusions correspond to a recent stream in the entrepreneurship literature which questions policies

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[4] In the United States, for example, one of the main programs to promote small businesses is the Technological Innovation Programme (TIP), which subsidizes the commercialization of successful prototypes with up to USD 3 million. This support scheme is available only if the small or medium-sized enterprise (SME) markets the product itself, or is the leading company in a joint venture (OECD, 2010, p. 106). See OECD (2010) for a listing of similar support schemes for SMEs in all OECD states.

[5] This is discussed in more detail in Section 2.

[6] A business tax system that is neutral in the presence of uncertainty would require the government to pay a tax refund equal to the tax rate times the full value of the initial investment in case of default (Bond and Devereux, 2003). This full refundability is not granted by any OECD country, however. An early empirical analysis of the resulting tax asymmetries is Altshuler and Auerbach (1990).

[7] These loans are made by the government-owned *Kreditanstalt für Wiederaufbau* (KfW), a national development bank, as well as by similar banks owned by the German states. In 2012, the KfW alone provided a total volume of Euro 24 billion in subsidized loans to SMEs (Kreditanstalt für Wiederaufbau, 2013).

[8] Econometric studies support the result that the asymmetric tax treatment of profits and losses has significant effects on entrepreneurial risk-taking (Cullen and Gordon, 2007), as well as on firms' investment incentives (Edgerton, 2010). In a recent study, Langenmayr and Lester (2013) show that firms which are unable to use loss carryback provisions (either because they have no previous profits, or because their home country does not allow loss carrybacks) take systematically fewer risks than firms which can use loss carrybacks.