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The Capital Gains Tax: a Curse but also a Blessing for Venture Capital Investment

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Abstract

This article documents a statistical association between the number and success of venture capital investments and the capital gains tax rate. To do this, we analyze investment data and taxes of 32 countries from 2000 to 2010. In our data, higher capital gains tax rates are associated with fewer firms financed and a lower probability for ventures receiving follow-up funding. However, if the first investment is received when taxes are high, the probability of a firm eventually going public or being acquired increases. We conclude that high tax rates are associated with fewer, but on average more successful companies.

JEL Classification Numbers : G24, H25, H32
Keywords : Capital Gains Tax, Venture Capital, Investment

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1 Introduction

Around the world governments introduce programs to promote venture capital and thus venture capital-financed start-up companies.[1] These companies are of special interest for the policy maker, because they are particularly innovative: For example, a dollar spent on venture capital yielded more than twice as many patents than a dollar spent on R&D by established companies in the United States over the period from 1983 to 1992 (Kortum and Lerner 2000).[2] Despite this political interest, it is not completely understood how tax policy — and in particular the capital gains tax — influences the investment behaviour of venture capital investors and thus the entrepreneurial process. Our study intends to fill this gap by measuring the effect of capital gains taxation on the investment behaviour of venture capital funds.

In the first part of our analysis, we estimate the potential effect of the capital gains tax rate on the number and the success probability of companies receiving their first funding by venture capitalists. We classify a company as successful if it is acquired or taken public. Our results indicate that an increase in the capital gains tax rate of one percentage point is associated with 0.90 fewer companies per ten million inhabitants receiving their first investment. This is a reduction of around 2% relative to the mean of newly financed companies. However, the probability of achieving a successful exit increases after a tax increase. In our data, a one percentage point increase in the capital gains tax rate is associated with 1.05 percentage points more companies being acquired or going public. An explanation for this might be a selection effect, as any statistically significant relation of the capital gains tax rate and the total number of companies being acquired or taken public can not be determined.

In the second part of the analysis, we estimate the potential effect of changes in the capital gains tax rate on the probability of a venture capital-backed start-up receiving a follow-up investment. We find that (on average) an increase in the capital gains tax rate of one percentage point is associated with a 2.94 percentage point lower probability of receving a follow-up investment. At a mean investment probability of 59% in our sample, such a tax increase reduces the likelihood of a follow-up investment by around four percent relative to the mean. In contrast, if we

[1] See for example Lerner (2009), Cumming (2010), **?**, and DeGennaro (2010).

[2] Furthermore, the likelihood of a new product being introduced in the market is three times higher if a start-up receives venture capital (Hellmann and Puri 2000).

analyze the potential effect of the capital gains tax rate at the first funding round on the probability that a follow-up funding round takes place, we find a positive impact of the tax rate. A one percentage point increase in this initial capital gains tax rate leads to a 1.4 percentage point increase in the probability of receving a follow-up funding round. Taken together, these findings point again to the selection effect of taxes, i.e. that high tax rates lead to the financing of fewer, but on average more successful companies.

To estimate the effect of the capital gains tax on venture capital investment, we match all recorded funding rounds in the Thomson One database (formerly known as VentureXpert) with the capital gains tax rates in 32 different countries from 2000 to 2010. We thus obtain an unbalanced panel of 27,219 companies in 32 different countries with a total of 58,228 funding rounds. In the first part of our analysis we use a weighted OLS with year-fixed effects. In the second part, we employ a firm-fixed effect models with year, stage, and round-fixed effects. As robustness we also use a simple OLS model with country and industry-fixed effects instead of firm-fixed effects. All standard errors are clustered on the country level as taxes are serially correlated within a country.

To the best of our knowledge, this is the first study analyzing the effect of taxes on the probability of venture capital funds to invest into start-ups. In particular, we explicitly consider the effect of taxes on the number of first round investments, on the start-up's probability of receiving a follow-up funding round, and on the probability of achieving a successful exit. Thus, we are able to trace the influence of taxes on ventures over the whole investment cycle from inception to the venture capitalist's exit. [3] Furthermore, the employed method of a firm-fixed effects panel regression has not been applied to the study of venture capital before. This is an improvement on prior work as we can better control for firm-specific heterogeneity compared to previous studies using country-fixed effects. As our study newly assesses the impact of the capital gains tax on the creation and the probability of continuous financial support for venture capital-backed companies, it suggests implications to policy makers on how to enhance the success of new ventures.

[3]The probability of receiving a follow-up investment has been used as an outcome variable before: For example, Townsend (2010) used in a recent article a hazard rate model to estimate the effect of the burst of the tech-bubble on the chance of obtaining a follow-up investment.

The idea of considering the effect of macro and industry conditions on the investment in the first funding round and on the probability of success is not new. Most closely related to our paper is Gompers, Kovner, Lerner, and Scharfstein (2008). They study the effect of the market-to-book ratio on a venture capital fund's number of investments in newly created companies and their success probability in a given industry. As we do, they consider the rate to achieve a successful exit as a dependent variable. An outcome of their analysis is that venture capitalists with especially high industry experience have a higher rate of achieving a successful exit. Another related study is Brander, Du, and Hellmann (2010) who use a similiar dataset as we do to analyze the influence of government supported venture capitalists on the probability of venture capital funds realizing a successful exit with their portfolio companies. They find that a moderate participation of government support is helpful toward venture capital funding outperforming their competitors, while too much government participation is harmful.[4]

Several other studies consider the effect of taxes on the volume of venture capital committed in a certain country and year. In general, they find a negative impact of taxes on the supply of risk capital or the total volume invested in a country (Poterba 1987, Poterba 1989b, Gompers, Lerner, Blair, and Hellmann 1998, Da Rin, Nicodano, and Sembenelli 2006, Bonini and Alkan 2009). Our study adds to their findings by analyzing the investment decision of the venture capitalist explicitly and not the overall volume invested by a venture capital fund or in a country. Therefore, we consider the investments into start-ups via several funding rounds over the whole investment cycle, which cannot be determined by looking at invested volumes alone.

The remainder of this paper is organized as follows. The next section explains the institutional set-up and the proposed causal channel of the capital gains tax on venture capitalists' investment decisions. In section 3 we discuss our data construction. The empirical specification and the results can be found in section 4. In section 5, we conduct robustness checks on our results and section 6 concludes.

[4]Other articles considering the success probability as a dependent variable are Gompers and Lerner (2000) and Amit, Brander, and Antweiler (2002).

2 Theoretical background

We want to assess how the capital gains tax influences the creation and the survival of venture capital-backed companies. Venture capital funds are often the only possible source of funding for young high risk (and often high tech) companies (Elango, Fried, Hisrich, and Polonchek 1995, Gompers, Lerner, Blair, and Hellmann 1998).[5] For such start-up companies, traditional bank financing is unavailable, because they do not have assets which can be pledged as collateral. Instead of demanding collateral, a venture capital fund monitors these start-ups intensively after investing so that the risk of exploitation of private benefits is reduced and entrepreneurial effort is enforced (Becker and Hellmann 2003, Kaplan and Strömberg 2004, Gompers, Lerner, Blair, and Hellmann 1998). The monitoring effort renders investments more costly for the venture capitalist limiting the possibility of investing in numerous start-ups simultaneously (Holmstrom and Tirole 1997). As a consequence, ventures with high monitoring efforts face financing constraints (Elango, Fried, Hisrich, and Polonchek 1995, Gompers, Lerner, Blair, and Hellmann 1998). Nevertheless, these start-ups might contribute to innovation and become growth companies. Therefore, the provision of venture capital to young and innovative companies is often desired from a political point of view. As monitoring costs can hardly be influenced, governments try to use different policy measures to increase the returns of venture capital investments (Bonini and Alkan 2009). Tax policy is the most direct way of increasing the venture capitalist's return, as the capital gains tax directly reduces the sales price of firms when investments are exited (Poterba 1989a, Poterba 1989b, Gompers, Lerner, Blair, and Hellmann 1998).

In order to improve their bargaining position in the monitoring process, venture capitalists do not invest the required funds all at once but provide them in consecutive funding rounds. A successful start-up usually receives several funding rounds before it is acquired or taken public. In our data, companies have on average 1.81 funding rounds. That means that after a certain period of time venture capitalists assess whether they continue investing, depending on the expected net present value of the investment in a start-up company. The investment in a start-up is profitable, if the investor is able to sell the acquired share of the company with a profit. The

[5] We use ventures, start-ups, and companies interchangeably throughout the paper.

most profitable exit route is to sell the new firm either to the public in an initial public offering (IPO) or to an established company in a trade sale. Cochrane (2005) estimates that if a firm is acquired or taken public, it delivers to the investor an arithmetic return of 698% with a standard deviation (std) of 3,282%.

In our analysis we consider the investment decisions of a representative venture capitalist who aims to achieve a minimum return on the investment. The venture capitalist closes a funding round for the venture if the expected gains from the investment, i.e. the expected sales price net of taxes less the expected costs associated with the investment, are high enough that the required return is met or exceeded.[6] Thus, the probability of venture capitalists providing funding to young companies rises if tax policy is designed in such a way that the venture capitalists' potential returns are high.

The capital gains tax is often considered to be the most decisive tax in the context of venture capital investments as it is levied on the difference between the sales price and the amount invested. This directly reduces the investor's return and thus the venture capitalist's incentive to invest in, to support, and to monitor the venture (Keuschnigg and Nielsen 2004). Therefore, higher capital gains taxes are supposed to reduce the number of start-ups that receive venture capital financing and the probability that entrepreneurial companies receive subsequent funding rounds (Keuschnigg and Nielsen 2001, Becker and Hellmann 2003, Keuschnigg and Nielsen 2004). In addition, capital gains taxes might also have an effect on the quality of ventures that are financed. If tax rates are high, venture capitalists will diligently decide about which start-ups will be financed in the first place. As a consequence, high capital gains taxes might lead to venture capitalists picking potentially more successful companies.[7] Gordon (1998) proves this for personal tax rates and finds that the survival rate of newly founded companies is low if personal tax rates are too low. He ascribes this effect to efficiency losses as too many start-ups - not just promising ones - are funded in the case of low tax rates. For our analysis, we consider the individ-

[6]The minimum rate of return is the so-called hurdle rate. It also covers the cost and expenditure associated with the investment. Among other factors, this minimum return is influenced by the risk-free return rate and the capital gains tax rate that would have to be paid on the return. Nanda and Rhodes-Kropf (2011) use a similar thought model for Venture Capital to explain innovation waves.

[7]Such selection effects are extensively described in the heterogenous firm literature started by Melitz (2003).

ual capital gains tax rates as these are usually effectively relevant for the individual venture capitalists. This is especially the case when venture capital funds underly a transparent taxation.

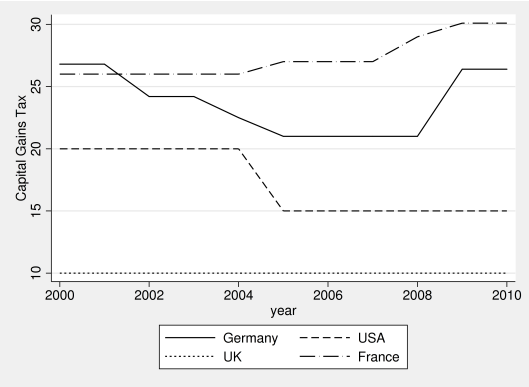
Prior studies use the investment volumes of venture capital as the dependent variable for analyzing tax policy, implicitly focusing on the incentive of the venture capitalist to do fundraising and of the limited partners to provide funds (Gompers, Lerner, Blair, and Hellmann 1998, Jeng and Wells 2000, Bonini and Alkan 2009). This makes sense as the raising of funds is a prerequisite for venture capital investments. However, size alone is not a satisfactory measure of the contribution of venture capital markets to the financing of new companies, as no direct conclusion can be drawn on how many firms are created and if they persist in the market (Da Rin, Nicodano, and Sembenelli 2006). In our study we focus on the net-effect of taxes on the number of new venture capital-financed ventures and their survival probability, whether this is associated with more or less capital committed.

3 Data and Variable Construction

For our dataset we collected tax data for 32 countries from 2000 to 2010 and matched it with venture capital investments in these countries during the same period. Data on the individual capital gains tax rates in each year and country was obtained from the Ernst&Young "Global Executive" tax guides and the tax handbooks published by the International Bureau of Fiscal Documentation (IBFD). The individual (instead of the corporate) capital gains tax rate is used because usually "transparent" taxation applies to venture capital funds. That means that venture capitalists' capital gains are taxed on the individual level even if the investments are executed via funds. The capital gains tax rate is determined for an investor who holds a substantial stake in a company and does not sell his or her shares for an extended time period. We use the tax rate applicable to individuals in the highest income bracket. If there is a dedicated capital gains tax relief for venture capital investors, such as the "relief on disposal for a business" for a venture capital trust in the United Kindom, we assume it applies. The evolution of the individual capital gains tax is depicted in Figure 1.

The tax data is matched with venture capital investments from the Thomson One database over the same period. Our dataset contains information on consecutive

Figure 1: Evolution of the capital gains tax rates over time



funding rounds for a large sample of venture capital-financed companies with name, country, founding date, date of investment round, round description, and the final company status from the Private Equity module of the Thomson One database published by Thomson Reuters.[8] To focus exclusively on venture capital investments, we select all rounds which bear relation to venture capital, such as "Seed", "Early Stage", "Expansion", or "Later Stage". Rounds whose description indicates a relationship with private equity (e.g. "MBO" "LBO", "Bridge Loan", etc.) are deleted. Additionally, we restrict our dataset to companies that received their first investment after 1999 as the Thomson One database has a good international coverage only after this date (Brander, Du, and Hellmann 2010).

In order to be able to analyze the number and the percentage of successful firms, we have to define "success". We use a classification based on the exit type of a company, because exit types are highly correlated with returns resulting from a venture capital investment (Phalippou and Gottschalg 2009). The following Thomson One exit types for the investee company are classified as successful: acquisition, pending acquisition, merger, in registration for an IPO, and those that went public. If an investee company is defunct or bankrupt, it is regarded as a failure. Active companies are evaluated as failures in this context as well. This classification is common in venture capital research and similiar to the one used by Gompers, Kovner, Lerner, and Scharfstein (2008).[9]

[8]The total investment amount of one round is usually provided by several venture capitalists. If this is the case, these investments are aggregated to one round. Funding rounds do not necessarily correspond to the development stages of the company, i.e. a start-up can have several funding rounds during its "Early Stage".

[9]According to their data description Gompers, Kovner, Lerner, and Scharfstein (2008) do not

In the first part of our analysis we estimate the effect of the capital gains tax on the number of firms receiving their first investment, on the number, and on the percentage of successful firms. In order to do this, we count the absolute number of firms receiving their first investment per 10 million inhabitants and the number of successful firms in each country-year combination. Dividing these two numbers delivers the percentage of successful firms. We match these variables with the tax rates in the year before the funding round took place. This is the same timing assumption as in Gompers, Kovner, Lerner, and Scharfstein (2008). Finally, we aggregate our data on the country-year level, because the capital gains tax rate does not vary below this level. The summary statistics for all employed variables in this first dataset are given in Table 1 and Figure 2 depicts the evolution of our dependent variables over time.

Table 1: Summary statistics for the number of firms analysis

	mean	sd	min	max	p10	p90
# Firms	27.45	44.25	0.00	533.52	0.09	64.50
# Success	3.93	8.79	0.00	91.68	0.00	10.21
% Success	12.78	15.70	0.00	100.00	0.00	29.59
Capital Gains Tax	19.43	11.23	0.00	50.00	0.00	30.00
Observations	321					

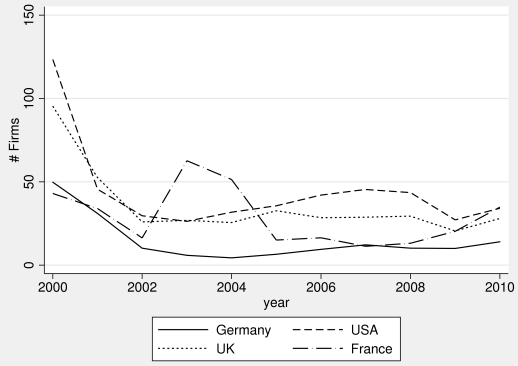
In the second part of the analysis we estimate the effect of the capital gains tax on the probability of a venture capital-backed company receiving a follow-up investment round. Our dependent variable, *Investment*, is a dummy which indicates for every investment round whether there was a subsequent funding round or whether the venture capitalist realized a successful exit.[10] If this is the case, the variable is set equal to one and to zero otherwise. This dummy is matched with the capital gains tax rate at the date of the current round. Figure 3 shows the evolution of probabilities of re-investment over time. Our data does not contain the exact date when the investment decision is taken. We only know that the decision date is after the current round date and before the date of the next round. In order to make

include the category "pending acquisition" as a successful exit. However, it seems reasonable to include it, since "in registration for an IPO" is also included. A similar classification is used by other authors (Hochberg and Lu 2007, Brander, Du, and Hellmann 2010). These articles exclude "mergers" from succcesful exits. Our results are robust to excluding this exit type.

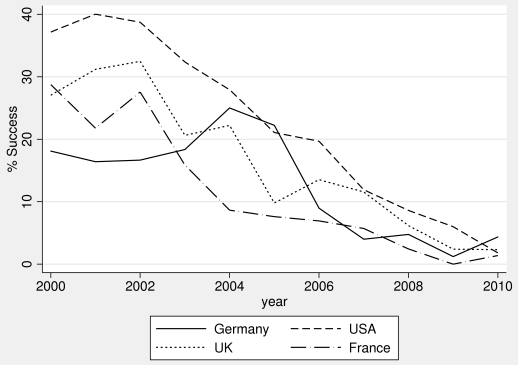
[10]In the Appendix, we re-estimate our regressions by only including subsequent funding rounds and receive the same results.

Figure 2: Evolution of the dependent variables over time

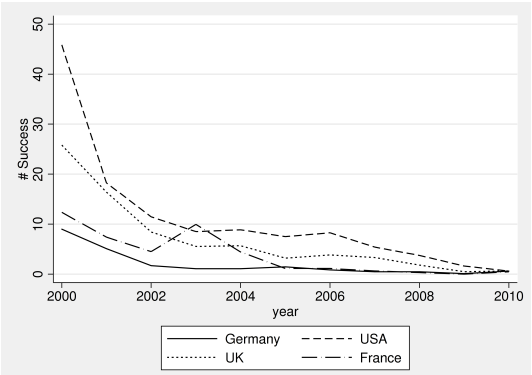
(a) Number of firms



(b) Success probability



(c) Number of successful firms



no arbitrary assumptions on the decision point in time, we use the tax rate at the current round date.[11]

Table 2 shows the summary statistics for our second dataset. In total, our dataset comprises 58,228 funding rounds of 27,219 companies in 32 different countries from 2000 to 2010. Table 4 lists the countries and the number of companies in our dataset. The variables are described in Table 3.

[11]We show the robustness of our results with regard to the timing of the capital gains tax rate in the Appendix.

Table 2: Summary statistics for the re-investment probability analysis

	mean	sd	min	max	p10	p90
Investment	63.29	48.20	0.00	100.00	0.00	100.00
Capital Gains Tax	18.89	6.29	0.00	45.00	15.00	26.40
Round Duration (days)	400.18	352.79	1.00	3803.00	88.00	817.00
# Rounds	2.12	1.82	1.00	20.00	1.00	4.00
Observations	58228					

Table 3: Data description

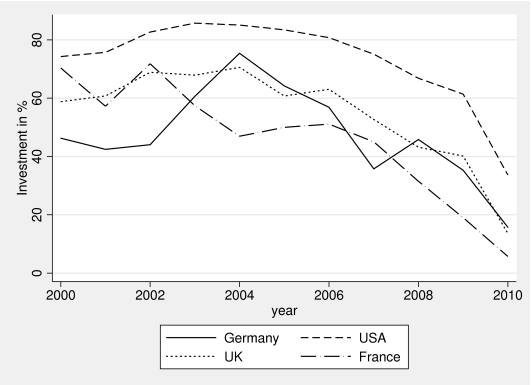
Variable	Description
Capital Gains Tax	Capital gains tax rate applicable to individuals in the highest income bracket.
# Firms	Count of the number of firms receiving the first investment round per ten million inhabitants.
% Success	Percentage of successful firms receiving their first funding in a specific country and year. A firm is classified as successful if it is acquired or taken public.
# Success	Count of number of successful firms per ten million inhabitants in a country. A firm is classified as successful if it is acquired or taken public.
Investment	Dummy variable, equal to 1 if the company obtains a follow-up round or is exited successfully. A successful exit is defined by a trade sale or the company going public.
Quality	Residual of a regression of the probability of investment on the capital gains tax rate, firm, and year-fixed effects.

Table 4: Country and Number of Firms

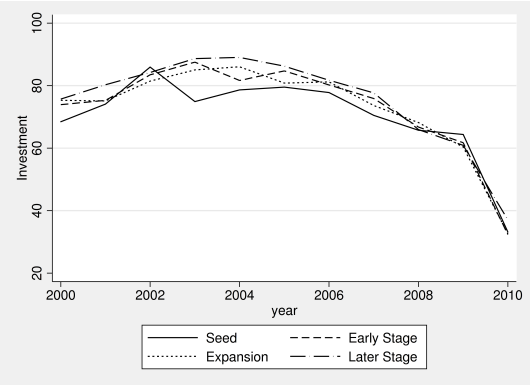
	# firms	Percent
USA	14,217	52.23
United Kingdom	2352	8.64
France	1,934	7.11
Canada	1,428	5.25
Germany	1,347	4.95
Sweden	622	2.29
Korea	596	2.19
Spain	502	1.84
Netherlands	501	1.84
Finland	493	1.81
Japan	334	1.23
Denmark	327	1.20
Israel	322	1.18
Italy	288	1.06
Belgium	285	1.05
Norway	260	0.96
Ireland	250	0.92
Switzerland	215	0.79
Australia	210	0.77
Austria	171	0.63
Portugal	148	0.54
Hungary	109	0.40
Poland	100	0.37
Greece	39	0.14
New Zealand	38	0.14
Luxembourg	30	0.11
Czech Republic	29	0.11
Iceland	20	0.07
Turkey	17	0.06
Slovakia	15	0.06
Mexico	14	0.05
Slovenia	6	0.02
Total	27,219	100.00

Figure 3: Evolution of the investment probability over time

(a) for different countries



(b) for different stages in the US



4 Empirical specification and Results

4.1 The impact of capital gains taxes on the first investment round

We first look at the potential effect of the capital gains tax on the number of firms funded before turning to its influence on the proportion and the number of successful firms. Our econometric model is

$$y = \beta \cdot \text{Lagged Capital Gains Tax} + Controls + \epsilon \tag{1}$$

where y is the number of firms receiving their first funding per ten million inhabitants in a country, the proportion, or the number of successful companies. In all specifications we use a constant, country, and year fixed-effects as controls. The country dummies take up the effect of constant unobserved country-specific factors that might be correlated with the tax rates and thus bias our estimates. Such factors might include e.g. the quality of the university system and the general entrepreneurial attitude. A full set of year dummies controls in a nonparametric way for a potential time trend in both regressions. In the next Section 5, we explore specifications with time-trends and additional control variables and receive the same results.

In the following, we discuss the potential effect of a change in the capital gains tax rate on the number of firms per capita, the proportion, and the number of successful companies per capita. Table 5 reports OLS regressions for equation 1. Throughout the analyses, all standard errors are clustered on the country level to account for the

Table 5: The impact of the capital gains tax on the first investment round

The sample consists of yearly observations with one observation per country and year for 2000 to 2010, inclusively. The dependent variable in the first column is the number of companies receiving their first funding per ten million inhabitants. In the second and third regression it is the proportion of successful firms and the number of succesful firms per ten million inhabitants. A firm is successful if it is eventually acquired or taken public. The independent variables in all regressions below are the capital gains tax rate in year t-1, country, and year dummies. Please refer to the text for the construction of these variables and the data sources. The estimation method in all regressions is ordinary least squares. All regressions are weighted: In the first and third regression we use the population size as analytic weights. In the second column the number of companies serve as weights. In all specifications the standard errors reported in parentheses are clustered on the country level. ***, **, * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

	(1)	(2)	(3)
	# Firms	% Success	# Success
Lagged Capital Gains Tax	-0.90**	1.05**	-0.01
	(0.40)	(0.41)	(0.35)
Year Fixed Effect	Yes	Yes	Yes
Country Fixed Effect	Yes	Yes	Yes
Model	OLS	OLS	OLS
adj. R2	0.70	0.88	0.59
Number of Observations	321	290	321

correlation of tax rates within a country over time (Bertrand, Duflo, and Mullainathan 2004). In the first and third column the observations are weighted with the population size of the country. In the second column we use the number of companies receiving their first funding as weights.

Column (1) shows an estimated coefficient of -0.90 (s.e.=0.4) for the potential impact of the capital gains tax rate on the number of firms that receive venture capital. This suggests that an increase in the capital gains tax rate by one percentage point leads to about 0.90 fewer financed companies per ten million inhabitants. In particular, according to this estimates, a one percentage point tax increase in the U.S. with a population of 309 million in 2010 leads to a reduction of 27.8 companies receiving their first funding. This is a reduction of about 2.15% relative to the average of 1,292 companies receiving funding in the U.S. per year over our sample period. One possible interpretation of these findings is that venture capitalists invest less when capital gains taxes are high. This would be in line with the theoretical predictions of Keuschnigg and Nielsen (2001) and Keuschnigg and Nielsen (2004) and the empirical findings of Da Rin, Nicodano, and Sembenelli (2006). As Thomson One often does

not report investment volumes of funding rounds and — if they are reported — sizes are estimated, we cannot assess whether capital gains taxes have an impact on the actual investment volume per company. Another possible interpretation of the results is that investee companies are selected more critically when capital gains tax rates are high as the venture capitalist's required return before taxes is higher which leads to fewer financed ventures.

In column (2) we estimate the potential effect of taxes and the proportion of successful companies. According to the reported results, increasing the capital gains tax rate by one percentage point is associated with a 1.05 percentage point higher probability of achieving a successful exit. The average probability of exiting an investment via an initial public offering or an aquisition is around 22.3% for the USA in our sample. Therefore a one percentage point tax increase leads to a 5% increase in the probability of realizing a successful exit relative to the mean. One possible explanation for this finding might be that when capital gains tax rates are high, venture capitalists use a stricter due diligence process to evaluate in which companies to invest. This means with high taxes, only the most promising ventures are financed. A second possibility is that the effort of the entrepreneur or the venture capitalist increases due to the tax change which renders financed firms more successful. We cannot conclusively tell whether the first or the second hypothesis applies. However, if tax changes improve the venture capitalist's or the entrepreneur's incentives to perform, we should be able to measure an increase in the number of successful firms with increasing tax rates.

This effect, however, cannot be approved. According to the estimates in column (3) we do not find any statistically significant influence of the capital gains tax rate on the number of successful companies over the whole sample period. The mean estimate is small and negative, but insignificant. Taking the results in columns (2) and (3) together, our findings are in line with the possibility that a more successful selection of funded companies takes place with higher capital gains tax rates. Higher tax rates might therefore lead to a sorting on productivity in the market as in Melitz (2003). Furthermore, these results are in line with the supposition that venture capitalists are already able to pick firms for which an successful exit is probable at the time of the first investment. However, the results do not imply that higher capital gains tax rates

are advisable. We have a large number of companies in our data that are classified as "active" according to Thomson One, which are regarded as failures according to our classification, although they might still exist in the market and create jobs. However, an increase in the capital gains tax rate might result in fewer of these companies.

We cannot exhaustively determine whether our results can be interpreted causally. The estimated regressions identify the causal effect of taxes only if the tax rates are not caused by some other time varying left-out variable that also influences the number of companies receiving their first investment. This seems plausible as we use the general capital gains tax rate which might be exogenous to decisions in the entrepreneurial sector. If taxes are, for example, raised to reduce a government deficit, it is unlikely that they are accompanied by other measures changing new company creation. In other cases this assumption might be more problematic: If a newly elected policy maker is interested in fostering entrepreneurship, he or she might lower taxes and at the same time reduce regulation or increase support mechanisms to entrepreneurship. This being the case, we cannot distinguish the effect of the change in the capital gains tax from the latter two measures. Generally, we have problems with identification if tax changes are embedded in synchronized programs to help or harm the entrepreneurial sector. In this case, our coefficients estimate the effect of the combined measures. Nevertheless, we think that even in that case such a statistic is of interest to the policy maker in its own right.

4.2 The impact of the capital gains tax on follow-up funding rounds

In order to appraise the potential effect of the capital gains tax rate on follow up funding rounds, we estimate four different equations. In the first specification, we regress the capital gains tax rate on an indicator that takes a value of one if the company under consideration receives a subsequent funding round or manages a successful exit (and zero otherwise). The controls include a constant, firm, year, round, and investment stage-fixed effects.

$$Investment = \beta \cdot \text{Capital Gains Tax} + \mu + Controls + \epsilon \tag{2}$$

As we potentially observe repeated investments in the same company, it is possible to use firm-fixed effects to control for time-invariant characteristics of the firm such as

the quality of the business idea or a key technology (Kaplan, Sensoy, and Strömberg 2009). The company's quality might e.g. be positively correlated with the tax burden and bias our estimates when left out. By using this method, we lose all firms with only one investment round. Therefore, we estimate in the second specification an OLS with country-fixed effects.[12]

In the third specification we drop the firm-fixed effect but control additionally for the capital gains tax rate a year before the first funding (initial capital gains tax). The reason is that a higher tax burden at the company's inception might lead to a selection based on quality and therefore also to a higher probability of investment in follow-up funding rounds. In the fourth specification, we first estimate specification 2 and then calculate the residual, which contains the firm-fixed effect μ. This residual captures factors such as the quality of the firm. For simplicity, we call this residual $Quality = \mu + \epsilon$ in the following, being aware that other factors might be subsumed in this measure as well. By dropping all but the first investment round, we can regress this residual on the initial capital gains tax rate and on country, year, and industry-fixed effects. Thus, we control for the year of the first funding.

In table 6 we report the results of all four specifications. In column (1) we find a significantly negative influence of the capital gains tax on the probability of receiving another investment at the 1% level. The mean estimate implies that a one percentage point tax increase is associated with a 2.94 percentage points lower probability of receiving another funding round. With an average re-investment probability of 63.29% in our sample, such a tax increase might lead to a likelihood reduced by 4.64% of receiving another investment relative to the mean. In the second column, we reestimate our model with an OLS. The mean estimate is smaller but still significantly different from zero at the 1% level. These findings imply that an increase in the capital gains tax rate potentially reduces the re-investment incentives in established companies and not only in new firms.

In column (3) we use an OLS model to explain the probability of receiving a follow-up funding round with the capital gains tax at the current round date and with the capital gains tax in force a year before the first round. The effects concerning

[12]Unfortunately, we cannot include firm-fixed effects together with country- and industry-fixed effects in the same regression. No firm in our data changes the industry or the country. Consequently, country and industry-fixed effects are perfectly collinear with the firm-fixed effects and not separately identified.

Table 6: The effect of taxes on the probability of receiving a follow-up investment

The unit of observation is a funding round of a venture capital-backed company. The dependent variable is a dummy that is one if the company under consideration receives a subsequent investment round, goes public, or is acquired. Otherwise the dummy is zero. The "Capital Gains Tax" is the individual capital gains tax rate at the current round. The "Initial Capital Gains Tax" is the capital gains tax rate in effect a year before the first investment round. We include year, stage, round, country, industry, and firm-fixed effects as controls. In the last three specifications we substitute the firm-fixed effects by dummies for the country and the industry and use an OLS as an estimation method. The standard errors reported in parentheses are clustered on country level. ***, **, * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

	(1) Investment	(2) Investment	(3) Investment	(4) Quality
Capital Gains Tax	-2.94***	-1.23***	-2.27***	
	(0.44)	(0.41)	(0.34)	
Initial Capital Gains Tax			1.40***	1.39***
			(0.35)	(0.28)
Year Fixed Effect	Yes	Yes	Yes	Yes
Stage Fixed Effect	Yes	Yes	Yes	Yes
Round Fixed Effect	Yes	Yes	No	No
Country Fixed Effect	No	Yes	Yes	Yes
Industry Fixed Effect	No	Yes	Yes	Yes
Firm Fixed Effects	Yes	No	No	No
Model	FE	OLS	OLS	OLS
Adj. R-squared	0.353	0.241	0.222	0.290
Number of Observations	58228	58228	55614	26719

the capital gains tax rate at the current round date remain virtually unchanged to specifications (1) and (2). Additionally, we find that a one percentage point higher capital gains tax rate in force a year before the first round is associated with a 1.40 percentage points higher probability of investment on average in every follow-up round.[13] This indicates that a higher tax burden at the time of the first investment might lead to an increased survival probability in the investment cycle. The findings in column (3) are corroborated in column (4). In this specification we correlate the firm-fixed effect with the initial capital gains tax rate. The results indicate that a higher initial tax rate appears to increase the firm-fixed effects of the firm. This might be due to an increase in the firm quality.[14]

Taken together, these findings are in line with the results of the last section: On the one hand, higher capital gains tax rates appear to be associated with a lower willingness of venture capitalists to provide further funding. On the other hand, a higher tax burden at the time of the first funding seems to entail investments in companies for which a successful exit is more probable. Again these findings are in line with a selection effect of taxes: If returns are reduced by a high tax burden, venture capital funds do not finance firms with a low success probability. This effect reduces the absolute number of investments but increases the average probability of success of a company given it receives funding.

Our estimates show the causal effect of capital gains tax rates only if nothing else changes (at the same time) taxes, the probability of investment, and the company's quality. As already noted above, this assumption is dubious if the tax changes are embedded in programs targeted at increasing or decreasing entrepreneurship. However, in this regression the potential endogeneity problem is less severe than in the analysis of the last section, because we consider only companies that already received an investment. These companies, especially in later stages, do not rely much on subsidies such as incubators, start-up loans, or coaching provided by state-sponsored programs.

[13]Note that we do not control for the funding round number in specification (3). The funding round number a company is able to achieve is an outcome of the quality of the company and therefore should not be used as an explantory variable if we want to find the determinants of firm quality. In an unreported regression we find that the funding round number is highly correlated with the initial capital gains tax rate.

[14]It is possible that we underestimate the standard errors in this regression because we do not correct for the additional variance of the estimated dependent variable.

5 Robustness

A major concern regarding the robustness of our results is the considered time-span. The dot-com bubble reached its peak in March 2000 and deflated during 2001. At the end of our sample period in 2008 to 2010, the financial crisis set in. If, for example, during such a crisis the government introduced a series of measures to help the entrepreneurial sector and a tax change happened at the same time, our estimates might wrongly reflect the overall effect of these measures and not only of the tax change. But if this is not the case, we might lose information by restricting our sample.

In order to show the robustness of our results, we repeat our regressions with different time-spans. Table 7 and Table 8 show the results. In the first three columns of both tables we exclude the tech-bubble years and in the next three columns we exclude the financial crisis. The last three columns use a sample from 2002 to 2008 without any crisis. The results from the main section appear to be stable: the mean estimates of all coefficients in both tables are of a similar magnitude and the results remain statistically significant at least at the 10% level. The only exception is the effect of taxes on the percentage of successful firms if only the years 2000 to 2008 (column (5) in Table 7) are considered. The estimated coefficient is not significantly different from zero and its estimated size is about half compared to the full sample. One reason for this result might be that our sample is blurred when including the dot-com bubble, during which successful exits were not possible for many companies, and when excluding the financial crisis.

Another concern is that the changes in tax rates pick up the effect of a trend or of correlated variables. In order to control for cofounding factors, we use three different sets of control variables in Table 9 and Table 10 : The "Market" set includes the market-to-book-ratio of the complete market and technology stocks (Gompers, Kovner, Lerner, and Scharfstein 2008). The "Taxes" set includes personal and corporate income taxes. These two sets, together with GDP and GDP growth, the total R&D spending in a country per capita, the R&D spending on higher education, government financed bussiness R&D, the average amount of funding in the last round, and the received funding per person is the "All" set of control variables.[15] In Table

[15] All estimated coefficients are available from the authors, but are left out here for conciseness.

11 and Table 12 we substitute the year-fixed effects, first with an overall and then with a country-specific linear and quadratic time-trend.

The estimates are in line with our findings in the results section as the same coefficients are significantly different from zero and have the expected magnitude. There are three exceptions: First, the negative effect of the capital gains tax on the investment probability while controlling for the initial capital gains tax is much smaller and has only a p-value of 11.6%. Second, there is no effect of taxes on the percentage of successful companies if we control for all variables (9, column (6)). Third, with a country-specific linear and quadratic time-trend the negative effect on the number of firms is not significant due to a larger standard-error (11, column (4)). This might be due to the selection of countries-years for which all controls are available. Reestimating it on the same sample without controls delivers an insignificant coefficient estimate, too.

Please note that the number of observations is reduced due to not all variables being available for all countries and years.

Table 7: Changing the time-span: The effect of taxes on the first round

We repeat the regressions of the results section. In columns (1) to (3) we exclude the tech-bubble years by changing the estimation sample to the year 2002 to 2010. In columns (4) to (6) we exclude the financial crisis by excluding 2009 and 2010. In columns (7) to (9) we estimate our regression with the years 2002 to 2008.

	(1) # Firms	(2) % Success	(3) # Success	(4) # Firms	(5) % Success	(6) # Success	(7) # Firms	(8) % Success	(9) # Success
Lagged Capital Gains Tax	-1.11**	1.36***	-0.01	-1.39**	0.61	-0.19	-1.64*	0.98***	-0.14
	(0.49)	(0.27)	(0.19)	(0.59)	(0.48)	(0.27)	(0.87)	(0.29)	(0.12)
Time span	2002-2010	2002-2010	2002-2010	2000-2008	2000-2008	2000-2008	2002-2008	2002-2008	2002-2008
Number of Observations	269	241	269	257	234	257	205	185	205

Table 8: Changing the time-span: The effect of taxes on follow-up rounds

We repeat the regressions of the results section. In columns (1) to (3) we exclude the tech-bubble years by changing the estimation sample to the year 2002 to 2010. In columns (4) to (6) we exclude the financial crisis by excluding 2009 and 2010. In columns (7) to (9) we estimate our regression with the years 2002 to 2008.

	(1) Investment	(2) Investment	(3) Quality	(4) Investment	(5) Investment	(6) Quality	(7) Investment	(8) Investment	(9) Quality
Capital Gains Tax	-3.64***	-2.24***		-2.78***	-2.16***		-3.66***	-2.23***	
	(0.50)	(0.39)		(0.54)	(0.25)		(0.48)	(0.27)	
Initial Capital Gains Tax		1.53***	1.94***		2.44***	1.35***		2.38***	1.55**
		(0.33)	(0.34)		(0.51)	(0.42)		(0.46)	(0.58)
Model	FE	OLS	OLS	FE	OLS	OLS	FE	OLS	OLS
Time-Span	2002-2010	2002-2010	2002-2010	2000-2008	2000-2008	2000-2008	2002-2008	2002-2008	2002-2008
Number of Observations	37801	36456	18270	38889	36813	19607	20767	19690	11437

Table 9: Adding Controls: The effect of taxes on the first round

We repeat the regressions of the results section and add additional control variables. For the description of the control sets please refer to the text.

	(1) # Firms	(2) # Firms	(3) # Firms	(4) % Success	(5) % Success	(6) % Success	(7) # Success	(8) # Success	(9) # Success
Lagged Capital Gains Tax	-1.42**	-1.31**	-2.02**	1.09**	0.98***	0.34	-0.29	-0.23	-0.22
	(0.62)	(0.53)	(0.96)	(0.48)	(0.32)	(0.67)	(0.21)	(0.17)	(0.32)
Controls	Market	Taxes	All	Market	Taxes	All	Market	Taxes	All
Number of Observations	187	306	121	187	276	121	187	306	121

Table 10: Adding Controls: Changing the time-span: The effect of taxes on follow-up rounds

We repeat the regressions from the results section and add additional control variables. For the description of the control sets please refer to the text.

	(1) Investment	(2) Investment	(3) Investment	(4) Investment	(5) Investment	(6) Investment	(7) Quality	(8) Quality	(9) Quality
Capital Gains Tax	-2.81***	-2.80***	-2.39***	-2.19***	-2.33***	-2.26***			
	(0.57)	(0.47)	(0.58)	(0.42)	(0.22)	(0.50)			
Initial Capital Gains Tax				1.51***	1.36***	1.74***	1.55***	1.37***	0.02
				(0.32)	(0.34)	(0.19)	(0.38)	(0.28)	(0.46)
Model	FE	FE	FE	OLS	OLS	OLS	OLS	OLS	OLS
Controls	Market	Taxes	All	Market	Taxes	All	Market	Taxes	All
Number of Observations	56530	52764	44236	53944	50202	41997	25475	26407	21967

Table 11: Controlling for time-trends: The effect of taxes on the first round

We repeat the regressions from the results section and add time trends. In columns (1) to (3) we include a linear and quadratic time trend. In columns (4) to (6) we control for a linear country-specific time trend.

	(1) # Firms	(2) % Success	(3) # Success	(4) # Firms	(5) % Success	(6) # Success
Lagged Capital Gains Tax	-1.48**	1.01***	-0.22	-2.55	0.83***	-0.82
	(0.72)	(0.22)	(0.23)	(1.98)	(0.23)	(0.59)
Trend	linear	linear	linear	Country	Country	Country
Number of Observations	321	290	321	321	290	321

Table 12: Controlling for time-trends: The effect of taxes in follow-up rounds

We repeat the regressions from the results section and add time trends. In columns (1) to (3) we include a linear and quadratic time trend. In columns (4) to (6) we control for a linear country-specific time trend.

	(1) Investment	(2) Investment	(3) Quality	(4) Investment	(5) Investment	(6) Quality
Capital Gains Tax	-2.68***	-1.57***		-1.89***	-0.25	
	(0.32)	(0.39)		(0.12)	(0.16)	
Initial Capital Gains Tax		1.04***	1.39***		1.44***	1.03*
		(0.27)	(0.19)		(0.12)	(0.57)
Year Fixed Effect	No	No	No	No	No	No
Model	FE	OLS	OLS	FE	OLS	OLS
Trend	linear	linear	linear	Country	Country	Country
Number of Observations	58228	55614	26719	58228	55614	26719

6 Conclusion

This study offers a new view on the effect of the capital gains tax in the entrepreneurial process. We document an empirical association between the capital gains tax and the number and success of venture capital investment. The influence of the capital gains tax can be separated into its effect on the propensity to invest and on the probability of the venture capital-backed start-up achieving a successful exit. Our results indicate that higher capital gains tax rates potentially lead to a reduction in the number of companies receiving their first investment and to a lower probability of receiving a follow-up investment. In contrast to that, high capital gains tax rates at the time of the first funding are associated with a higher probability of receiving follow-up funding and eventually being acquired or going public. Therefore, high tax rates are correlated with fewer financed but — on average — more successful firms. Our results imply hence that policy makers can indeed influence entrepreneurial activities by tax policy. It does not mean, however, that policy makers should raise tax rates in order to improve the funding of successful ventures. First of all, we have a high number of companies in our database, that are classified as "active" according to Thomson One. These companies might not be successfully acquired or taken public, but several of them can nevertheless contribute to innovation and create jobs. Second, the general number of companies funded is reduced by high capital gains taxes which decreases proportionally the absolute number of potentially successful ventures.

Besides, our study might contribute empirical evidence to the ongoing policy discussion on the taxation of carried interest in the U.S. which started in the early 2000s. The aim of different legislative proposals was to increase the taxation of carried interest, a variable compensation for general partners of venture capital funds, from 15% on capital gains to the level of 39% on ordinary income. In many other countries similar discussions followed. Our findings imply that on the one hand, such a tax increase can heavily reduce the number of companies financed by venture capital and harm the probability of existing companies receiving a follow-up funding round. On the other hand, such a tax increase might cause a potentially desirable selection effect, by raising the number of companies which eventually lead to a successful exit like an IPO or a trade sale.

We do not have data on the differential classification of certain investment returns

for general partners of venture capital funds, as either capital gains or income, in order to further breakdown the effect of the capital gains tax rate and to give a quantitative effect of the estimated effect. In addition, our estimate constitutes a combination of the effect of the capital gains tax on the decision of entrepreneurs, venture capitalists, and limited partners. Therefore, we cannot isolate the cause of the effect on any single one of these groups and ascribe it to one special tax treatment. However, when stakes in ventures are sold either by the venture capitalist or the entrepreneur himself, capital gains taxes will be due. Even if some venture capitalists might be tax exempt - which might be the case in the U.S. - they would as well favor a lower capital gains taxation so that exit possibilities are alleviated as entrepreneurs would then have to pay lower taxes. Thus, our results might be a reasonable approximation of the effects a proposed tax increase for carried interest could have. Besides, high capital gains taxes reduce the number of generally venture capital-financed companies which might harm the innovation in economies.

References

Amit, R., J. Brander, and W. Antweiler (2002): "Venture capital syndication: Improved venture selection versus the value-added hypothesis," *Journal of Economics and Management Strategy*, 11, 423–452.

Becker, R., and T. Hellmann (2003): "The Genesis of Venture Capital - Lessons from the German Experience," CESifo Working Paper Series 883, CESifo Group Munich.

Bertrand, M., E. Duflo, and S. Mullainathan (2004): "How Much Should We Trust Differences-in-Differences Estimates?*," *Quarterly Journal of Economics*, 119(1), 249–275.

Bonini, S., and S. Alkan (2009): "The Macro and Political Determinants of Venture Capital Investments around the World," SSRN Working Paper.

Brander, J., Q. Du, and T. Hellmann (2010): "The Effects of Government-Sponsored Venture Capital: International Evidence," Mimeo.

Cochrane, J. H. (2005): "The risk and return of venture capital," *Journal of Financial Economics*, 75(1), 3 – 52.

Cumming, D. J. (2010): "Review Essay: Public Policy and the Creation of Active Venture Capital Markets and Some Comments on 'Boulevard of Broken Dreams: Why Public Efforts to Boost Entrepreneurship and Venture Capital Have Failed and What to Do About It,' by Josh Lerner," Venture Capital: An International Journal of Entrepreneurial Finance,Forthcoming.

Da Rin, M., G. Nicodano, and A. Sembenelli (2006): "Public policy and the creation of active venture capital markets," *Journal of Public Economics*, 90(8-9), 1699 – 1723.

——— (2010): "A Reply to Douglas Cumming's 'Review Essay: Public Policy and the Creation of Active Venture Capital Markets'," Venture Capital: An International Journal of Entrepreneurial Finance, Forthcoming.

DeGennaro, R. P. (2010): "Book Review: Boulevard of Broken Dreams: Why Public Efforts to Boost Entrepreneurship and Venture Capital Have Failed and What to Do About it by Josh Lerner, Princeton University Press, p. 248, 2009," *International Journal of Business*, Vol. 15, No. 2.

Elango, B., V. H. Fried, R. D. Hisrich, and A. Polonchek (1995): "How venture capital firms differ," *Journal of Business Venturing*, 10(2), 157 – 179.

Gompers, P., A. Kovner, J. Lerner, and D. Scharfstein (2008): "Venture capital investment cycles: The impact of public markets," *Journal of Financial Economics*, 87(1), 1 – 23.

Gompers, P., and J. Lerner (2000): "Can corporate venture capital succeed? Organizational structure, complementarities, and success," in *Concentrated Ownership.*, ed. by R. Morck. University of Chicago Press, Chicago.

Gompers, P. A., J. Lerner, M. M. Blair, and T. Hellmann (1998): "What Drives Venture Capital Fundraising?," *Brookings Papers on Economic Activity. Microeconomics*, 1998, pp. 149–204.

Gordon, R. H. (1998): "Can High Personal Tax Rates Encourage Entrepreneurial Activity?," *IMF Sta Papers*, 45(1), 49–80.

Hellmann, T., and M. Puri (2000): "The interaction between product market and financing strategy: the role of venture capital," *Review of Financial Studies*, 13(4), 959–984.

Hochberg, Yael; Ljungqvist, A., and Y. Lu (2007): "Who you know matters: venture capital networks and investment performance," *Journal of Finance*, 62, 251–301.

Holmstrom, B., and J. Tirole (1997): "Financial Intermediation, Loanable Funds, and the Real Sector," *The Quarterly Journal of Economics*, 112, 663–691.

Jeng, L. A., and P. C. Wells (2000): "The determinants of venture capital funding: evidence across countries," *Journal of Corporate Finance*, 6(3), 241 – 289.

Kaplan, S. N., B. A. Sensoy, and P. Strömberg (2009): "Should Investors Bet on the Jockey or the Horse? Evidence from the Evolution of Firms from Early Business Plans to Public Companies," *The Journal of Finance*, 64(1), 75–115.

Kaplan, S. N., and P. Strömberg (2004): "Characteristics, Contracts, and Actions: Evidence From Venture Capitalist Analyses," *The Journal of Finance*, 59, 2177–2210.

Keuschnigg, C., and S. B. Nielsen (2001): "Public Policy for Venture Capital," *International Tax and Public Finance*, 8, 557–572, 10.1023/A:1011251920041.

——— (2004): "Start-ups, venture capitalists, and the capital gains tax," *Journal of Public Economics*, 88(5), 1011 – 1042, ISPE Conference.

Kortum, S., and J. Lerner (2000): "Assessing the Contribution of Venture Capital to Innovation," *The RAND Journal of Economics*, 31(4), pp. 674–692.

Lerner, J. (2009): *Boulevard of broken dreams: Why public efforts to boost entrepreneurship and venture capital have failed - and what to do about it.* Princeton, N.J: Princeton University Press.

Melitz, M. J. (2003): "The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity," *Econometrica*, 71(6), pp. 1695–1725.

Nanda, R., and M. Rhodes-Kropf (2011): "Financing Risk and Bubbles of Innovation," Harvard Business School Entrepreneurial Management Working Paper No. 11-013.

Phalippou, L., and O. Gottschalg (2009): "The Performance of Private Equity Funds," *Review of Financial Studies*, 22(4), 1747–1776.

Poterba, J. M. (1987): "How burdensome are capital gains taxes?: Evidence from the United States," *Journal of Public Economics*, 33(2), 157 – 172.

Poterba, J. M. (1989a): "Capital gains tax polic toward entrepreneurship," *National Tax Journal*, 42(3), 375–89.

Poterba, J. M. (1989b): "Venture Capital and Capital Gains Taxation," *Tax Policy and the Economy*, 3, pp. 47–67.

Townsend, R. (2010): "Propagation of Financial Shocks: The Case of Venture Capital," Job Market Paper - Harvard University, Dec 30, 2010.

7 Appendix

This section contains additional robustness checks for the methods used in the results section. First, we change the timing of our policy interventions. In the main text we use the tax rate for the year before the actual funding decision is taken. This is the timing assumption of Gompers, Kovner, Lerner, and Scharfstein (2008). More precisely, we use the tax rate for the year before the first funding for the first investment. For the follow-up investment we use the tax rate at the current round date. In Table 7 and Table 8 we change the timing by lagging and forwarding the tax rates one year relative to the timing in the main text. Therefore, we consider the tax rates two years before the decision (-1) and in the year after the decision (+1) for the first funding round. We expect that our estimates should be relatively insensitive to the exact timing because taxes are serially correlated.

We find that the coefficients have the expected sign and are statistically significant if we measure the tax rate at the date of the decision. The results are more nuanced if we consider the tax rates two years before the decision: there is no effect on the number of firms receiving their first funding. The mean estimate of the coefficient even has a positive sign but with large standard errors. If we restrict the sample to the years after 2000, the sign becomes again significantly negative. Therefore, it might be explained by the number of firms which decreased in the aftermath of the tech-bubble. The coefficient is also negative if we estimate an unweighted regression, thus giving the U.S. a smaller weight. All other results are as expected.

Another concern is, that the weighing scheme might influence our results: In the main text we use weighted regressions in the first round because some observations are more informative than others. The percentage of successful companies has e.g. more information for the U.S. as our sample contains many companies of this country whereas it contains less for e.g. Slovenia. If we give all observations equal weights as we do in Table 15, the coefficients on the percentage of successful firms is not significantly different from zero anymore. Apparently, countries with few companies add noise, if we do not do weighted regressions. If we restrict our sample to the

15 countries which have on average 10 or more (column (4)) or 20 or more (column (5)) companies per 10 million inhabitants receiving their first funding, the results are again significant.

Finally, a concern which was expressed to us is that by classifying a successful exit as a follow-up investment, we might bias our results. In Table 16 we delete the last round of every company which achieved a successful exit. Therefore, the resulting dataset consists only of re-investment decisions for successful firms. On the flip-side, for unsuccessful firms we do not know whether the last funding decision was really an incorrect decision to re-invest or the decision to not exit the investment. The results that we get with this modification are similar to the one reported in the results section.

Table 13: Changing the timing: The effect of taxes on the first round

We repeat the regressions from the results section and change the timing of the independent variables. If a (+1) is added to the variable name, this indicates that the variable is measured a year after the current round. With a (-1) we indicate a variable measured a year before the current round.

	(1) # Firms	(2) % Success	(3) # Success	(4) # Firms	(5) % Success	(6) # Success
Lagged Capital Gains Tax (-1)				1.23	0.49***	0.81
				(1.05)	(0.17)	(0.63)
Lagged Capital Gains Tax (+1)	-0.74*	1.03***	0.11			
	(0.43)	(0.33)	(0.42)			
Model	OLS	OLS	OLS	OLS	OLS	OLS
Number of Observations	321	290	321	315	284	315

Table 14: Changing the timing: The effect of taxes on follow-up rounds

We repeat the regressions from the results sections and change the timing of the independent variables. If a (+1) is added to the variable name, this indicates that the variable is measured a year after the current round. With a (-1) we indicate a variable measured two years before the current round as we use the variable one year before the current round in the main results section.

	(1) Investment	(2) Investment	(3) Quality	(4) Investment	(5) Investment	(6) Quality
Capital Gains Tax (-1)	-2.65***	-1.93***				
	(0.55)	(0.48)				
Capital Gains Tax (+1)				-3.04***	-2.07***	
				(0.54)	(0.45)	
Initial Capital Gains Tax (-1)		0.56**	0.23			
		(0.21)	(0.17)			
Initial Capital Gains Tax (+1)					0.91**	0.46*
					(0.41)	(0.27)
Model	FE	OLS	OLS	FE	OLS	OLS
Number of Observations	57221	54780	26328	52037	51017	24623

Table 15: Changing the weighing scheme: The effect of taxes on the first round

We repeat the regressions from the results section and change the weighing scheme. In the first three columns we show unweighted regressions. In specifications (4) and (5) we restrict our sample to countries with more than 10 and 20 new companies per ten million inhabitants on average receiving their first funding.

	(1) # Firms	(2) % Success	(3) # Success	(4) % Success	(5) % Success
Lagged Capital Gains Tax	-1.10**	0.38	-0.20	1.23	2.23**
	(0.44)	(0.55)	(0.13)	(0.96)	(0.93)
Model	unweighted	unweighted	unweighted	>10	>20
Number of Observations	321	290	321	209	150

Table 16: Leaving out the exits: The effect of taxes on follow-up rounds

We repeat the regressions from the results section and change the estimation method to random effects.

	(1) Investment	(2) Investment
Capital Gains Tax	-1.25***	-2.05***
	(0.38)	(0.33)
Initial Capital Gains Tax		1.05***
		(0.22)
Year Fixed Effect	Yes	Yes
Stage Fixed Effect	Yes	Yes
Round Fixed Effect	Yes	No
Country Fixed Effect	Yes	Yes
Industry Fixed Effect	Yes	Yes
Firm Fixed Effects	No	No
Model	RE	RE
Adj. R-squared		
Number of Observations	58228	55614