Tax Policy for Venture Capital Backed Entrepreneurship

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Abstract

Venture capital has become an important source of financing young entrepreneurial firms. Venture capital backed firms are often perceived as more innovative and as creating more value than others. Perhaps for this reason, policy makers are keen to create a good institutional framework to facilitate the development of an active venture capital industry. We explore the role of tax policy in determining the incentives of individuals to start up new firms and of venture capitalists to finance and advise them. In particular, we examine how business taxation at the company and investor level together with start-up capital subsidies affect the volume and quality of venture capital backed entrepreneurship.

Keywords

Entrepreneurship, venture capital, taxes, subsidies

JEL Classification

D82, G24, H24, H25

1 Introduction

Among new firms in high-technology industries, venture capital (VC) has become an important player, not only as a source of finance but also as a source of professional support. The firm's transition from birth of the idea to a marketable product not only involves technological experiments and development of prototypes. Acquiring new facilities, developing marketing strategies, attracting key clients and reliable suppliers, hiring new personnel, team building, and raising further financing requires managerial skills. While proficient at the technological side, start-up entrepreneurs not only lack the necessary capital, but would typically benefit from professional assistance. Seasoned venture capitalists (VCs) are well suited to fill these gaps. They have access to capital and are endowed with managerial experience and industry knowledge. They have developed a well connected network of suppliers, customers and key personnel. Indeed, the defining characteristic of VC is the combination of financing and commercial assistance. In contrast to more passive bank financing, VCs arrange for entrepreneurs to receive support by creating links to suppliers and possible customers, getting hold of key personnel, providing strategic and marketing advice and helping the professionalization of the firm.

Venture capital started out in the U.S. half a century ago and has vigorously grown since then. Almost half of new firms in the U.S. which are sold off at IPOs (Initial Public Offerings) have been backed by VC (see Gompers and Lerner, 2001). In Europe, VC emerged significantly later. Only in the most recent years have VC firms become prominent financiers of young technology firms. Statistics published by EVCA (European Private Equity and Venture Capital Association) report a total investment of 71 billion Euros in 2006, up from 10 billion in 1997 and 24 billion in 2001.[1] As in previous years, seed and start-up investment constituted only a minor part (8.3 pct. in 2006) while expansion and replacement investments absorbed 21 pct. The major part was in financing buyouts (70.7 pct.). In 2005, 5.2 pct. of total investments was allocated to seed and start-up, 26.6 pct. to expansion and replacement investments, and 68.2 pct to financing buyouts. The

[1] See EVCA Barometer June 2005 on http://www.evca.com.

EVCA statistics further reveal marked differences across countries. Sweden, U.K. and Netherlands had the largest Private Equity/VC markets in Europe (1.44, 1.26 and 1.05 pct. of GDP in 2006, respectively), while France's share was slightly above the European average of 0.57 pct. Germany and Switzerland recorded only around 0.2 pct. of GDP.

Innovation generates large social returns. Jones and Williams (1998) suggest that the social rate of return on R&D is about 30% while private returns are much lower, between 7 to 14%. These authors argue that, from a social perspective, R&D investments should be two to four times higher than what is actually observed! While VC accounts for a rather small part of total investment, it is concentrated in the most innovative sectors. Kortum and Lerner (2000) found that VC is responsible for a disproportionately large share of overall industrial innovation in the U.S. A dollar of VC appears to be about three times more potent in stimulating patents than a dollar of traditional corporate R&D. According to their estimates, VC accounted only for about 3 pct. of corporate R&D from 1983 to 1992 but was responsible for about 8 pct. of industrial innovation in this decade. Given an unchanged potency of venture funding, VC investments should have accounted for about 14% of U.S. innovative activity in 1998. Policy makers and the business community have thus taken a strong interest in healthy conditions for financing new firms, and in the development of an active VC industry in particular. Young VC backed firms are considered an important source of innovation and growth. Several important questions arise when developing a policy perspective. Is there enough risk capital available? Do administrative procedures and requirements hinder entrepreneurship in the first place? Are government grants and subsidies to new firms appropriate? Do taxes block the creation and development of start-ups? Do taxes deter the support and advisory effort of VCs to their portfolio companies?

The VC industry itself considers public policy to be relevant and keeps an eye on whether the policy environment is suitable to promote the development of private equity and VC markets and to encourage entrepreneurship. For instance, EVCA in 2003 and again in 2004 published a benchmarking report on the tax and legal environment in its

member countries (cfr. EVCA, 2004). The assessment evaluates 13 indicators relating to both the supply-side (i.e. investors in private equity and VC funds and fund managers investing directly in companies) and the demand-side of private equity and VC (i.e. creation of entrepreneurial firms). Among the tax indicators covered are (i) company tax rates, with special attention to those applicable to small and medium-sized companies; (ii) capital gains tax rates for individuals; (iii) income tax rates for private individuals; (iv) tax incentives for individual investors investing in private equity; (v) the entrepreneurial environment; and (vi) fiscal incentives to enhance research and development.

The EVCA benchmarking report defines a favorable tax environment by the following criteria: (i) Company tax rates, especially for small and medium sized enterprises should help to support entrepreneurship. (ii) A favorable tax treatment of the sale of unquoted investments in growth companies should strengthen the incentive to entrepreneurial investment. (iii) Income tax rates for private individuals should support, attract and retain human capital, in particular entrepreneurs, researchers and highly qualified company managers. (iv) Tax incentives should be adopted for individuals investing in private equity funds. (v) Fiscal R & D incentives should be adopted.

The benchmarking report reflects a firm belief that taxes matter for entrepreneurship. Empirical research in public finance indeed testifies to the importance of taxes for entrepreneurship. For example, Rosen (2005) in summarizing his research with a series of co-authors produces ample evidence that once started, the decisions in new firms regarding employment, capital investment and production are markedly influenced by taxes. Gentry and Hubbard's (2000) empirical analysis demonstrates that the progressivity of the tax schedule is important for entrepreneurship. They argue that the progressivity of the income tax acts like a success tax that taxes successful ventures generating high incomes at particularly high rates and thereby significantly reduces the probability of entrepreneurial entry. Gordon (1998) and Cullen and Gordon (2007), on the other hand, argue that high personal tax rates could actually encourage entrepreneurial activity when individuals are able to exploit the option to incorporate. The argument is that entrepre-

neurs would choose to be noncorporate in the early stage when the business makes losses. They would then save taxes by offsetting these losses against other personal income. Once the business starts to record profits, an entrepreneur prefers to incorporate in order to exploit low corporate taxes. According to this view, high personal income tax rates can thus encourage entrepreneurship because they imply high tax savings from offsetting losses in the early phase. Boadway and Tremblay (2005) offer a broad overview of the theoretical public finance literature on entrepreneurship and examine various rationales for policy intervention with respect to start-up entrepreneurship.

Apart from this public finance literature on entrepreneurship, there is little theoretical or empirical work on the effects of public policies on VC financed entrepreneurship. Exceptions are a couple of contributions by Poterba (1989a,b) and Gompers and Lerner (1998). These authors find some evidence of a moderately negative effect of the capital gains tax on VC investments and fund raising. Capital gains taxation tends to depress demand for VC by discouraging entrepreneurial entry. Since the entrepreneur's income from starting a firm mainly consists of capital gains earned in the start-up period, the capital gains tax makes VC backed entrepreneurship less attractive relative to dependent employment. The capital gains tax can also importantly affect contracts. Cumming (2005) found for Canada that a lower capital gains tax can significantly increase the use of convertible preferred equity. The capital gains tax can also hamper fundraising since investors' returns mainly consist of capital gains as well. In addition, Gompers and Lerner (1998) found that liberalization of pension fund investment regulations is an important source of new capital and can thereby stimulate the expansion of the industry. More recently, Da Rin, Nicodano and Sembenelli (2006) have found that the corporate capital gains tax hurts VC investments in Europe, in particular for early stage investments.

None of this empirical literature has actually been able to identify how taxes might change the relative performance of VC-backed compared to other firms by affecting the incentives of VCs to provide support and add value to their portfolio companies. Our own previous theoretical work has aimed to shed light on how exactly taxes as well as

subsidies can affect the number of VC-backed firms and the incentives of entrepreneurs and VCs to exploit the full potential of these firms (see Keuschnigg, 2003, 2004a-b, and Keuschnigg and Nielsen, 2003a-b, 2004a-b).

The effectiveness of subsidies to capital and research investments of young firms has been investigated empirically by Lerner (1999) and Wallsten (2000), among others. These authors conclude that programs such as the Small Business Innovation Research (SBIR) program in the U.S. can significantly raise the growth of awardee firms compared to other matched firms. This superior performance was confined to awardees in areas with substantial new firm creation. Wallsten found significant crowding out effects although he too argued that the program could help firms to attract additional private funding. The program might thus have a certification role in the sense that participation in the program makes firms more likely to attract additional venture financing. Our theoretical analysis yields an ambiguous conclusion on the desirability of such subsidies. Although successful in boosting the rate of business creation, start-up subsidies may in fact reduce the quality of VC backed entrepreneurship.

This paper synthesizes own previous theoretical research and informally discusses the consequences of selected taxes and subsidies such as those emphasized by the EVCA benchmarking report mentioned above. They are relevant at different stages of the firm's life-cycle. We explore how they impact on the quantity and quality of VC financed entrepreneurship. In particular, we examine a subsidy to start-up investment representing the various investment grants, interest subsidies, and subsidies to capital expenditure in research and development which are prevalent in many countries. We explore the taxation of capital gains in new firms when sold off to new investors, the taxation of wages in occupations alternative to the pursuit of an entrepreneurial career, and corporate income taxation. Our analysis indeed shows that a limited focus on the taxation of small early stage firms cuts too short. The taxation of mature firms might be as important for start-ups as the direct taxation of infant companies. Corporation and dividend taxes may well reduce entrepreneurship even though these taxes are typically paid only by mature

companies rather than young ones. The basic insight is that taxes which reduce the value of mature firms thereby diminish the gains from setting up new companies as well.

The main results reported in this paper concern the effects of taxes and subsidies. Most real world policies towards young firms subsidize the cost of capital from start-up investment. We find that these subsidies are indeed effective in stimulating entrepreneurship but are questionable from a broader welfare perspective because they are not useful to stimulate effort and VC support and therefore do not help improve the quality of entrepreneurship, as indicated by the success probabilities of start-up companies. More appropriate would be a temporary reduction in success taxes, such as capital gains, dividend and corporate taxes, which are paid only if the company survives to the mature profit generating state. It would be important, of course, to limit the tax priviledge to the innovative part of start-up companies. A reduction in success taxes with the same present value of lost tax revenue is more suitable to sharpen incentives and boost survival rates of young innovative firms. We discuss other alternatives for tax policy as well.

Section 2 reviews the empirical evidence on the value added role of VC firms. It then illustrates at which stages of a firm's life-cycle taxes become relevant. The largest part is devoted to discuss the likely impact of taxes on the quality and quantity of VC backed entrepreneurship. Section 3 discusses how the effects of tax policy would have to be qualified in the presence of firm heterogeneity and adverse selection, and when start-up firms have a choice between bank and VC financing. Section 4 shortly refers other important areas of public policy beyond taxation. Section 5 summarizes.

2 Start-up Activity and Venture Capital Financing

2.1 The Value Added of Venture Capital

The main policy interest is in the rate of business creation and the quality of VC financing. In Keuschnigg and Nielsen (2006) and earlier own work, we have analyzed the

effects of taxes and subsidies on the survival probability of start-ups, IPO prices, capital investment of mature firms, and overall welfare. We have concentrated on the relationship between a wealth constrained entrepreneur and a VC firm that must pay for the new firm's physical investment expenses. The firm's success rests on the entrepreneur's effort and due diligence (see the empirical results reviewed in Rosen, 2005). It also reflects the VC's engagement and contribution to the firm (Gompers and Lerner, 1999, Hellmann and Puri, 2000, 2002, or Bottazzi, Da Rin and Hellmann, 2007, among many others). The main functions of VC financing consist of screening, contracting and advising (see Kaplan and Stromberg, 2001, for a concise statement of the stylized facts and Kaplan and Stromberg, 2003, 2004 for detailed empirical evidence). VCs carefully screen and select business plans. They have developed sophisticated financial instruments and contractual arrangements to alleviate the problems resulting from informational asymmetries. They add value by establishing contacts, giving strategic business advice, and generally helping in the professionalization of young firms.

There is substantial empirical evidence on the value added role of VCs. Hellmann and Puri (2002) show that VC backed start-ups in Silicon Valley are much faster in introducing stock option plans for high skilled personnel and in hiring a professional sales manager. Also, the presence of a VC makes it more likely that the entrepreneur is replaced by a professional CEO from outside if her lack of managerial abilities turns out to be an impediment to the firm's rapid growth. The VC's influence is particularly strong in the early phase of business development when the informational problems are the largest, but becomes insignificant later on when the firm has successfully matured. In short, the VCs add value and raise the likelihood of success by promoting the professionalization of young firms. Hellmann and Puri (2000) show that VC-backed firms introduce more radical innovations and pursue more aggressive market strategies compared with other start-ups. For example, once a VC joins the firm and provides finance, the probability of introducing the new product on the market jumps up by a factor of more than three! Rapid market introduction is strategically important because the first firm in the market enjoys a first mover advantage.

Part of this superior performance of VC backed firms might result from VCs being able to locate more profitable firms than other investors, rather than adding value. The issue of selection versus value added has been empirically investigated by Sorensen (2006). He finds important sorting effects in the sense that the most experienced investors get the best deals. The probability of success of a firm financed by the most experienced investor in his sample is 39 pct. which compares with only 15 pct. of firms financed by the least experienced investors. These findings are in line with Bottazzi, Da Rin and Hellmann (2007) who also emphasize human capital of VCs, showing that more experienced VCs are significantly more involved with their portfolio companies and are able to generate larger returns on exit. The results hold when controlling for sorting effects. Sorensen (2006) further reports that sorting (the best investors getting the best deals) explains 58 pct. of this increase in success probability while the investor's influence explains 42 pct. Although ignoring sorting and selection effects leads to overestimation of the degree of investor influence, the value increasing role of VC financing remains a very important one. The impact of tax policy on the interaction between VCs' selection and value added activities is postponed until Section 3.

The productive contribution of VCs to business growth is not a guaranteed matter, however. Apart from investor experience, it may also rest on the existence of appropriate incentives on the part of the financier. Indeed, the empirical evidence on the impact and value added of VC is less clearcut in Europe than in the U.S. (see Bottazzi and Da Rin, 2002, for a skeptical view while Audretsch and Lehmann, 2004, arrive at a more positive picture). Finance theory has addressed VC incentives in terms of a double-sided moral hazard problem, where both the entrepreneur and VC must exert effort in the company (see Holmstrom, 1982; Aghion and Tirole, 1994; Casamatta, 2003; Inderst and Mueller, 2004; Repullo and Suarez, 2004; Schmidt, 2003; and our own previous work mentioned above). Since neither party's effort is verifyable and contractible, the VC contract must be carefully crafted to provide appropriate incentives to both the entrepreneur and VC. In focussing on the real effects of VC in industry equilibrium, we postulate a particularly simple model of the entrepreneur's and VC's interaction. In this framework, a Pareto-

optimal contract allocates profit shares depending on each partner's importance for the firm's success. The contract can be implemented as straight equity.

2.2 Rationales for Public Policy

The rationales for public policy towards start-up companies are essentially based on two main arguments: (i) knowledge spillovers from new firm creation; and (ii) financing problems of young firms. The main policy interest in entrepreneurship and VC financing is that young firms are more innovative than large mature corporations, and that VC financing can magnify the commercial potential of innovations. Among young firms, VC financed firms tend to be more radical and aggressive in their innovation strategies (see empirical evidence in Hellmann and Puri, 2000, and Da Rin and Penas, 2007, at the micro level) and are thus responsible for a disproportionately large share of industrial innovation (Kortum and Lerner, 2000, at the industry level). Young entrepreneurial firms and a vibrant venture capital industry are thus considered an important engine of growth. The analysis in Keuschnigg (2004b) within an endogenous growth framework is in this spirit. The potential for technological spillovers from launching new products is a prime motivation for fiscal relief to encourage entry of new innovative firms. The argument is that entry subsidies could help to internalize the technological spillovers to the rest of the economy and thereby reward innovators for these social returns to entrepreneurial activity. However, the analysis in Keuschnigg (2003) shows that this does not create a case for up-front subsidies to the cost of capital. Quite to the contrary, any given government budget allocated to encourage start-up activity of innovative firms should be used to give success dependent rewards, such as corporate tax relief or even an output subsidy. This leads us to the second rationale for public policy towards start-up companies which is related to financing problems of young firms.

When starting a company with potentially large growth prospects, the founder is typically wealth constrained. The investment needs by far exceed personal resources. The financing frictions result from the need of external capital. The repayment to external

investors takes away from the residual profit that the entrepreneur can keep in case of success and which determines her incentives to put in effort and due diligence. The more external financing is required, the more an entrepreneur must repay, and the larger the incentive problem is. Survival rates will be too low from a social perspective since the entrepreneur will have to bear the entire private effort cost but can keep only part of the returns to effort. The problem is particularly severe in VC financing because not only the entrepreneur's effort but also the VC's willingness to actively engage are a matter of incentives. Previous theoretical work has identified the double moral hazard in the relationship between the entrepreneur and the VC as a source of inefficiency while all other behavioral margins such as occupational choice and entry are free of distortions.[2] Since efforts are assumed not verifiable and not contractible, neither the entrepreneur nor the VC is able to commit to first best effort levels. They choose their inputs according to their own private return, even though each separate contribution to the success of the company benefits all stakeholders simultaneously. Repayment to the external VC investor requires that both agents must share the return on their effort within the team, but must fully bear their own private effort cost, implying that effort and VC advice tend to be too low.[3] In consequence, welfare is positively related to marginal increases in effort and advice. Even small taxes can give rise to first order welfare changes. To obtain welfare gains relative to the laissez faire equilibrium, one must look for policies that boost entrepreneurial effort and VC support rather than entry. In our framework, policy should not so much focus on the quantity but rather on the quality of VC financing.

Within our theoretical framework, the contract specifies that the VC acquires a profit share for a price that covers at least the physical start-up costs. The contract must also be sufficiently generous to compensate the entrepreneur for her foregone alternative career opportunities. The agreed profit sharing is chosen to optimally allocate incentives

[2] We postpone discussion of excess entry due to cross-subsidization of heterogeneous firms to section 3 and concentrate here on the need to strengthen incentives for effort and VC support.

[3] Such incentive problems in teams have been first analyzed by Holmstrom (1982) and were applied, among others, by Aghion and Tirole (1994) to analyze output of innovation teams.

to the entrepreneur and VC in order to maximize the joint surplus to be divided among them. Although profit sharing is Pareto-optimal among the members of the team, it nevertheless implies that each party is able to appropriate only a share of the marginal gains from putting forth extra effort while she will have to bear the entire private cost of doing so. For this reason, entrepreneurial effort and VC advice tend to be too low compared to a socially efficient allocation, resulting in an overly high failure rate among start-ups. We first abstract from any possible capital market distortion with respect to the rate of business creation that might result from cross-subsidization and adverse selection when firms are heterogeneous. The literature on firm heterogeneity has been very skeptical towards policies that simply aim to promote the rate of business creation. In fact, it often argues for a tax rather than a subsidy to entry (cfr. De Meza, 2002; see also the discussion in Cressy, 2002, and Parker, 2003).[4] From a normative point of view, our analysis does not support a strong case for policies to accelerate business creation but rather argues for better quality of start-ups. A better quality reflects improved incentives for entrepreneurial effort and VC support and is felt in a lower failure rate among start-up firms. Policy should not aim at more but rather more successful VC backed firms. There is a quality-quantity trade-off.

How robust is this bias towards low entrepreneurial effort and managerial support which contributes to lower quality of VC financing? Our assumption that the VC and entrepreneur jointly determine the success probability and must exercise effort simultaneously, is important. Schmidt (2003), for example, assumes sequential efforts where in a first phase only the entrepreneur's effort is required while in a second stage the further increase in the value of the firm depends exclusively on the VC's managerial input. With this sequential effort choice, Schmidt (2003) is able to explain the use of convertible debt. In particular, he shows that convertible securities serve to obtain a first best outcome in his framework. While convertible debt is certainly a more flexible financial instrument and may allow parties to attain a superior outcome relative to straight equity finance,

[4] Cross-subsidization leads to excess entry while the existence of innovation spillovers implies too little entry. One might expect that the two distortions are largely offsetting.

the first best result hinges critically on the fact that efforts are never required simultaneously but only sequentially, see Schmidt (2003, section III.G). Different from Schmidt, we stress the fact that the entrepreneur's effort is critical throughout the company's life. In reality, most business failures are ultimately due to some entrepreneurial management mistake. When the joint efforts of entrepreneur and financier overlap and are required simultaneously, the possible advantage of convertible securities relative to (mixed) equity contracts is reduced. In this case, the basic inefficiency noted above emerges again.

Real world VC contracts contain, of course, many additional elements such as staging and syndication of venture capital investments (Lerner, 1994; Cornelli and Yosha, 2003) or the use of control rights (Hellmann, 1998; Gompers and Lerner, 1996). The extra contractual flexibility should make VC contracting more efficient in reality. However, these non-monetary incentives may be considered more like complements rather than substitutes to the financial incentives (see Hart, 2001). Neglecting them in our analysis should thus not affect the basic policy conclusions.

2.3 Alternatives For Tax Policy

Figure 1 illustrates a stylized model of young and mature firms. The typical events during the life-cycle of a young firm unfold from left to right. The government defines a policy environment, consisting of the policy instruments listed at the bottom of the Figure. From the perspective of the entrepreneur, starting a firm is an occupational choice problem. It is assumed that entrepreneurs can always pursue an employed career. Entrepreneurship is worthwhile only if it promises a higher present value of income. A high relative tax burden on labor compared to cumulative capital income taxes, consisting of corporation tax as well as dividend and capital gains taxes on the personal level, favors entrepreneurship.

An entrepreneur must first undertake a 'seed investment' to turn her idea into a project and develop a business plan which can be presented to a financier. Often, this limited seed investment is financed from own resources, family, business angels etc. When the business idea is innovative and the young firm thus promises high growth prospects, own equity

will be far from sufficient to finance expansion investment to fully exploit the growth potential. The firm must thus approach an external investor. However, the entrepreneur typically needs more than just money. His experience at this stage is often mainly with technical product development rather than the management of a growing company. The firm thus needs both money and managerial advice and will ideally be able to enlist VC financing. Experienced VCs can help with industry experience, managerial know-how, a network of contacts and can give strategic business advice. Their incentives to engage with the firm depend on the resources at stake.

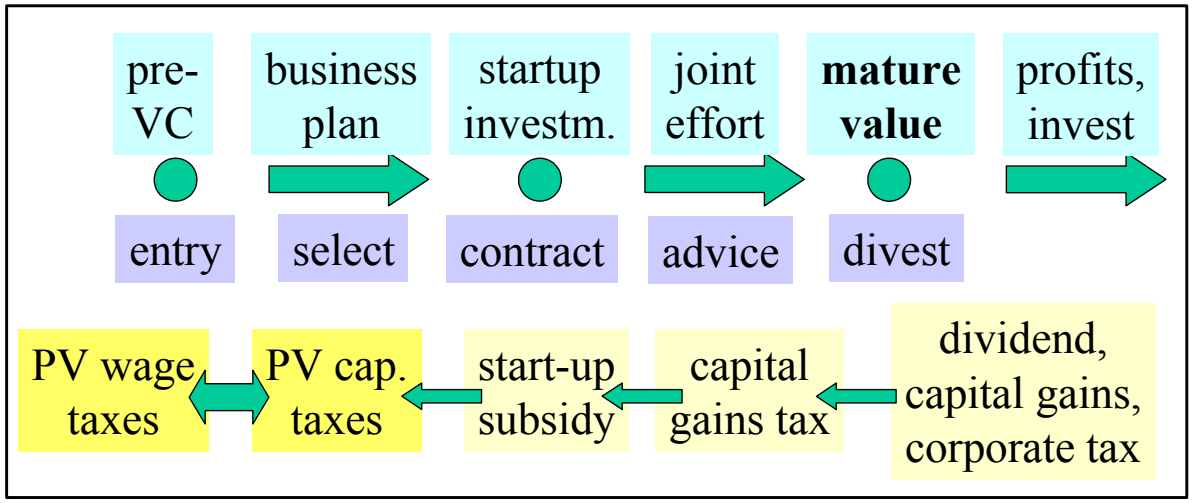

Fig. 1: Taxes and the Venture Capital Cycle

The possibility to force value increasing decisions also depend on additional control rights and other features that make VC contracts much different from straight debt financing by banks (see, Kaplan and Strömberg, 2003, 2004). Often these additional covenants are complements to the allocation of cash-flow rights in a VC contract. The contract stipulates that the VC firm acquires a profit share and pays a price that covers at least the private start-up investment cost net of a possible government subsidy. The contract is optimally designed to allocate incentives for entrepreneurial effort and the active engagement of the VC to promote the success chances of the firm. In particular, the VC's stake assures her incentives to provide managerial support and must be large enough to break even on the financing. The contract must also be sufficiently attractive to induce the entrepreneur to give up the alternative career. The amount of external financing to be

raised is reduced by a subsidy on start-up investment. Note that these subsidies are given before success is realized. They are thus independent of success which undermines incentives. This subsidy in our framework captures in a simple way the numerous government programs to subsidize start-up entrepreneurship, such as direct investment tax credits paying for part of the investment cost, subsidized interest for small businesses, credit guarantees etc. Public credit guarantees, at a cost to the government in case of failure, allow banks and investors to charge lower interest than would otherwise be possible.

The venture is risky. Both the entrepreneur and the VC must put in effort to enhance survival chances. The likelihood of success, $p = p(e, a)$, depends on entrepreneurial effort e and VC advice a. Efforts are non-contractible and create intangible costs. While entrepreneur and VC must fully bear their own costs, they share the return to effort. In other words, there is a double sided moral hazard problem. The need to share the returns to effort leads to underinvestment, resulting in too high failure rates. In any case, if the firm's product is successfully launched and production is started, the firm can be sold to new investors, possibly in an IPO on a stock market for young technology companies. At that point in time, when the VC firm divests and the entrepreneur realizes part of her stake, the capital gains tax kicks in and cuts into the privately earned gains during the start-up period.[5] If it fails (with probability $1 - p$), the firm is shut down without any revenue whatsoever. After all, the financing of new firms with a product not yet tested on the market is one of the most risky forms of business investment. When firms successfully mature to production stage, they start to earn positive profits that are subject to corporation tax. The corporate tax together with depreciation rules and other provisions in the tax base such as interest deductibility, immediate write-offs, tax treatment of research expenditures etc. influence the further growth of mature firms.

It is important to note that corporate taxes and dividends and capital gains taxes on the investor level all reduce the private value of companies, independent of their implica-

[5] For simplicity, we assume complete loss-offset in capital gains taxation. The consequences of incomplete loss-offset is analyzed by Keuschnigg and Nielsen (2003b).

tions for mature firms' investment. These taxes, although not paid during the start-up period but only much later, do have an important negative impact on start-up activity and incentives in the early stage of business development. They reduce the company value which can be expected when starting a business and putting in effort to enhance survival chances. After all, the potentially high gains in wealth are the primary motivation for entrepreneurial activity and the engagement of external investors. It's not only the capital gains tax which is relevant for venture capital backed entrepreneurship.

2.4 Tax Policy and the Venture Capital Sector

There is a general pattern how taxes impact on VC backed entrepreneurship. Any tax that must be paid when the firm already generates profits, reduces mature firm value. Since this value is the reward to effort and entrepreneurship, taxes on mature firms thereby discourage effort by both entrepreneurs and VCs. Being anticipated at an earlier stage of business development, taxes levied on mature firms should thus lead to lower success probabilities and contribute to higher failure rates. Both the reduction in mature firm value, and the reduced chances of business survival, reinforce each other to reduce the *expected* value of a newly created firm and thereby discourage entrepreneurship. The following analysis will emphasize intuitive explanations. For a more formal analysis of the proposed policy experiments we refer to Keuschnigg and Nielsen (2004b,c).

2.4.1 Wage Tax

The rate of business creation depends on the expected capital income by starting one's own firm relative to the entrepreneurs' alternative career prospects. For this reason, wage taxation is quite relevant for start-up activity as the empirical literature mentioned in the Introduction emphasizes. The wage tax exclusively influences the occupational choice decision, see Figure 1. In reducing the opportunity cost of entrepreneurship, it stimulates entry of new entrepreneurs. If a high tax load on labor relative to capital

income, as in countries with a dual income tax such as the Nordic countries, strongly boosts real entrepreneurship, new firms might possibly start to compete down prices in their specialized market segments so that the value of a mature firm declines. This value being the reward for effort during the start-up stage, the tax might even discourage effort and lead to higher failure rates. Simply pushing agents into entrepreneurship might not be a good policy because it would only lead to more start-up firms but a lower quality of them as reflected in an excessive failure rate. If this happened, more entrepreneurship would reduce efficiency and welfare because effort tends to be too low already in the untaxed market equilibrium.[6]

The mirror image of this result is that low capital income taxes increase entrepreneurship. However, part of it may only be motivated to convert highly taxed labor income into lightly taxed capital income (Gordon, 1998, Crawford and Freedman, 2007). This income shifting has lead to substantial losses in tax revenue in some Nordic countries with a dual income tax regime (Sorensen, 2005). However, tax shifting may be less of a problem with innovative, VC backed firms in search of large growth opportunities.

2.4.2 Corporate Tax and Investment Allowances for Mature Firms

The corporate tax kicks in when firms have already reached the production stage and generate profits. A first policy effect is that the corporate tax impairs expansion investment and diminishes output and size of a mature firm. The tax reduces the present value of after tax profits and, thus, mature firm value. The value reducing effect is independent of whether the tax impairs mature firm investment or not.[7] The reduction in firm value, like other diminished prospects for business growth, erode the incentives for effort and active involvement of VCs during the earlier start-up stage. After all, the return to effort and VC advice is the value created by these costly activities. When less is at stake, effort

[6]The problem is exacerbated in the presence of adverse selection where the marginal projects are cross-subsidized and are socially not viable.

[7]This is simply a consequence of the envelope theorem.

is not worthwhile to the same extent. In consequence, a larger share of start-ups will fail. The higher rate of business failure further reduces, beyond the reduction of mature firm value, the *expected* value of starting a firm. In consequence, entrepreneurs with business ideas at the margin of profitability who would have started a firm in the absence of tax, will no longer do so when taxes cut into future profits. All else equal, the corporate tax discourages business creation and entrepreneurial entry. It also contributes to higher failure rates because it discourages effort during the start-up stage.

The corporate tax might reduce economic efficiency on three fronts. First, by discouraging mature firm investment, the tax reduces private firm value by more than it adds to the present value of tax revenue that becomes available to finance government spending. The corporate tax thus involves an excess burden or deadweight loss like any other tax which discourages private activity in one form or the other. Second, in reducing firm value, the corporate tax is likely to magnify financing frictions. By reducing entrepreneurial effort and managerial VC advice, the corporate tax leads to a first order welfare loss since efforts are already too low and the rate of business failure too high in the market equilibrium. This first order welfare loss is much more severe than the tax distortion of mature firm investment which results only in a second order welfare loss and would thus disappear for small taxes. Third, given the above average innovation potential of young VC backed firms, the loss in aggregate innovation will not be made up by increased innovation of established firms. The corporate tax is thereby likely to reduce the rate of innovation and economic growth. In view of the knowledge spillovers created by new firms, entry of new innovative firms is too low even in the absence of taxes. If there are important external effects from private innovation activity, the tax again reinforces a preexisting market distortion and is therefore particularly harmful. There are thus two additional reasons which raise the cost of the corporate tax beyond the usual deadweigth loss that is associated with other taxes as well. In consequence, the effects of the corporate tax on VC backed innovative entrepreneurship are particularly harmful.

The impact of the corporation tax on size and value of mature firms depends impor-

tantly on depreciation allowances for investment. Depending on tax depreciation rules, different systems are possible. For example, a cash-flow tax allows for immediate expensing of investment outlays and is neutral with respect to (mature firm) investment. It results in a *marginal effective tax rate* on expansion investment equal to zero. In this case, the user cost of capital is independent of the tax rate. However, the *average effective tax rate* of the cash flow tax (i.e. the share of corporate income paid in tax) remains strictly greater than zero since it continues to tax economic rents unrelated to the returns on marginal investments. The tax burden is capitalized in a lower firm value. In reducing the IPO price, the cash flow tax does distort against discrete start-up investment. It also impairs the incentives of entrepreneurs and VCs and thereby contributes to more frequent business failure. Given that joint efforts are already too low from a social perspective, the cash flow tax diminishes welfare and efficiency as well.

Consider now a move towards a more favorable tax depreciation or tax allowance for expansion investment, keeping the statutory tax rate constant. A more generous allowance promotes expansion investment and, by reducing the average effective tax rate, boosts firm value. Given a larger value to be realized at IPO, entrepreneurs can expect a larger surplus from business creation and will accordingly start businesses more often. At the same time, the expectation of larger IPO values invigorates the joint effort in the start-up phase and contributes to improved survival rates, i.e. a better quality of VC backed investments. Given that joint effort is too low initially, the tax allowance results in a first order welfare gain. Note also that, in a cross section of firms, a higher survival rate also implies a larger share of mature firms relative to young firms.

2.4.3 Dividend and Capital Gains Taxes

At the investor level, corporate income can accrue either as dividends or capital gains and is subject to personal taxes. A young growth company, be it VC financed or not, will typically not pay dividends during the start-up phase since cash-flow, if there is one at all, will be needed to finance further investment before acquiring additional external financing.

Once firms have survived to a mature production stage and have accumulated a large enough capital stock, they will start paying dividends. Dividend payments are typically observed only at a more mature stage when the VC firm has already exited by means of an IPO, management buy back or sale to another firm. The fact that start-up firms are usually not paying dividends does not mean, however, that dividend taxation wouldn't be relevant for their performance. Quite to the contrary. Capitalization of dividend taxes paid during the mature stage reduces firm values, irrespective of whether there is any impact of dividend taxes on mature firm investment or not.[8] Lower firm value depresses effort and survival chances at earlier stages, and eventually reduces entrepreneurship. Except for the potentially different impact on value and size of mature firms, the effects on business creation and survival rates during start-up phase are qualitatively the same as for the corporate tax.

The capital gains tax is generally believed to be the most relevant tax impediment to VC financed investments, the reason being that the return to investment both to entrepreneurs and VC firms mostly accrues in form of capital gains during the start-up period. It would be seriously incomplete, though, to limit attention only to the capital gains tax. The size of the capital gains is determined by the value that is realized whent the VC firm divests, by IPO, acquisition, buy back or write-off. The value of the firm at this stage depends on future profits net of taxes if the company didn't fail already before the transition to the mature state. Since corporate and dividend taxes are capitalized into firm value, they reduce the capital gains that can possibly be created during the start-up phase. The focus in the VC literature on the capital gains tax is much too narrow.

However, *given* a mature firm value expected in case of success, the immediate effect of a capital gains tax on young firms is to subtract from returns to effort. The tax thus

[8] There is an unresolved debate about whether mature firms, in response to dividend taxes, reduce investment or not (new versus old view of dividend taxation). A general consensus seems to be that dividend taxes do not distort investment of large, mature firms which can finance their investments fully with retained earnings, but they reduce investment by young and growing firms. This is precisely what our framework implies for VC financed growth companies.

discourages entrepreneurial effort and managerial advice and consequently results in a higher failure rate among start-ups. The capital gains tax thus directly reduces the value that is expected when the business is started. The expected value from entrepreneurship is further reduced because the tax also diminishes survival rates by discouraging effort and active VC involvement. One should thus observe a lower number of VC financed start-ups, and an even larger reduction in the number of mature firms since more firms are eliminated during the start-up phase. Given that entrepreneurial effort and managerial VC support already tend to be too low in market equilibrium, this discouraging effect is particularly harmful. The tax leads to a first order welfare loss.

We have assumed full loss offset in capital gains taxation. The results on the capital gains tax are robust to restrictions on loss offset. Interestingly, the loss offset limitation can itself strengthen incentives for VC support in that the tax penalty arising from a limited loss offset makes business failure more costly (Keuschnigg and Nielsen, 2003b).

A lower capital gains tax might stimulate fund inflows by individual investors but less by tax exempt institutions such as pension funds. The empirical literature (Poterba, 1989a,b, and Gompers and Lerner, 1998) finds that the capital gains tax mainly affects entrepreneurial entry rather than fund inflows. Our theoretical framework thus starts from the presumption that fund raising is not a limiting factor. In fact, there might be too much money chasing too few attractive investments (Gompers and Lerner, 2000). If at all, VC financing is probably constrained by the possible shortage of management skills and entrepreneurial know-how required in VC investing (Bottazzi et al., 2007, or Gompers et al. 2006), rather than a shortage of funds.

2.4.4 Subsidies to the Cost of Capital

Many real world policies to encourage business creation allow for direct subsidies to investment spending. A subsidy to the cost of start-up investment is largely unrelated to firm performance ex post. For any given level of private investment, a subsidy reduces the volume of upfront financing needed to start the firm. With smaller repayment, the

entrepreneur extracts a larger present value from the project which encourages entry. Since a subsidy paid upfront is independent of actual success of the company, it fails to strengthen incentives for effort and VC involvement. It thus stimulates quantity without improving the quality of entrepreneurship, i.e. the success rate among new firms.

If the subsidy were very successful in stimulating entry of new firms in a market with limited size, it might actually erode output prices and thereby reduce the value for each company. If this were to happen, there might be an undesirable side effect of start-up subsidies because lower values impair incentives and undermine the fitness of companies. In this case, subsidies would increase quantity but reduce quality of VC backed entrepreneurship. In short, the more successful these subsidies are in stimulating entry, the more likely should be the decline in venture returns and the stronger the negative welfare consequences of reduced effort. In the absence of any important knowledge spillovers from new firms, there would be no welfare gains from stimulating entry, leaving a first order welfare loss from reduced incentives. In case of innovation spillovers, a higher rate of entry would be desirable but the associated welfare gains would be reduced by negative feedback effects on effort.

If the subsidy were conditional on the innovation content of the project, meaning that government agencies actually provide screening services, it might be effective in certifying the firm's innovation potential to external investors and thereby boost the chances of obtaining VC financing. The Small Business Innovation Research (SBIR) in the U.S. is of this kind and was shown to significantly raise the growth of awardee firms compared to others (see Lerner, 1999, and his review in 2002). Wallsten (2000) found significant crowding out effects although he too argued that the program could help firms to attract additional private funding.

2.4.5 Welfare Improving Tax Policy

The welfare results on the capital gains tax (or also dividend or corporation tax) on the one hand and the start-up subsidy on the other suggest the following policy strategy that

would countribute to a more active VC industry, yet avoid a high cost to the tax payer. Impose a tax, instead of a subsidy, on start-up investment cost and use the proceeds to finance a narrow tax break on capital gains or profits to young VC backed firms. Since the entrepreneur is wealth constrained, the start-up tax must be financed by the VC who should have no difficulty in raising capital and who will share the tax subsidy with the entrepreneur when the venture succeeds. Being self-financed, the policy provides a *net tax or subsidy equal to zero* and therefore neither encourages nor discourages entry. However, the reform would make taxation of firms more front loaded, meaning that the tax burden becomes relatively higher at an early stage while it falls at a later stage of a firm's life, without changing the present value of taxes paid.

Since a low tax burden late in the firm's life-cycle increases the value of firms at a mature stage, it magnifies the expected capital gains accruing during the start-up stage and increases the reward to effort. The reform would thus contribute to a more active style of the VC industry without throwing more money at it. The key rationale for this policy is not to stimulate entry, but to sharpen incentives and thereby contribute to a higher survival rate. However, recall again that the policy shifts the tax burden from late to the early stage of a business without changing the present value of net taxes for a given success probability. If, as a result of increased effort, the success probability of firms rises, the expected present value of the company at its creation must also increase. It should thereby weakly stimulate entrepreneurship as well. On account of a higher survival rate, the policy will boost even more so the number of mature firms which are successfully competing in the product market. Innovation spillovers presumably do not depend on the number of firms started but on the numbers that actually make it to the mature product market stage. The more firms survive out of a given number of start-ups, the more new products and services are successfully introduced, and the larger the knowledge spillovers. The policy will thus boost aggregate innovation, mainly on account of higher survival rates which is reinforced by induced entry. This policy was formally shown to boost the equilibrium growth rate in an innovation based growth model in Keuschnigg (2004). It brings about a welfare improvement for two reasons: it encourages effort and active VC

support, thereby raising survival rates. And it boosts knowledge spillovers and innovation based growth.

Our conceptual model in this section essentially implies that public policy should not aim at more, but at more successful VC backed firms. Policy should not aim at the volume, but at the quality of VC investments. This conforms quite well with the conclusions of Bottazzi and Da Rin (2002) and Hege et al. (2003) about VC in Europe. They argue that in Europe VC has expanded quite impressively over the last decade, but the impact on firm performance seemingly remained rather limited. If anything, this calls for a policy that sharpens incentives for more entrepreneurial effort and more active VC involvement. In our framework, the entry margin might be undistorted (in the absence of knowledge spillovers and cross-subsidization), but the double moral hazard between entrepreneurs and VCs works to erode incentives for value creating effort. While in many countries current policy vis-a-vis start-up firms essentially consists of a series of subsidies to investment in these firms, coupled with taxation of capital gains, dividends and corporate profits (one might call them "success taxes"), our analysis suggests that scaling down these subsidies and using the budget savings to finance a narrowly defined reduction of success taxes on VC backed investments would be beneficial. The key aspect of this reform is "front-loading", meaning that the tax burden is shifted from late to the early stages of a firm's life-cycle while keeping the present value of tax liabilities constant. Given that firms would first have to accept a larger tax cost and reap the benefits only later on, one might expect tax avoidance or rent capturing behavior to be rather limited.

The European VC association has developed indicators for assessing whether the fiscal policy environment is conducive to the development of a healthy private equity and VC industry. One of the indicators is the availability of low company tax rates for small and medium sized young firms, possibly for a limited time period (EVCA, 2004). If it were combined with higher taxes on early stage investment to avoid any windfall gain in the present value of tax payments, the suggestion would correspond to a welfare improving front loading. Of course, the industry's benchmarking report simply calls for preferential

tax treatment and did not ask for this second compensating measure.

In the general literature on tax reform, two rivaling concepts of "investment neutrality" are put forward that might actually have quite different implications in the presence of moral hazard in an entrepreneurial economy: cash-flow taxes as proposed in the Meade Report (1978), Hall and Rabushka (1985), or the U.S. President's Panel (2005), among others. The rivaling concept is the allowance for corporate equity (ACE), pioneered by Boadway and Bruce (1984) and introduced into the tax reform debate by the IFS Capital Taxes Group (1991). The choice between cash-flow versus allowance for equity is again on the agenda of the current Mirrlees review for tax reform.[9] These two concepts are largely considered as two alternative proposals for investment neutrality which are generally thought to be equivalent and to give rise to the same present value of tax burden and tax revenues, see e.g. Bond and Devereux (2003). It is also acknowledged that the two concepts, while equal in present value terms, differ in terms of the timing of tax payments. The cash-flow tax gives immediate tax relief to investment and shifts the tax burden into the future, thus being back loaded, while ACE shifts the tax burden to the present and is front loaded. As we have intuitively argued before, this should make a fundamental difference for entrepreneurial incentives in a world with information problems in start-up investment! The ACE concept for business taxation should thus be superior for entrepreneurial incentives and active VC support!

3 Selection Versus Value Added

The suggested front-loading might increase the rate of entrepreneurship even though the present value of tax payments are not changed. However, more start-up activity might actually not be desired. For entirely different reasons, the literature based on De Meza and Webb (1987), or De Meza (2002) for a more recent statement and the evidence discussed

[9] Ongoing research under the Mirrlees Review commissioned by the editorial team can be accessed under www.ifs.org.uk/mirrleesreview/index.php.

and presented in Cressy (1996, 2002) and Parker (2003), argues to the contrary that entry should actually be actively discouraged since entrepreneurship might be too high in a world with asymmetric information. Firms are probably very heterogeneous with respect to their success probability and/or value created (De Meza and Webb, 1999).

Banks cannot easily distinguish between high and low quality firms. While entrepreneurs might be fully aware of the quality and success chances of their venture, a bank might have difficulties to judge from outside what the potential of a new firm without past track record really is. Banks thus tend to offer uniform financing conditions to heterogeneous firms and often are unable to prevent cross subsidization in their credit portfolio. Lending conditions are too unattractive to the very best firms, but too favorable for low quality firms. As a result, credit conditions allow entry of less able entrepreneurs at the lower margin who would not get financed if banks had a chance to correctly assess individual risk. If a correct risk assessment of young firms without track record is not possible from outside, the bank makes a loss while the marginal entrepreneur just breaks even. In consequence, the net present value of the venture is negative from a social perspective. Policy should be concerned to reduce entry rather than encourage it. From a normative perspective, the literature has argued for interest taxes and other measures to increase the cost of capital, rather than start-up subsidies. Interpreted in the light of the framework of the preceeding section, the net present value of taxes on the company and investor level should be positive and exceed the wage tax burden to discourage entry.

The recent synthesis and generalization of Boadway and Keen (2005), see also the discussion of Boadway and Tremblay (2005), makes the point that firms differ not only in one but possibly in several dimensions with no clear correlation pattern of success probabilities and returns of different types. In not being able to distinguish different firm types, banks will again offer uniform credit conditions. However, with heterogeneity in several dimensions such as survival probabilities or market potential, uniform bank lending does not give rise to a clear cut pattern of cross-subsidization, or only in rather special cases (one being the DeMeza-Webb framework). To cut a long discussion short,

the implication is that bank financing leads to excess lending and overinvestment of some types of firms while lending would be too restrictive and entrepreneurial investment too low in other types of new ventures. Clear cut policy recommendations are no longer possible. If banks are unable to distinguish heterogeneous firms, government is expected to be even less able to differentiate. As a default rule, tax policy should arguably remain neutral towards the entry margin. Other reasons such as knowledge spillovers might still call for a policy to encourage entry of more innovative firms.

VCs are more sophisticated, active investors. They are in a better position to screen and select firms and, due to their close involvement, they can obtain much more information about their portfolio companies than banks. The scarce resource of VCs is time and specific investment skills. Experience and skills matter very much (Bottazzi, Da Rin and Hellmann, 2007, and Gompers, Kovner, Lerner and Scharfstein, 2006). Sorensen (2006) attributes about half of the excess performance of VC backed over bank financed firms to selection, and the other half to value adding activities. Since advising and coaching is time intensive, the portfolio of VC firms is much smaller and more focussed. Each manager is responsible only for a few companies (Kanniainen and Keuschnigg, 2004, Keuschnigg 2004a, and Cumming, 2006b**,** for empirical evidence). VC firms also use more flexible contractual forms such as convertible securities and stage financing to taylor financing needs to the specific character of firms. For example, Cumming (2006a) has shown empirically and Keuschnigg and Nielsen (2007) provide a formal analysis that convertible securities are useful to induce desired self-selection of entrepreneurs. Compared to banks, VC firms should thus be able to limit if not totally avoid cross-subsidization. In particular, they should be able to better identify and attract relatively more of the high performing, innovative firms among all start-up firms, as the empirical literature on the excess performance of VC backed relative to bank financed firms shows.

What are the effects of taxation when the market for start-up financing is shared among banks and VC firms? There is some research to explain what determines entrepreneurs' choice between bank and VC financing, e.g. Ueda (2004) or Winton and Yerramilli (2006).

A market equilibrium model between informed and uninformed lenders was suggested early by Holmstrom and Tirole (1997). Landier (2003) and Inderst and Mueller (2006) propose models more specifically addressed to the special role of VC firms as compared to banks. None of these papers investigates how taxes might differentially affect bank and VC financed firms, market splitting among banks and VC funds, entrepreneurship and aggregate income. A first attempt is Keuschnigg and Nielsen (2005) who suggest a search model where VC backed firms earn excess returns over bank financed firms due to active VC support. Entry is determined by competitive lending conditions of banks. Among all entrants, a segment of firms is matched (rationed) with a limited number of VC firms and earns excess returns. The remaining part is left with passive bank financing. Ex post, VC and bank financed firms are different, but all firms within each class are identical.

Success taxes are more harmful to VC backed firms since they reduce not only the return to entrepreneurial effort but additionally discourage the active involvement of VC investors. They thus reduce overall entrepreneurship. Given that the number of VC backed firms declines by relatively more, the share of VC financed firms among all start-ups also falls. A uniform start-up subsidy available to both types of firms boosts entry. If more entry reduces the price on the output market, firm values decline which is again relatively more harmful to VC backed firms. In this case, it could easily be that higher start-up subsidies crowd out VC backed firms. The picture would change, of course, if the subsidy could be limited to VC backed firms only. Suppose that the government can indeed apply differential taxes and subsidies depending on a firm's status of receiving VC finance which tends to be the most innovative segment of firms. Offering VC backed firms a selective tax break compensated by a higher start-up tax (or reduced subsidy) such that the present value of net taxes remains unchanged, would boost the quality and also the quantity of VC backed firms relative to bank financed projects and raise welfare. Again, government should not aim at more, but at more successful VC backed start-ups.

There is clearly more need for further research regarding the policy impact when there is both bank and VC financing. The analysis in Keuschnigg and Nielsen (2005)

is limited in the sense that it abstracts from cross-subsidization and adverse selection in bank financing. At this stage, we can only phrase some conjectures. Suppose VC firms are indeed able to attract the most innovative and profitable part of firms. The average return on a bank's pooled credit portfolio must then decline, forcing it to insist on less attractive lending conditions. Some marginal entrepreneurs will no longer find it advantageous to start a firm which shaves off the least profitable firms from the bank's portfolio. The presence of an active VC sector specialized in financing the most innovative firms might thus much reduce the excess entry problem that results from cross subsidization in bank financing. Entrepreneurship is reduced. Depending on the relative cost of VC relative to bank financing and therefore the size of the VC sector,[10] the welfare implications of entry behavior might become ambiguous. There is also the problem of whether the cut-off point between bank and VC financing is socially efficient.

4 Other Areas of Public Policy

Taxes and subsidies are by far not the only important area of public policy towards innovative entrepreneurship and VC financing. There might be policy complementarities leading to mutually reinforcing effects (e.g. Cumming, 2007). One omission of the present review is the tax treatment of stock options for employees (Gilson and Schizer, 2003). Substantial tax savings might be possible due to tax deferral when stock options are taxed only at the date when the option is exercised and income actually is realized, rather than at the date of issue.[11] A favorable tax treatment of employee stock options could help young technology firms to attract key personnel at a lower wage cost at a time when cash-flow is low or non-existent.

One particular important precondition for a healthy VC industry is access of young technology companies to liquid stock markets. Liquid stock markets allow VCs to exit

[10] Venture capital tends to be a more expensive form of start-up financing.

[11] The problem is similar to the tax advantage of applying the realization principle in capital gains taxation, rather than taxation upon accrual.

from their portfolio companies faster and more profitably. This exit possibility also helps the entrepreneur to regain control over the company when the concentrated stake of the VC firm is broadly dispersed over smaller market investors at an IPO. Since entrepreneurial independence is a main motivation for entrepreneurship in the first place, the presence of specialized stock markets makes potential entrepreneurs more willing to start a firm (Black and Gilson, 1998). It also makes the value added of VC financing more attractive to entrepreneurs since the intense control of VCs is expected to last only for a limited time period. According to Micchelacci and Suarez (2004), the presence of liquid stock markets allows VCs to exit faster and to reshuffle their activities to new early stage companies where VC support is needed the most. In equilibrium, liquid stock markets boost innovation and growth because the faster turnover of VC allows for a larger rate of VC backed entrepreneurship. The empirical analysis of Da Rin, Nicodano and Sembenelli (2006) indeed finds that the presence stock markets significantly stimulates VC activity.

There are other important areas of public policy towards a vibrant VC sector, unrelated to taxes and subsidies. Among them are: entry regulations and administrative barriers to start firms (Fonseca, Lopez-Garcia and Pissarides, 2001); patent protection to allow young firms to safely appropriate their innovation rents, and investor protection and reporting rules (e.g. Armour and Cumming, 2006); bankruptcy laws that do not permanently stigmatize failed entrepreneurs (diminished job prospects in case of failure make innovators less willing to start a firm in the first place, see Gromb and Scharfstein, 2003, Landier, 2006); or liberal pension fund regulations to allow pension funds to diversify by allocating funds to VC firms which facilitates fund raising (Gompers and Lerner, 1998).

5 Conclusions

The creation of young firms is a significant factor in promoting employment and innovation. VC has become an increasingly important source of finance start-ups. In combining financing with active advice and networking support, VC can help the professionalization

of portfolio companies and add value. Therefore, VC backed firms appear to outperform similar firms without access to VC, making them a particularly important source of job growth and innovation. Policy makers are thus much concerned about creating the right policy environment for a dynamic VC industry.

Our policy analysis implies that capital gains taxes may be quite harmful to the quality of VC financed entrepreneurship. Corporate taxes are not only harmful to investment and valuation of mature firms but could be equally harmful to start-up firms which have not yet begun to actually pay the tax. In reducing mature firm value, the corporate tax impairs the incentives for effort and advice at the firm's start-up stage. It may therefore contribute to an overly high failure rate and harm the quality of VC investments. Our analysis lends some support to the advocates of cutting the capital gains tax or giving corporate tax relief to small innovative firms. However, such tax relief should be confined to VC backed firms only. In terms of practical tax policy, two issues should be noted. First, the burden of the capital gains tax may already be quite low compared to other capital income taxes. The deferral of capital gains until realization implies interest gains that significantly reduce the actual tax burden. Second, there might be some practical difficulties in selectively applying a tax break to VC backed firms only.

Many programs to stimulate business creation involve investment subsidies. They are not useful to sharpen incentives for effort and advice since they are unrelated to success. In boosting the rate of business creation, they may actually reduce venture returns which, in turn, discourages effort and advice. By reducing the quality of entrepreneurship this way, investment subsidies may turn out to be quite undesirable. There are, of course, other arguments such as the possibility of new innovative firms creating positive spillovers which may be relevant in designing an appropriate policy towards high-technology start-ups. Such spillovers might indeed call for a net subsidy to the sector to promote new firm creation. However, even in this case the subsidy should preferably be given in form of a selective tax break which strengthens incentives by rewarding success, rather than an upfront subsidy unrelated to success.

References

[1] Aghion, P., Tirole, J., 1994. The Management of Innovation. Quarterly Journal of Economics 109, 1185-1209.

[2] Armour, J., Cumming, D., 2006. The Legislative Road to Silicon Valley, Oxford Economic Papers 58, 596-635.

[3] Audretsch, D.B., Lehmann, E., 2004. Debt or Equity? The Role of Venture Capital in Financing High-Tech Firms in Germany, Schmalenbach Business Review 56, 314-357.

[4] Black, B.S., Gilson, R.J., 1998. Venture Capital and the Structure of Capital Markets: Banks versus Stock Markets, Journal of Financial Economics 47, 243-277.

[5] Boadway, R., Bruce, N., 1984. A General Proposition on the Design of a Neutral Business Tax, Journal of Public Economics 24, 231-239.

[6] Boadway, R., Keen, M., 2005. Financing and Taxing New Firms under Asymmetric Information, Queen's University and IMF, Discussion Paper.

[7] Boadway, R., Tremblay, J.F., 2005. Public Economics and Start-up Entrepreneurship, in: Kanniainen, V., Keuschnigg, C. (eds.), Venture Capital, Entrepreneurship and Public Policy, CESifo Seminar Series, Cambridge: MIT Press, 198-219.

[8] Bond, S.R., Devereux, M.P., 2003. Generalized R-based and S-based Taxes Under Uncertainty, Journal of Public Economics 87, 1291-1311.

[9] Bottazzi, L., Da Rin, M., 2002. Venture Capital in Europe and the Financing of Innovative Companies, Economic Policy 34, 231-269.

[10] Bottazzi, L., Da Rin, M., Hellmann, T., 2007, Who are the Active Investors? Evidence from Venture Capital, Journal of Financial Economics, forthcoming.

[11] Casamatta, C., 2003. Financing and Advising: Optimal Financial Contracts with Venture Capitalists, Journal of Finance 58, 2058-2085.

[12] Cornelli, F., Yosha, O., 2003. Stage Financing and the Role of Convertible Securities, Review of Economic Studies 70, 1-32.

[13] Crawford, C., Freedman, J., 2007. Small Business Taxation. A Special Study in Selected Issues Untertaken for the Mirrlees Review, Working Paper.

[14] Cressy, R, 1996. Are Business Start-ups Debt Rationed?, Economic Journal 106, 1253-1270.

[15] Cressy, R., 2002. Introduction: Funding Gaps, Economic Journal 112, F1-F16.

[16] Cullen, J.B., Gordon, R.H., 2007. Taxes and Entrepreneurial Activity: Theory and Evidence for the U.S., Journal of Public Economics 91, 1479-1505.

[17] Cumming, D., 2005. Agency Costs, Institutions, Learning, and Taxation in Venture Capital Contracting, Journal of Business Venturing 20, 573-622.

[18] Cumming, D., 2006a. Adverse Selection and Capital Structure, Entrepreneurship Theory and Practice, 155-183.

[19] Cumming, D., 2006b. The Determinants of Venture Capital Portfolio Size: Empirical Evidence, Journal of Business 79, 1083-1126.

[20] Cumming, D., 2007. Financing Entrepreneurs. Better Canadian Policy for Venture Capital, C.D. Howe Institute Commentary No. 247.

[21] Da Rin, M., Penas, M. F., 2007. The Effect of Venture Capital on Innovation Strategies, NBER DP 13636.

[22] Da Rin, M., Nicodano, G., Sembenelli, A., 2006. Public Policy and the Creation of Active Venture Capital Markets, Journal of Public Economics 90, 1699-1723.

[23] De Meza, D., Webb, D., 1987. Too Much Investment: A Problem of Asymmetric Information, Quarterly Journal of Economics 102, 281-292.

[24] De Meza, D., Webb, D., 1999. Wealth, Enterprise, and Credit, Economic Journal 109, 153-163.

[25] De Meza, D., 2002. Overlending?, Economic Journal 112, F17-F31.

[26] EVCA (European Private Equity and Venture Capital Association), 2004. Benchmarking European Tax & Legal Environments, May 2004.

[27] Fonseca, R., Lopez-Garcia, P., Pissarides, C.A., 2001. Entrepreneurship, Start-up Costs, and Employment, European Economic Review 45, 692-705.

[28] Fuest, C., Huber, B., Nielsen, S.B., 2003. Why Is the Corporate Tax Rate Lower Than the Personal Tax Rate? The Role of New Firms, Journal of Public Economics 87, 157-174.

[29] Gentry, W.M., Hubbard, R.G., 2000. Tax Policy and Entry into Entrepreneurship, American Economic Review 90, 283-287.

[30] Gilson, R., Schizer, D., 2003. Understanding Venture Capital Structure: A Tax Explanation for Convertible Preferred Stock, Harvard Law Review 116, 875-916.

[31] Gompers, P.A., Lerner, J.P., 1996. The Use of Covenants: An Empirical Analysis of Venture Partnership Agreements, Journal of Law and Economics 39, 463-498.

[32] Gompers, P.A., Lerner, J.P., 1998. What Drives Venture Capital Fundraising?, Brookings Papers on Economic Activity - Microeconomics, 149-192.

[33] Gompers, P.A., Lerner, J., 1999. The Venture Capital Cycle, Cambridge: MIT Press.

[34] Gompers, P.A., Lerner, J., 2000. Money Chasing Deals? The Impact of Fund Inflows on Private Equity Valuations, Journal of Financial Economics 55, 281-325.

[35] Gompers, P.A., Lerner, J., 2001. The Venture Capital Revolution, Journal of Economic Perspectives 15, 145-168.

[36] Gompers, P.A., Lerner, J., 2002. Short-Term America Revisited? Boom and Bust in the Venture Capital Industry and the Impact on Innovation, Innovation Policy and the Economy 3, 1-27.

[37] Gompers, P. Kovner, A., Lerner, J., Scharfstein, D., 2006. Skill vs. Luck in Entrepreneurship and Venture Capital: Evidence from Serial Entrepreneurs, Discussion Paper.

[38] Gordon, R., 1998. Can High Personal Tax Rates Encourage Entrepreneurial Activity?, IMF Staff Papers 45, 49-80.

[39] Gromb, D., Scharfstein, D., 2003. Entrepreneurship in Equilibrium, Discussion Paper.

[40] Hall, R.E., Rabushka, A., 1985. The Flat Tax, Stanford: Hoover Institution Press.

[41] Hart, O., 2001. Financial Contracting, Journal of Economic Literature 39, 1079-1100.

[42] Hege, U., Palomino, F., Schwienbacher, A., 2003. Determinants of Venture Capital Performance: Europe and the United States, RICAFE Working Paper No. 001, Financial Markets Group, London School of Economics.

[43] Hellmann, T., 1998. The Allocation of Control Rights in Venture Capital Contracts, RAND Journal of Economics 29, 57-76.

[44] Hellmann, T., Puri, M., 2000. The Interaction Between Product Market and Financing Strategy: The Role of Venture Capital, Review of Financial Studies 13, 995-984.

[45] Hellmann, T., Puri, M., 2002. Venture Capital and the Professionalization of Start-Up Firms, Journal of Finance 57, 169-197.

[46] Holmstrom, B., 1982. Moral Hazard in Teams, Bell Journal of Economics 13, 324-340.

[47] Holmstrom, B., Tirole, J., 1997. Financial Intermediation, Loanable Funds, and the Real Sector, Quarterly Journal of Economics 112, 663-691.

[48] IFS Capital Taxes Group, 1991. Equity for Companies: A Corporate Tax for the 1990s, Commentary No. 26, London: Institute for Fiscal Studies.

[49] Inderst, R., Mueller, H.M., 2004. The Effect of Capital Market Characteristics on the Value of Start-Up Firms, Journal of Financial Economics 72, 319-356.

[50] Inderst, R., Mueller, H.M., 2006. Early-Stage Financing and Firm Growth in New Industries, London School of Economics and New York University.

[51] Jones, Charles I. and John C. Williams (1998), Measuring the Social Return to R&D, Quarterly Journal of Economics 113, 1119-1135.

[52] Kanniainen, V., Keuschnigg, C., 2004. Start-up Investment With Scarce Venture Capital Support, Journal of Banking and Finance 28, 1935-1959.

[53] Kaplan, S.N., Stromberg, P., 2001. Venture Capitalists as Principals: Contracting, Screening, and Monitoring, American Economic Review 91, 426-430.

[54] Kaplan, S.N., Stromberg, P., 2003. Financial Contracting Meets the Real World: An Empirical Analysis of Venture Capital Contracts, Review of Economic Studies 70, 281-315.

[55] Kaplan, S.N., Stromberg, P., 2004. Characteristics, Contracts, and Actions: Evidence From Venture Capital Analysis, Journal of Finance 59, 2173-2206.

[56] Keuschnigg, C., 2003. Optimal Public Policy for Venture Capital Backed Innovation, CEPR DP 3850.

[57] Keuschnigg, C., 2004a. Taxation of a Venture Capitalist With a Portfolio of Firms, Oxford Economic Papers 56, 1-22.

[58] Keuschnigg, C., 2004b. Venture Capital Backed Growth, Journal of Economic Growth 9, 239-261.

[59] Keuschnigg, C., Nielsen, S.B., 2003a. Tax Policy, Venture Capital, and Entrepreneurship, Journal of Public Economics 87, 175-203.

[60] Keuschnigg, C., Nielsen, S.B., 2003b. Taxes and Venture Capital Support, European Finance Review 7, 515-539.

[61] Keuschnigg, C., Nielsen, S.B., 2004a. Start-ups, Venture Capitalists, and the Capital Gains Tax, Journal of Public Economics 88, 1011-1042.

[62] Keuschnigg, C., Nielsen, S.B., 2004b. Taxation and Venture Capital Backed Entrepreneurship, International Tax and Public Finance 11, 369-390.

[63] Keuschnigg, C., Nielsen, S.B., 2005. Public Policy for Start-up Entrepreneurship With Venture Capital and Bank Finance, in: Kanniainen, V., Keuschnigg, C. (eds.), Venture Capital, Entrepreneurship and Public Policy, CESifo Seminar Series, Cambridge: MIT Press, 221-250.

[64] Keuschnigg, C., Nielsen, S.B., 2006, Public Policy, Start-up Entrepreneurship and the Market for Venture Capital, in: Parker, S., (ed.), The Life-Cycle of Entrepreneurial Ventures, International Handbook Series on Entrepreneurship, Vol. 3, New York: Springer, 227-257.

[65] Keuschnigg, C., Nielsen, S.B., 2007, Self-Selection and Advice in Venture Capital Finance, University of St. Gallen.

[66] Kortum, S., Lerner, J., 2000. Assessing the Contribution of Venture Capital to Innovation, RAND Journal of Economics 31, 674-692.

[67] Landier, A. (2003). Start-up financing: From banks to venture capital. Working Paper, Graduate School of Business, University of Chicago.

[68] Landier, A. (2006). Entrepreneurship and the Stigma of Failure, Working Paper.

[69] Lerner, J., 1994. The Syndication of Venture Capital Investments, Financial Management 23, 16-27.

[70] Lerner, J., 1999. The Government as Venture Capitalist: The Long-Run Impact of the SBIR Program, Journal of Business 72, 285-318.

[71] Lerner, J., 2002. When Bureaucrats Meet Entrepreneurs: The Design of Effective 'Public Venture Capital' Programmes, Economic Journal 112, F73-F84.

[72] Micchelacci, C., Suarez, J., 2004. Business Creation and the Stock Market, Review of Economic Studies 71, 459-481.

[73] Parker, S.C., 2003. Asymmetric Information, Occupational Choice and Government Policy, Economic Journal 113, 861-882.

[74] Poterba, J.M., 1989a. Capital Gains Tax Policy Toward Entrepreneurship, National Tax Journal 42, 375-389.

[75] Poterba, J.M., 1989b. Venture Capital and Capital Gains Taxation, in: Summers, L.H. (ed), Tax Policy and the Economy, Vol. 3, Cambridge: MIT Press, 47-67.

[76] President's Advisory Panel on Federal Tax Reform, 2005. Simple, Fair, and Pro-Growth. Proposals to Fix America's Tax System, www.taxreformpanel.gov.

[77] Repullo, R., Suarez, J., 2004. Venture Capital Finance: A Security Design Approach, Review of Finance 8, 75-108.

[78] Rosen, H.S., 2005. Entrepreneurship and Taxation: Empirical Evidence, in: Kanniainen, V., Keuschnigg, C. (eds.), Venture Capital, Entrepreneurship and Public Policy, CESifo Seminar Series, Cambridge: MIT Press, 251-279.

[79] Schmidt, K.M., 2003. Convertible Securities and Venture Capital Finance, Journal of Finance 43*, 1139*-1166.

[80] Soerensen, P.B., 2005. Neutral Taxation of Shareholder Income, International Tax and Public Finance 12, 777-801.

[81] Sorensen, M., 2006. How Smart is Smart Money? An Empirical Two-Sided Matching Model of Venture Capital, Journal of Finance, forthcoming.

[82] Stiglitz, J.E., Weiss, A., 1981. Credit Rationing in Markets with Imperfect Information, American Economic Review 71, 393-410.

[83] Ueda, M., 2004. Bank Versus Venture Capital. Project Evaluation, Screening, and Expropriation, Journal of Finance 59, 601-621.

[84] Wallsten, S.J., 2000. The Effects of Government-Industry R&D Programs on Private R&D: The Case of the Small Business Innovation Research Program, RAND Journal of Economics 31, 82-100.

[85] Winton, A., Yerramilli, V., 2006. Entrepreneurial Finance: Banks versus Venture Capital, Journal of Financial Economics, forthcoming.