



Corporate finance and the governance implications of removing government support programs [☆]



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ABSTRACT

Governments worldwide spend trillions of dollars on business support programs. This article examines the implications to investors of phasing out one of these subsidy programs. Our setting takes advantage of a unique quasi-natural experiment, where tax subsidies for Canadian Labour-Sponsored Venture Capital Corporations (LSVCCs) were phased out in one province but not in others. Using a difference-in-differences setting, we show that fund performance—unrelated to the tax credit—decreased substantially following the enactment of the phase-out. We further show empirically that LSVCC managers continued to charge venture capital-like management fees, despite the fact that their investment strategies become more similar to mutual funds. Our data strongly support the idea that investors in companies and/or funds that unexpectedly lose government support face significant financial costs.

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1. Introduction

Governments worldwide spend trillions of dollars on business support programs in the form of direct/indirect subsidies to firms or investors (Cressy, 2002; Keuschnigg and Nielsen, 2003, 2004a, 2004b; Colombo et al., 2011; Takalo et al., 2013). For example, the United States government has established Individual Retirement Account (IRA) and 401 k savings plans to increase individuals' savings rates (see, e.g., Engen et al., 1996; Gale and Scholz, 1994; Poterba et al., 1996; Venti and Wise, 1990). And the province

of Ontario in Canada spends over C\$4 billion per year on business support programs (Cumming and Johan, 2013). Other economies such as Germany spent billions in subsidies after reunification in order to boost the economies of the East German states (Dornbusch and Wolf, 1994). Furthermore, in order to combat the recent financial crisis, many governments worldwide implemented short-term subsidy programs.

Inevitably, however, subsidy programs must be phased out at some point, either because they are too limited, or because governments, and thus policies, change. This article empirically explores whether there are corporate governance or corporate finance implications of phasing out such programs, particularly with respect to any misconduct among those that lose government support.

To illustrate, consider tax subsidies on retirement savings. While many articles have focused on the effectiveness of these subsidies or on changes in savings behavior (Engen et al., 1996; Gale and Scholz, 1994; Poterba et al., 1996; Venti and Wise, 1990), there has been little research thus far on the cost impact

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to investors. Clearly, we expect to find costs for investors when subsidy programs end. Given the global importance and volume of such programs, it is somewhat surprising that we have so little sound empirical evidence on the implications of a phase-out of tax subsidies for investors.

Our main challenge here is to find compelling exogenous variation, and thus implement a convincing research design. For example, we consider a difference-in-differences approach using temporary subsidy or government support programs with a predefined phase-out, but this method will inevitably face an endogeneity bias. If managers and investors anticipate the end of a government program, this could lead to biased estimates. Hence, when considering a temporary business support program, we cannot be fully cognizant of the costs to investors after it is phased out. We empirically explore this question in a quasi-natural setting, where the phase-out of a long-term government support program is an exogenous event.

To provide empirical evidence, we first use the example of a repeal of a subsidy program for retail investors. In May 1985, tax-subsidized Labour-Sponsored Venture Capital Corporations (LSVCCs) were created in order to close the perceived venture capital (VC) funding gap in Canada, as well as to tap the retail market as a new source of VC funds. Similar funds called Venture Capital Trusts (VCT) were also established in the U.K. (Cumming and MacIntosh, 2007; Cumming and Johan, 2013).

Due to their high level of investment risk, VC funds are usually managed by expert fund managers (Kannianen and Keuschnigg, 2003, 2004; Keuschnigg, 2004; Wang and Wang, 2010, 2012a,b; Wang and Zhou, 2004). In the past, such funds were available primarily to sophisticated institutional investors or to accredited high net worth investors. Such investors were able to not only take advantage of the diversification benefits of VC funds, they could also enjoy average historical realized returns that were significantly higher than those of traditional asset classes like equities or bonds. Thus, the Canadian government believed that the diversification benefits and return prospects—given fund manager selection and other restrictions—would also enhance retail investors' portfolio risk and return structure. In view of the potential benefits of increasing VC availability to entrepreneurs and the effect on national innovation rates, both the federal and provincial governments of Canada provided tax credits to retail investors in LSVCCs. This paper discusses why such good intentions may have ultimately been misplaced, and can end up costing retail investors dearly.

Specifically, we explore the value implications for retail investors who exploited or attempted to exploit the end of this program. The phase-out was first announced in 2005, but it was not carried out until 2008, and there was great uncertainty in between about the actual end date. Our identification strategy is based on a difference-in-differences setting that exploits regional differences, because the phase-out applied only to investors in one province (Ontario). Provinces where retail investors continued to enjoy the tax subsidy serve as our control group.

Since the introduction of LSVCCs, however, the literature has documented an underperformance of mutual funds and of the market when measured by, e.g., small-cap fund indices. This is despite the fact that these funds on average have expert management and accompanying “expert” rate fees, these funds on average have underperformed mutual funds and the market when measured, e.g., by small-cap fund indices. Moreover, extant research has established certain inadequacies of the LSVCC structure and some governance issues (see, e.g., Cumming and MacIntosh, 2007). For example, in 2008, after the final enactment that gradually removed the tax subsidies, LSVCCs in Ontario shifted their investment strategies from VC and private equity to public equity (Johan et al., 2014). The funds thus became more mutual fund-like

in strategy, which led to a reduction in diversification benefits. However, they continued charging higher management fees than mutual funds (see Section 4.6 for more details).

We test the performance consequences of such shifts in investment behavior on the part of LSVCC managers in response to the regulatory changes. What differentiates our study is that we are able to analyze changes in tax structure in 2005 and 2008. This quasi-experimental setting enables us to overcome the key challenges of finding a convincing empirical strategy to study the effect of a tax subsidy phase-out policy on funds' return on assets (RoA) for Ontario versus non-Ontario LSVCCs. We are thus able to document the magnitude of the value-destroying effect caused by this phase-out-induced shift in investment behavior for retail investors.

Our non-parametric tests suggest that the returns in Ontario and the other provinces followed a common and parallel trend until 2007. Therefore, the announcement of the phase-out did not have immediate return consequences. However, as of 2008, the returns of both groups began to diverge, and the returns of Ontario LSVCCs dropped well below those in other provinces. To ensure this observation was not driven by cross-province differences in economic development, we also run a placebo test using Canadian mutual funds across all provinces. We find that the returns of the Ontario funds and the other Canadian mutual funds followed parallel paths over the entire sample period. This observation implies that the difference in returns after 2007 is a consequence of the tax subsidy phase-out and not a different trend across provinces.

Our difference-in-differences estimation allows us to control for other potentially confounding factors that may affect RoA, such as fund size, investment strategy, management fee, number of VC investments, and local GDP. We find consistent evidence that the tax subsidy phase-out had only a small effect around the announcement date. The negative return effect occurs in Ontario after the final enactment, and is substantial: The RoA of Ontario LSVCC funds was 16.4 percentage points lower than that of LSVCC funds in other provinces. This is significant given the −3.6% average LSVCC fund return over the sample period. Furthermore, because investments were typically “locked up” for a minimum of eight years, only a small minority of investors would have been able to adjust their savings behavior when the tax subsidies were phased out. However, even if they could have responded, it is not clear that investors would have adjusted their behavior. Consider a study by Chetty et al. (2013), for example, that showed 85% of Danish individual investors behaved passively when tax subsidies on retirement savings changed.

Our study contributes to the debate on subsidies and government support programs in the following ways. First, we contribute to the literature on tax subsidies and savings (Engen et al., 1996; Gale and Scholz, 1994; Poterba et al., 1996; Venti and Wise, 1990). We find that removing the tax subsidies resulted in changes in funds' investment behavior. It also proved contrary to the interests of retail investors, who sought to benefit from the higher returns of high-risk VC investments while diversifying their investment portfolios with VC. Some managers instead destroyed the value of their portfolios.

Second, our findings have implications for redesigning tax policies and potential fund regulations. Other Canadian provinces are considering phasing out tax subsidies, while some jurisdictions such as the U.K. are increasingly revisiting their own policies. Following the Ontario government's tax subsidy phase-out policy, the Canadian federal government announced plans to gradually remove the federal tax credit for LSVCC investors by the end of 2016.¹

¹ See the Government 2013 Budget Plan at <http://www.budget.gc.ca/2013/doc/plan/chap3-4-eng.html#a25-Phasing-Out-the-Labour-Sponsored-Venture-Capital-Corporations-Tax-Credit>.

Because retail investors tend to exhibit rather “sticky” investment behavior (Jones, 2012), it could be useful to establish regulations that would limit managers’ opportunities to change investment strategies, and thus further erode investors’ portfolio values. Moreover, regulators could also consider recent findings from government-managed funds that indicate a relative lack of efficiency of those funds (see Grilli and Murtinu, 2014a).

However, when government-managed funds syndicate their venture investments with independent VC funds (using the latter as the lead), prior research has documented a positive impact on venture investment performance (see Cumming et al., 2015a,b; Grilli and Murtinu, 2014b). Given this evidence, it seems advantageous to consider requiring co-investments, with private VC funds taking an active role in the venture firm. This is generally not allowed in our case for LSVCCs.

Our findings also suggest that LSVCC managers in Ontario increasingly tend to mimic the structure of mutual fund portfolios, while continuing to maintain the higher fee structures that are characteristic of VC fund investments. Therefore, investors who maintain their LSVCC investments after a tax subsidy phase-out are likely to continue to underperform mutual funds with similar risk profiles. New regulations could address this incongruity.

Note, however, that restructuring existing regulations is always exceedingly complex. For example, tax authorities may be asked to consider grandfathering rules, which enable existing retail investors to maintain the tax benefits and status that were in place at the time they first invested. New rules would apply only to new investors. These and other potential policy designs can limit value destruction, e.g., the transfer of tax benefits to mutual funds, but they are costly for the government and they increase compliance costs.

Our results also highlight the general effects of subsidies. Retail investors apparently respond to tax-beneficial investments without questioning the net-of-tax profitability of their portfolio decisions. However, we believe that retail investors are not necessarily as unsophisticated as they are made out to be. They may be incentivized to invest with the expectation of higher returns from the relatively higher risk VC investment arena. However, we would also expect returns to exceed those of mutual funds in tax-deferred accounts (Dammon et al., 2004; Huang, 2008). The transparency of fund investments, changes in asset structure, and changes in tax subsidies may therefore induce more investors to rebalance their portfolios. We find that, if retail investors could efficiently calculate how their investments have performed relative to other (mutual) funds and markets net of fees, including the tax subsidies, the value destruction would undoubtedly affect households’ asset allocation.

The remainder of this paper proceeds as follows. Section 2 provides details on the institutional background of LSVCCs, while Section 3 presents our data and discusses our estimation methods. In Section 4, we present our empirical evidence. Section 5 summarizes our main results, discusses the policy implications, and concludes.

2. Institutional background

2.1. Tax subsidies for labour-sponsored venture capital corporations and reform

LSVCCs have played an important role in the Ontario investment market since the early 1990s, especially for the funding of small and medium-sized companies. By the end of 2003, in fact, LSVCCs contributed more than one-third of total investment into small and medium-sized businesses in Ontario province. Since the inception of the first LSVCC in Quebec, both the federal and

provincial governments have provided charitable tax benefits to individual investors in order to encourage investments in these funds. We briefly summarize the benefits to individual LSVCC investors here by using Ontario as an example.

LSVCCs in Canada are a unique type of corporation and are incorporated under various federal and province-specific legislations. In Ontario, LSVCCs are incorporated under the Labour-Sponsored Venture Capital Corporations Act, passed in 1992. Furthermore, each LSVCC requires a labor union sponsor, which legally controls the fund, but does not operate it. Except for LSVCCs incorporated in Quebec and federally incorporated, LSVCCs are normally only allowed to accept investments from local residents. There is no fixed minimum amount required for an individual investment, but there is a maximum allowable amount per year. Prior to 2007, the amount was C\$5,000; it was subsequently increased to C\$7,500.

LSVCC contributions by investors are made through a so-called *Registered Retirement Savings Plan* (RRSP), which is similar to a 401 k plan in the U.S. and provides tax-exempt retirement savings (*Federal Tax Credit*). Ontario governments generally provide a 15% tax credit for LSVCC investors. Thus, individual investors could realize up to C\$750 in tax benefits/returns prior to 2007 ($C\$5000 \times 15\%$), and C\$1,125 ($C\$7500 \times 15\%$) since then.² Besides this generous provincial tax benefit, individual investors also benefit from a 15% tax credit at the federal level. Assuming a RRSP contribution via a LSVCC of C\$5000, along with a 15% Federal Tax Credit and another 15% Provincial Tax Credit (as most provinces provide), would result in a combined Federal and Provincial Tax Credit of C\$1500 ($=C\$750 + C\750).

The RRSP *Tax Savings* range in Ontario from C\$1100 (for investors with income of up to C\$20,000, and a corresponding tax rate of about 22%) to C\$2320 (for investors with income of above C\$100,000 and a corresponding tax rate of 46.40%, the tax rate changes marginally every year). This results in *Total Tax Credits and Savings* ranging from C\$2600 to C\$3820, depending on an investor’s taxable income, or a *Gross Return on Tax Credit* ranging from 52% (22% tax rate) to 76% (46.40% tax rate).

However, this *Gross Return on Tax Credit* does not include the *Gross Return on LSVCC Performance* (measured by RoA). The *Net Return* for investors, assuming a 10% RoA, then ranges from 62% (22% tax rate) to 86% (46.40% tax rate). If the provincial government removes the 15% tax credit for LSVCC investors, the *Gross Return on Tax Credit* will mechanically be reduced by 15% for new contributions. However, there would be no such impact on the *Gross Return on LSVCC Performance* (RoA)—the dependent variable in our empirical analysis.

The previous calculation shows that a removal of the *Provincial Tax Credit*, if removed as in Ontario, has a stronger impact on lower income investors in relative terms, due to their lower marginal tax rate. Importantly, we see no economic reason why investors in different taxable income brackets should react differently in response to *Provincial Tax Credit* changes. Investors are locked into their LSVCC investments, so the investor base around the tax credit phase-out does not change. Therefore, we do not expect that the tax status of investors will explain our findings of RoA changes in Ontario versus other provinces.

Regardless of the obvious attraction of this investment, there has been much criticism that LSVCC managers have not been able to attain similarly “attractive” returns for their investors—before consideration of the tax advantages. Several studies have shown that the performance of these high-risk investments is subpar, and for some holding periods it is not comparable to that of

² If the fund is research-oriented, investors can obtain an additional 5% tax credit, which equaled C\$250 ($C\$5000 \times 5\%$) before 2007, and C\$375 since then ($C\$7500 \times 5\%$).

risk-free investments (Cumming and MacIntosh, 2007; Cumming and Johan, 2013).

On August 29, 2005, the Ontario government announced it would eliminate the 15% Ontario tax credit for LSVCC investors. A more detailed plan was released on September 30, 2005, when the government stated it would keep the 15% tax credit unchanged until the end of 2008, and then gradually decrease it by 5% per year afterward. By the end of 2010, Ontario intended to fully eliminate it. On May 14, 2008, the Ontario government extended the phase-out of the tax credit by one more year, and announced a full elimination by the end of 2011.³ During this time, there were multiple minor amendments to the LSVCC Act in different provinces, relating primarily to the minutiae of fund operations. However, the fundamental idea of the Act has not changed: Its goal is to provide the necessary liquidity to support small local businesses.

In addition to changes in the tax credit for Ontario-based investors, there was an increase in the tax credit to 20% in two provinces after 2009: (1) New Brunswick, and (2) Newfoundland and Labrador. However, we find that the tax changes in these two provinces do not influence our main findings because they only affected one LSVCC. Furthermore, the LSVCC was missing some important information about management fees and returns, and thus could not be included in our regression analysis.

2.2. Governance structure of LSVCCs

As we noted earlier, LSVCC funds combine many features of mutual and private venture capital funds. For example, in Canada, mutual funds can be formed as either corporations or trusts. LSVCCs are formed under provincial legislation as corporations. Similarly to mutual funds, LSVCCs can issue shares and sell them to individual retail investors. However, the investment strategy of LSVCCs is more similar to that of private VC funds, which invest primarily in high-risk small and medium-sized enterprises. LSVCCs also feature several unique organizational characteristics that differ from both mutual funds and private VC funds.⁴ These unique characteristics may have contributed to the lower performance.

First, mutual funds invest mainly in listed companies or bonds, while LSVCCs invest mainly in small and medium-sized companies. This investment strategy is very similar to that of private VC funds, which are often formed as limited partnerships. The structure of a corporation can empower individual shareholders through voting. However, if not properly enforced, this type of structure may also exacerbate so-called agency problems.

Second, LSVCC funds by law require labor sponsors. Unfortunately, these labor sponsors do not typically have any expertise in running investment funds, nor are they necessarily interested in controlling fund managers effectively. In fact, many of the labor unions simply “rent” their names out, collecting fees in exchange.

Third, mutual fund investors can redeem shares on a daily basis; investments in LSVCC funds, however, are “locked up” for a period of eight years (in Ontario). This creates a considerable liquidity disadvantage, and investors cannot rebalance their portfolios around the announcement of the phase-out.

Fourth, unlike investors in both mutual funds and private VC funds, who receive no tax benefits and will need to pay income

taxes on their profitable investments, LSVCC investors receive upfront tax benefits based on their initial investments.

We therefore argue that individual investors, who own only a small portion of the total shares issued, do not have the incentive or the means to monitor the behavior of fund managers or the performance of the LSVCC fund. This lack of monitoring is due to the unique structure of LSVCC funds and to the upfront tax benefits on the initial investments.

2.3. Related government subsidy programs in other jurisdictions

In many ways, Canadian LSVCCs combine several features of VC funds, professional management funds that invest in small high risk firms, and mutual funds, which are open to retail investors. Due to this unique design, no other country exhibits this exact regulatory framework. Nevertheless, our results have external validity and are comparable to other settings.

We discuss two specific governmental initiatives in this context that also aim to foster investments in SMEs to reduce existing funding gaps, create jobs, and spur innovation. In the U.S., the Small Business Investment Company (SBIC) program, created in 1958 and operated by the Small Business Administration (SBA), is a large-scale program, which has channeled \$17 billion in investments to about 6000 U.S.-based SMEs from 2010 through 2014. This program differs substantially from Canadian LSVCCs, because SBIC investors do not receive any tax benefit. Instead, the program is designed so that, for every \$1 raised from private investors (pension funds, banks, etc.) for a particular SME, the SBA co-invests up to \$2 of debt (see, for example, Lerner, 1999, for more details). The SBIC program has not yet phased out, which restricts any calculations we can make about SBIC returns.

The U.K. government followed a similar path, and set incentives for investments in non-listed SMEs by offering tax relief. The Enterprise Investment Scheme provides capital gain and income tax relief to investors in “qualified” companies, which are referred to as Venture Capital Trusts (VCTs). The Seed Enterprise Investment Scheme (SEIS) became active on 6 April 2012, and allowed a reduction in income tax liabilities of 30% of the investment amount in the “qualified” company. This incentive scheme comes closest to LSVCCs in Canada, but this program is still active, which permits us to analyze similar effects.

To qualify for the tax relief, VCTs are subject to certain funding rules, such as a 15% maximum funding volume in a single portfolio company. A breach of this rule can result in withdrawal of the tax credit by Her Majesty's Revenue and Customs (HMRC) (the governing body responsible for the collection of taxes). On 13 March 2014, the U.K. tax authorities announced the withdrawal of the tax credit for two VCTs (Oxford Technology 1 and 3), because they breached the funding rule, investing more than 15% in a portfolio company (see Financial Times, 2014a).

This situation comes very close to the tax credit phase-out for LSVCCs, with the major difference being that LSVCCs are not publicly listed, which restricts us to measuring value changes on a daily basis, and that the withdrawal was unanticipated. We use an event study methodology to approximate investor assessments of the expected change in portfolio value of the two VCTs. In reported results, we calculate that the initial price reaction after the announcement was a drop of about 25% in portfolio value, which decreased with considerable volatility even further to about 33% ten days post-announcement (the removal of the tax credit would result in a further loss for investors due to a back pay or tax liability of any received income tax relief).⁵ This drop is

³ A detailed table summarizing the changes in legislation for Canadian LSVCCs is available from the authors upon request.

⁴ See Cumming and Johan (2013), Cumming and MacIntosh (2003a, 2003b), Johan et al. (2014) for a more detailed summary of the unique characteristics of LSVCCs and a comparison of the differences between LSVCCs and the standard corporation. We provide a brief comparison between LSVCCs and mutual funds here.

⁵ The distinct price fluctuations could be attributable to high levels of uncertainty and the related investor overreactions (see De Bondt and Thaler, 1985).

comparable to our reduction in LSVCCs' RoA in the first two years of the post-enactment period.

Interestingly, on 6 June 2014, HMRC reinstated the VCT status for Oxford Technology 1 and 3, which is an ideal setup from which to study a reverse treatment (see [Financial Times, 2014b](#)). Around this announcement date, Oxford Technology 1 and 3 experienced an increase in value of about 18%. This increase is somewhat lower than the initial price decrease, but HMRC mentioned that the “tax-efficient” status remained pending, so investors continue to face some uncertainty about the final decision.

To summarize, we interpret the results from this exercise as support for our argument that tax subsidy removals are value-destroying for investors (even without considering the tax credit per se).

3. Data sample and estimation strategy

LSVCCs are required to issue audited annual reports to shareholders, similarly to many other types of funds. For the purposes of our study, we hand-collected data from the annual reports of all LSVCC funds (for both active and inactive funds) at that time. We, thus, have no selection bias. The data cover the 1997–2011 period, and the main variable of interest is total return on assets under management. We used the System for Electronic Document Analysis and Retrieval (SEDAR), a filing system developed for the Canadian Securities Administrators, to review all filings by Investment Funds for LSVCC funds. For active LSVCC funds, we hand-collected all financial statements from the beginning until the latest available in 2011. For inactive LSVCC funds, we collected all available financial statements during the time they were “active.” We coded each financial item from each financial statement into the dataset for our analysis. We further consulted government websites to ensure we have the most comprehensive list of Canadian LSVCCs available. To be included in our sample, we imposed the condition that funds have complete information available on all of our independent and dependent variables. We allow for new funds entering the sample and for the closure of funds in order to avoid survivorship bias.

Our final sample consists of 223 fund-year observations from 36 LSVCCs. In addition, we obtained information on local GDP growth from Statistics Canada. 10-Year Canadian Bond yields come from <http://www.bankofcanada.ca/rates/interest-rates/lookup-bond-yields/>. The detailed definition of each variable is in [Appendix 1](#).

3.1. Empirical model

We test the effect of the phase-out in tax subsidies on fund performance in an OLS regression framework that estimates the following model:

$$\begin{aligned} RoA_{i,j,t} = & \alpha_1 + \beta_1 \cdot Ontario_i \times PostAnnouncement_t \\ & + \beta_2 \cdot Ontario_i \times PostEnactment_t + \beta_3 \cdot Ontario_i \\ & + \gamma \cdot X_{i,j,t} + \alpha_t + \epsilon_{i,j,t} \end{aligned} \quad (1)$$

where the dependent variable $RoA_{i,j,t}$ is the return on assets of fund i in state j in year t , $Ontario_i$ is a dummy variable equal to 1 if the LSVCC fund is located in Ontario, and 0 otherwise, $PostAnnouncement$ is an indicator variable equal to 1 for years 2005–2007, $PostEnactment$ is a dummy variable equal to 1 for years 2008–2011, $X_{i,j,t}$ is a vector for fund-level and regional-level control variables, and α_t are year fixed effects.

Our estimation approach follows the concept of a difference-in-differences approach. Because the tax law changed in Ontario, but not in other provinces, there is an exogenous assignment of treatment and control groups. Funds located in Ontario comprise our

treatment group; all other LSVCCs are the control group. Note that, over the entire observation period, neither Ontario-based nor non-Ontario-based LSVCCs changed location.⁶

The advantage of using a difference-in-differences design is that neither a federal change in LSVCC regulation nor any time-invariant difference between Ontario and other provinces can explain our findings. The identification of the RoA effects is based on the announcement and enactment of the phase-out. We split our sample into two subperiods according to the development in legal changes. These periods comprise the year after the announcement (*PostAnnouncement*), and the years after the final enactment (*PostEnactment*). The coefficients of interest are the difference-in-differences coefficients β_1 and β_2 . If the phase-out in tax subsidies destroyed the value of fund holders, both coefficients will be negative. Negative β_1 and β_2 coefficients would indicate that the returns of Ontario LSVCCs decreased relative to funds in other provinces where investors continued to benefit from the tax subsidy.

If the announcement of the tax reform did not change relative performance across provinces, because fund managers were not able to adjust their investment strategies immediately ([Johan et al., 2014](#)), then we would expect β_1 to be insignificant. However, we find that the final enactment of the subsidy phase-out did change investment behavior, and we therefore expect β_2 to be negative if the change in strategy destroyed value. β_2 would be positive if retail investors benefited from the style drift. We additionally test whether $\beta_1 > \beta_2$ to examine whether the negative return consequences are more severe during the enactment period than during the announcement period.

Our vector of control variables, $X_{i,j,t}$, includes nine variables to capture differences in investment strategies and risks across LSVCCs that may impact returns. *Venture* is total investment in VC relative to overall investment. *Num VC* is the number of ventures in an LSVCC's portfolio. *Public* is total investment in public companies relative to overall investment. *Fixed* is total investment in fixed interest assets relative to overall investment. *Technology* is a dummy variable equal to 1 if the LSVCC's investment strategy focuses on high tech firms. *Early Stage* is a dummy variable equal to 1 if the LSVCC's investment strategy focuses on early-stage firms. We include *Age*—the number of years since incorporation—because more experienced managers may be able to generate higher returns. *Management Fee* is the ratio of total fees to managers scaled by total assets. *Log (Total Assets)* is the logarithm of total assets. *GDP Growth_{t-1}* is lagged GDP growth (in percent) in the province of incorporation. We include year fixed effects to control for general macroeconomic trends in Canada. Therefore, coefficients on *PostAnnouncement* and *PostEnactment* are not identified, and thus not reported in the tables below. Our statistical inferences are based on robust standard errors clustered at the fund level.

3.2. Summary statistics

Table 1 provides the summary statistics for the main variables used in our study. Average RoA is –3.8%, and it varies considerably,

⁶ Each LSVCC in the respective province is incorporated under special provincial legislation and each fund also requires a labour union sponsor within the province in which it is incorporated (except LSVCCs incorporated at the federal level). These unique restrictions limit LSVCCs' movements from one province to another. If an LSVCC management considers moving the fund to another province, they would have to liquidate/sell-off the entire portfolio, which would be rather difficult, given the illiquid private companies in the portfolio. And they would also have to apply to relinquish their authorization to operate in the existing province, and obtain authorization to operate in the new province. This is difficult because there are limited numbers of authorizations available for each province. Finally, because LSVCC investors must be residents of the province in which the LSVCC operates, a relocated LSVCC would also need to seek all new retail investors.

Table 1

Descriptive statistics. This table gives the descriptive statistics of our main variables. *RoA* is the LSVCC's net income over prior year total assets. *Ontario* is a dummy variable equal to 1 if the LSVCC is incorporated in Ontario and the Ontario tax regime applies. *PostAnnouncement* is a dummy variable equal to 1 for years 2005, 2006, and 2007. *PostEnactment* is a dummy variable equal to 1 for years 2008 and later. *Venture* is total investment in venture capital relative to overall investment. *Public* is total investment in public companies relative to overall investment. *Num VC* is the number of venture capital investments in the portfolio. *Fixed* is total investment in fixed interest assets relative to overall investment. *Technology* is a dummy variable equal to 1 if the LSVCC's investment strategy focuses on high technology firms. *Early Stage* is a dummy variable equal to 1 if the LSVCC's investment strategy focuses on early-stage firms. *Age* is the number of years since incorporation. *Management Fee* is the ratio of total fees to managers to total assets. *Log(Total Assets)* is the log of total assets. *GDP Growth_{t-1}* is lagged GDP growth (in percent) in the province where the fund is incorporated.

| Variable | N | Mean | Standard deviation | 25th percentile | Median | 75th percentile |
|----------------------------|-----|---------|--------------------|-----------------|---------|-----------------|
| RoA | 223 | −0.0360 | 0.1734 | −1.1480 | −0.0659 | −0.0115 |
| Ontario | 223 | 0.7399 | 0.4397 | 0.0000 | 0.0000 | 1.0000 |
| Ontario × PostAnnouncement | 223 | 0.2018 | 0.4022 | 0.0000 | 0.0000 | 0.0000 |
| Ontario × PostEnactment | 223 | 0.2691 | 0.4445 | 0.0000 | 0.0000 | 0.0000 |
| PostAnnouncement | 223 | 0.2870 | 0.4534 | 0.0000 | 0.0000 | 0.0000 |
| PostEnactment | 223 | 0.3498 | 0.4780 | 0.0000 | 0.0000 | 0.0000 |
| Venture | 223 | 0.6107 | 0.2354 | 0.0000 | 0.4790 | 0.6207 |
| Num VC | 223 | 20.8206 | 22.6657 | 0.0000 | 8.0000 | 15.0000 |
| Public | 223 | 0.1088 | 0.2380 | 0.0000 | 0.0000 | 0.0000 |
| Fixed | 223 | 0.1255 | 0.1611 | 0.0000 | 0.0000 | 0.0634 |
| Technology | 223 | 0.4036 | 0.4917 | 0.0000 | 0.0000 | 0.0000 |
| Early stage | 223 | 0.2780 | 0.4490 | 0.0000 | 0.0000 | 0.0000 |
| Age | 223 | 6.0807 | 4.1015 | 0.0000 | 3.0000 | 6.0000 |
| Management fee | 223 | 0.0206 | 0.0065 | 0.0100 | 0.0150 | 0.0200 |
| Log (total assets) | 223 | 17.6022 | 1.4527 | 10.5189 | 16.7927 | 17.6923 |
| GDP Growth _{t-1} | 223 | 0.0182 | 0.0235 | −0.0318 | 0.0138 | 0.0218 |

from −6.8% (25th percentile) to 4.6% (75th percentile). This is consistent with many existing studies that find LSVCCs have attained lower than average returns (see, for example, [Osborne and Sandler, 1998](#)). Note also that, on average, LSVCCs invest 60.9% of their total assets into VC, but the range is significant, from 48% to 77%. Among the funds in our sample, 41% have a high tech investment strategy, and 28% have an early-stage investment strategy. Moreover, LSVCC funds have an average management fee of 2%, with an overall range from 1.5% to 2.5%.

Table 2 presents the correlation matrix of our variables. The −0.25 negative correlation between *Ontario × PostEnactment* and *RoA* is a first indication in favor of our hypothesis that the enactment of the tax subsidy phase-out in Ontario will lead to a reduction in *RoA*.

4. Empirical results

4.1. Graphic evidence

We present our empirical results in three ways. The first is graphical. The simplest way to provide evidence consistent with our hypothesis is to track the *RoA* of LSVCCs across provinces over time. We split our sample into funds located in Ontario (treatment group), and funds located in other provinces (control group). We compute average *RoA* over all LSVCCs in both groups for each sample year. Panel A of [Fig. 1](#) plots average fund returns for both groups. The dashed vertical line indicates the date of announcement of the tax subsidy phase-out. The solid vertical line separates the pre- and post-enactment periods.

Prior to the final tax subsidy phase-out, Ontario LSVCCs (dashed line) and non-Ontario LSVCCs (solid line) exhibited very similar *RoA* levels. In line with the underlying assumptions of a difference-in-differences approach, the returns of funds in our treatment (Ontario) and control groups (other provinces) follow a parallel trend until the final phase-out. Afterward, we note that the *RoA* of Ontario funds fell to very low levels, −23% (year 2008) and −14% (year 2009), respectively. In contrast, funds in other provinces experienced higher returns (−13.0% and −3.5%).

This divergence in *RoA* between Ontario- and non-Ontario-based LSVCCs after the post-enactment period can also be seen in panel B of [Fig. 1](#), which shows the performance of an average investment amount of 100 in 2003 in both groups. Again, we

observe a parallel trend for both groups before 2008. However, afterward, the value of the investment in Ontario-based LSVCCs is only about 67; in non-Ontario-based LSVCCs, it is about 87. This underperformance is not made up in subsequent years: Both LSVCC groups show a similar increase. This is further evidence that the final enactment of the tax subsidy phase-out led to high negative returns for investors.

However, one potential explanation for this result could be cross-province differences in economic growth and development. To rule out this possibility, we run a placebo test using mutual funds. We obtain data on Canadian mutual funds and their location from Morningstar Direct. We then compare the returns of mutual funds located in Ontario to those located in other provinces. [Fig. 2](#) replicates [Fig. 1](#), but with mutual fund data.

[Fig. 2](#) shows that the returns of mutual funds in Ontario and other provinces followed a parallel trend before the tax subsidy phase-out. In contrast to LSVCCs, though, the parallel trend continued after the final enactment. The returns of funds in Ontario and in other provinces are on average very similar. From this placebo test, we can conclude that the difference in returns of LSVCCs across regions stems from the phase-out of the tax subsidy, not from regional differences.

4.2. Univariate tests

Our second method of presenting empirical results is through univariate tests. These simple non-parametric tests compare the *RoA* levels of our treatment and control groups around the announcement and enactment events. [Table 3](#) presents average returns for the pre-announcement period (column 1), the post-announcement period of 2005–2007 (column 2), and the difference in returns between the two periods (column 3). Columns 4–6 use the pre-enactment period prior to 2007, the post-enactment period of 2008–2011, and the difference between periods. We test the significance of differences using *t*-tests, and give results for all three panels. Panel A uses all the funds; panel B uses only Ontario-based LSVCCs; and panel C uses only non-Ontario-based LSVCCs.

The results in panel A indicate that the average LSVCC return increased from −2.4% prior to 2005 to 1.3% in the post-announcement period. This increase in returns is statistically significant (*t*-stat = 2.03). Around the time of the phase-out, average LSVCC returns decreased by 8.7 percentage points, from −0.8% to

Table 2
Correlation matrix. This table gives Pearson correlation coefficients. * indicates significant correlations at the 5% level.

| | [1] | [2] | [3] | [4] | [5] | [6] | [7] | [8] | [9] | [10] | [11] | [12] | [13] | [14] | [15] |
|--------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|-------|--------|
| [1] RoA | 1 | | | | | | | | | | | | | | |
| [2] Ontario | 0.053* | 1 | | | | | | | | | | | | | |
| [3] Ontario × PostAnnouncement | 0.145* | 0.298* | 1 | | | | | | | | | | | | |
| [4] Ontario × PostEnactment | 0.252* | 0.360* | 0.305* | 1 | | | | | | | | | | | |
| [5] PostAnnouncement | 0.180* | 0.053 | 0.793* | 0.385* | 1 | | | | | | | | | | |
| [6] PostEnactment | 0.222* | 0.049 | 0.369* | 0.827* | 0.465* | 1 | | | | | | | | | |
| [7] Venture | 0.122 | 0.046 | 0.100 | 0.161* | 0.095 | 0.248* | 1 | | | | | | | | |
| [8] Num VC | 0.009 | 0.074 | 0.061 | 0.074 | 0.001 | 0.018 | 0.215* | 1 | | | | | | | |
| [9] Public | 0.073 | 0.074 | 0.028 | 0.197* | 0.052 | 0.168* | 0.532* | 0.219* | 1 | | | | | | |
| [10] Fixed | 0.090 | 0.044 | 0.091 | 0.329* | 0.037 | 0.389* | 0.050 | 0.050 | 0.341* | 1 | | | | | |
| [11] Technology | 0.183* | 0.117 | 0.140* | 0.066 | 0.118 | 0.010 | 0.174* | 0.010 | 0.138* | 0.072 | 1 | | | | |
| [12] Early stage | 0.108 | 0.003 | 0.038 | 0.151 | 0.040 | 0.140* | 0.031 | 0.232* | 0.020 | 0.135* | 0.081 | 1 | | | |
| [13] Age | 0.075 | 0.044 | 0.037 | 0.440* | 0.015 | 0.498* | 0.329* | 0.235* | 0.015 | 0.317* | 0.007 | 0.250* | 1 | | |
| [14] Management fee | 0.184* | 0.413* | 0.199* | 0.064 | 0.055 | 0.097 | 0.100 | 0.079 | 0.042 | 0.035 | 0.166* | 0.099 | 0.170* | 1 | |
| [15] Log (total assets) | 0.124 | 0.106 | 0.042 | 0.061 | 0.060 | 0.042 | 0.240* | 0.633* | 0.283* | 0.005 | 0.033 | 0.113 | 0.250* | 0.010 | 1 |
| [16] GDP Growth _{t-1} | 0.123 | 0.123 | 0.138 | 0.538* | 0.229* | 0.559* | 0.115 | 0.011 | 0.166* | 0.225* | 0.039 | 0.064 | 0.286* | 0.010 | 0.132+ |

−8.8%. The difference across periods is statistically significant at the 1% level (t -stat = 2.81).

Based on the statistics in panels B and C, we can identify which group explains the decline in returns. Both experienced increasing returns around the phase-out announcement. The positive difference, however, is not significant, due to a lack of power in our tests. However, we can explain which group caused the overall decline in returns. Non-Ontario-based LSVCCs had similar RoA levels around the enactment period, but those of Ontario-based funds decreased by more than 10.5 percentage points. The difference is statistically significant (t -stat = 2.95). The calculation of the difference-in-differences returns from panels B (Ontario-based) and C (non-Ontario-based) reveals that Ontario-based LSVCCs statistically underperform non-Ontario-based funds by about 10 percentage points (t -stat = 2.02) (see panel D of Table 3) following the phase-out enactment.

Before turning to the multivariate analyses, we also test for differences in observable fund characteristics across LSVCCs in Ontario versus other provinces. One concern about our research design is that these characteristics change over time, and at the same time as the tax change. To demonstrate that our results cannot be explained by different trends in *Public*, *Fixed*, *Technology*, or *Early Stage* between Ontario and non-Ontario funds, we show there are no significant changes in the difference around 2008 (see Table 4). While there are differences in the number of VC investments, they do not change over time. Hence, this difference is not of concern for our regression analysis, because of our difference-in-differences research design. The only difference that changes from before to after the enactment is *Venture*. This result is in line with Johan et al. (2014), and is presumably the reason for the drop in returns, as we point out throughout this paper.

4.3. Baseline estimates

Our third method is to present regression results from the difference-in-differences estimation, where we control for other fund characteristics and cross-province differences in economic development. Table 5 provides the regression results from OLS regressions where we subsequently added controls for asset classes (*Venture*, *Num VC*, *Public*, *Fixed*), investment type (*Technology*, *Early Stage*), fund characteristics (*Age*, *Management Fee*, *Log (Total Assets)*), and local GDP.

We are mainly interested in two difference-in-differences coefficients. The interaction between *Ontario* and *PostAnnouncement* is statistically significant at least at a 10% level, except for specification (1). In the full model, it is weakly significant (t -stat = 1.95), which we interpret as weak evidence that RoA also declined following the phase-out announcement in Ontario. It is possible that returns did not immediately respond to the announcement, because the final outcome of the reform process was still uncertain, though, due to, e.g., the effects of lobbying.

The interaction *Ontario* × *PostEnactment* is negative and statistically significant in all specifications at least at the 5% level. In the full model, the β_2 coefficient amounts to −0.164, and is statistically significant at the 1% level (t -stat = 2.76). This result shows that the final enactment of the tax subsidy phase-out in Ontario caused large negative returns for investors. The RoA of an Ontario fund decreased by 16.4 percentage points on average relative to that of a non-Ontario fund. This effect is quite large, given that an average LSVCC fund returned −3.8% over our sample period. The effect is also comparable to the return consequences of about +18% in the U.K. around the reinstatement of the VCT status for Oxford Technology 1 and 3 (see discussion in Section 2.3). Moreover, the RoA of Ontario-based LSVCCs decreased statistically more after the enactment than after the announcement of the phase-out

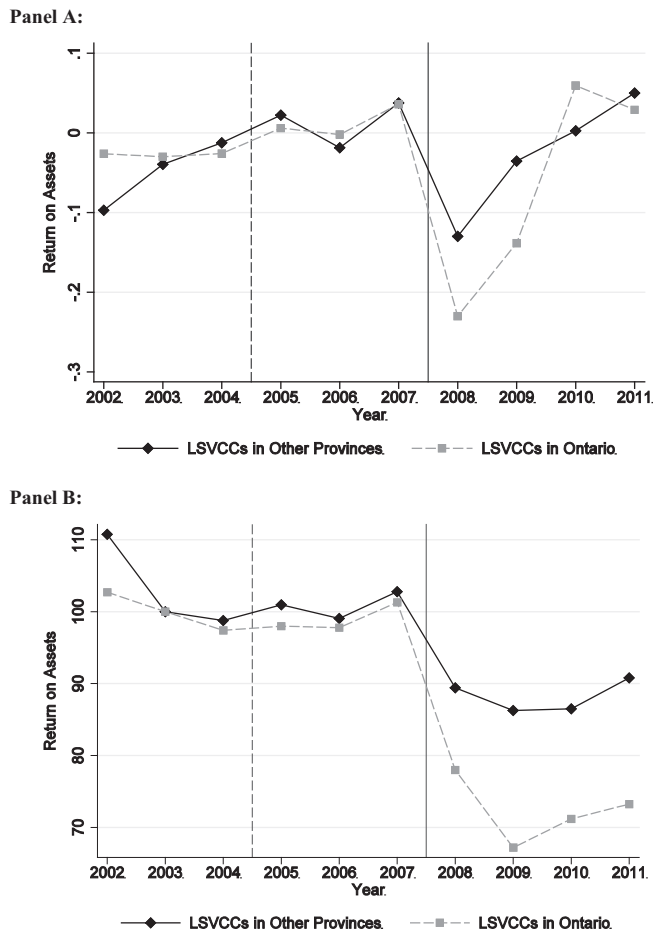


Fig. 1. Return on assets of LSVCCs: Breakdown by province. Panel A shows average LSVCC returns in Canada over the 2002–2011 period, using funds located in Ontario (dashed line) and in other provinces (solid line). The vertical lines separate pre- and post-announcement periods (dashed line), as well as post-announcement and post-enactment periods. We calculate average LSVCC returns as the difference between fund total return on assets in the current and previous year at year-end. Panel B is a different representation of panel A, where, instead of average LSVCC returns, we use the performance of an average LSVCC investment of 100 since 2003.

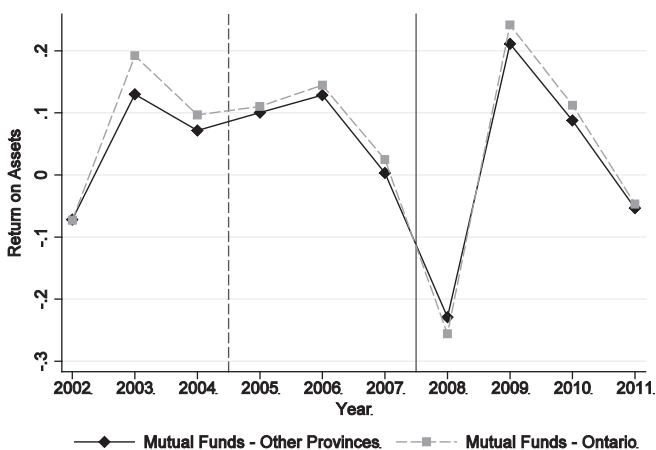


Fig. 2. Mutual fund ROA: Breakdown by province. This figure shows average mutual fund returns in Canada over the 2002–2011 period. We use funds located in Ontario (dashed line), and in other provinces (solid line). The vertical lines separate pre- and post-announcement periods (dashed), as well as post-announcement and post-enactment periods. Average fund returns are calculated as the difference between the fund total return on assets in the current year, and the fund total return on assets in the previous year.

compared to non-Ontario LSVCCs, as $\beta_1 > \beta_2$ (p -values range from about 0.05 to 0.08 across specifications).

The results for our control variables indicate that funds with a large share of VC (Venture) or fixed interest investments (Fixed), or with more ventures in their portfolio (Num VC), yield lower returns. Likewise, investments in the technology sector, or with higher than average management fees, are associated with lower RoA. Larger funds, and funds in regions with higher local GDP growth in the prior year, yield higher RoA. Most importantly for our study, the subsequent inclusion of control variables does not alter our results for the interactions *Ontario* \times *PostAnnouncement* or *Ontario* \times *PostEnactment*.

Recall for the univariate results in Table 4 that we compared fund characteristics between Ontario and other provinces, and documented that the investment portfolios were not identical in terms of the percentage of venture investments. To control for all time-invariant differences between LSVCCs in Ontario and other provinces, we include a dummy variable that equals 1 if the fund is located in Ontario in all regression models. After controlling for several investment portfolio characteristics, we find that the Ontario dummy variable is no longer statistically significant. Importantly, our two difference-in-differences coefficients are not affected by time-invariant differences between LSVCCs in Ontario and other provinces (see Table 5, specifications (3)–(5)).

4.4. Control for Potential Autocorrelation of Returns

One concern about our regression analysis is the potential autocorrelation of our dependent variable. The reasons for autocorrelation in RoAs typically stem from stale pricing and appraisal smoothing, which is common for rather illiquid investments such as private companies (see Cumming et al., 2013). To address this concern, we first rerun our regression models, and correct for potential autocorrelation using OLS with Newey–West standard errors (column (1) of Table 6). Second, we use a random effects estimator with standard errors clustered at the fund level (column (2) of Table 6). In unreported results, we included one lag of the dependent variable to control for possible autocorrelation. We find that the coefficient on lagged RoA is not statistically significant (see, for example, Bonardo et al., 2011).⁷

The results in Table 6 confirm the findings from our baseline estimates. Column (1) replicates our main test (specification (5)) from Table 5; the t -statistic is very close to our baseline estimate. The random effects estimator in column (1) also supports this finding. Furthermore, and most importantly for our study, the coefficient estimate on *Ontario* \times *PostEnactment* remains significant, although the power of our test decreases because of a drop in the number of observations. We are thus confident that our results cannot be explained by potential autocorrelation of fund returns.

4.5. Breakdown by years

Next, we explore the persistence of the effects on RoA. The difference-in-differences approach estimates the average difference. We split the time periods and interact the *Ontario* dummy with year dummy variables estimated for each sample year. Using this approach, we are able to determine the annual difference in RoA between our treatment and control groups separately. Our analysis begins in 2002. Table 7 presents coefficient estimates for

⁷ Alternatively, we could consider a dynamic panel estimator, such as the Arellano–Bond estimator. However, this approach would conflict with our difference-in-differences design, because the Arellano–Bond model is estimated in first differences. In this case, we could not compare returns in certain time periods across treatment or control group.

Table 3

Univariate tests. The *, **, *** are statistically significant at the 10%, 5% and 1% level, respectively.

| (1) | (2) | (3) | (4) | (5) | (6) |
|--|----------------------------|---|----------------------------|------------------------------|--|
| <i>Panel A: all LSVCCs</i> | | | | | |
| Return pre-2005 –2.439% | Return 2005–2007 1.321% | Difference [t-stat] 3.760%** [2.03] | Return pre-2007 –0.779% | Return 2008–2011 –8.835% | Difference [t-stat] –8.056%*** [2.81] |
| <i>Panel B: ontario LSVCCs</i> | | | | | |
| Return pre-2005 –1.626% | Return 2005–2007 1.374% | Difference [t-stat] 3.001% [1.41] | Return pre-2007 –0.340% | Return 2008–2011 –10.785% | Difference [t-stat] –10.444%*** [2.95] |
| <i>Panel C: LSVCCs in other Provinces</i> | | | | | |
| Return pre-2005 –4.759% | Return 2005–2007 1.193% | Difference [t-stat] 5.952% [1.51] | Return pre-2007 –1.931% | Return 2008–2011 –2.336% | Difference [t-stat] –0.404% [0.11] |
| <i>Panel D: difference in difference returns Panel B–Panel C</i> | | | | | |
| | | Difference [t-stat] –2.951% [0.66] | | | Difference [t-stat] –10.040%** [2.02] |

Table 4

Differences in fund characteristics. This table presents differences between Ontario and other provinces (Ontario), and how this difference has changed from around the enactment (Ontario \times PostEnactment). Variables are defined as in Table 1. The *, **, *** are statistically significant at the 10%, 5% and 1% level, respectively.

| | Venture | Num VC | Public | Fixed | Technology | Early stage |
|--------------------------------|---------------------|-----------------------|-----------------|-------------------|-------------------|-------------------|
| Ontario | 0.063 [1.59] | –15.562*** [–2.90] | 0.006 [0.16] | –0.009 [–0.27] | –0.069 [–0.75] | 0.068 [0.80] |
| Ontario \times PostEnactment | –0.138** [–2.31] | 1.223 [0.12] | 0.091 [1.45] | 0.001 [0.01] | –0.192 [–1.19] | –0.179 [–1.24] |

Table 5

OLS results. This table gives regression results on the return on assets of LSVCCs in Canada. The dependent variable is the fund's return on assets. Independent variables are as defined in Table 1. We include year fixed effects in every specification. We report robust standard errors clustered at the fund level in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

| | (1) | (2) | (3) | (4) | (5) |
|--|----------------------------------|-----------------------------------|----------------------------------|----------------------------------|-----------------------------------|
| Ontario | 0.066* [1.84] | 0.103** [2.48] | 0.071 [1.48] | 0.039 [0.76] | 0.048 [0.95] |
| Ontario \times PostAnnouncement | –0.067 [1.62] | –0.108** [2.28] | –0.082* [1.78] | –0.080* [1.75] | –0.109* [1.95] |
| Ontario \times PostEnactment | –0.139** [2.35] | –0.177*** [2.79] | –0.165** [2.42] | –0.148** [2.17] | –0.164*** [2.76] |
| Venture | | –0.217** [2.46] | | | –0.211*** [2.97] |
| Num VC | | 0.000 [1.00] | | | –0.001** [2.04] |
| Public | | –0.114 [1.65] | | | –0.104** [2.06] |
| Fixed | | –0.289*** [3.33] | | | –0.292*** [3.20] |
| Technology | | | –0.063** [2.52] | | –0.054** [2.72] |
| Early Stage | | | –0.038 [1.13] | | –0.038 [1.59] |
| Age | | | | 0.000 [0.04] | 0.001 [0.18] |
| Management fee | | | | –6.007* [1.99] | –6.922*** [5.84] |
| Log (total assets) | | | | 0.011 [1.38] | 0.020*** [3.04] |
| GDP Growth _{t-1} | | | | | 1.677** [2.07] |
| P-value from testing: Ontario \times PostEnactment < Ontario \times PostAnnouncement | 0.0843 | 0.0500 | 0.0521 | 0.0764 | 0.0764 |
| Year fixed effects | Yes | Yes | Yes | Yes | Yes |
| Observations | 223 | 223 | 223 | 223 | 223 |
| R-squared | 0.256 | 0.311 | 0.297 | 0.307 | 0.422 |

Table 6

Alternative empirical estimation strategies. This table gives regression results on the return on assets of LSVCCs in Canada. The dependent variable is the fund's return on assets. Independent variables are as defined in Table 1. We include year fixed effects in every specification. In column (1), we use OLS with Newey–West standard errors to account for autocorrelation. In column (2), we report robust standard errors clustered at the fund level in parentheses and use random effects models. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

| | Newey–West S.E. (1) | RE effects (2) |
|---|-----------------------------------|-----------------------------------|
| Ontario | 0.048 [1.13] | 0.048 [0.95] |
| Ontario × PostAnnouncement | −0.109** [2.55] | −0.109* [1.95] |
| Ontario × PostEnactment | −0.164*** [2.75] | −0.164*** [2.76] |
| Venture | −0.211*** [2.69] | −0.211*** [2.97] |
| Num VC | −0.001 [0.99] | −0.001** [2.04] |
| Public | −0.104* [1.88] | −0.104** [2.06] |
| Fixed | −0.292*** [3.81] | −0.292*** [3.20] |
| Technology | −0.054*** [2.66] | −0.054*** [2.72] |
| Early stage | −0.038 [1.26] | −0.038 [1.59] |
| Age | 0.001 [0.17] | 0.001 [0.18] |
| Management fee | −6.922* [1.91] | −6.922*** [5.84] |
| Log (total assets) | 0.020** [2.10] | 0.020*** [3.04] |
| GDP Growth _{t-1} | 1.677** [2.11] | 1.677** [2.07] |
| P-value from testing: Ontario × PostEnactment < Ontario × PostAnnouncement | 0.1107 | 0.0719 |
| Controls | Yes | Yes |
| Year fixed effects | Yes | Yes |
| Observations | 223 | 223 |

the Ontario dummy for 2003 through 2011. We include both fund- and regional-level control variables in the model.

Table 7 reports the coefficient estimates. The results for our control variables remain largely unchanged. We still find a negative coefficient on *Venture*, *Fixed*, *Technology*, and *Management Fee*, and a positive coefficient on *Log (Total Assets)*. We are especially interested in how the *Ontario* dummy develops over time. The annual breakdown shows there is a short-term announcement effect. In 2005, the year of announcement, the RoA of Ontario funds was about 8.6 percentage points lower than that of funds in other provinces. The interaction terms are not significant for 2006 or 2007. After the enactment of the tax subsidy phase-out, we find significant differences in returns across the treatment and control groups in 2008 and 2009. The economic effects are substantial. In 2008 and 2009, LSVCCs from Ontario underperformed LSVCCs from other provinces by about 19 percentage points in each year. We also test whether the coefficients during the announcement period are significantly higher than the 2008 and 2009 coefficients. P-values that compare 2008/2009 to 2005/2006 estimates range from 0.02 to 0.10. Again, all results are in line with the prediction that there was a significant decrease in returns during the enactment period relative to the announcement. Furthermore, returns in Ontario are significantly lower in 2008/2009 relative to the pre-announcement period prior to 2005 (p-values range from 0.002 to 0.074).

Table 7

OLS results: breakdown by year. This table replicates Table 5, but gives the difference between Ontario and other provinces for each year. Independent variables are defined in Table 1. We report *t*-stats based on robust standard errors clustered at the fund level in brackets. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

| Variable | Coefficient | <i>t</i> -stat | <i>p</i> -value 2008 < year t | <i>p</i> -value 2009 < year t |
|---------------------------|-------------|----------------|----------------------------------|----------------------------------|
| Ontario × 2002 | 0.0876 | [2.03] | 0.011 | 0.002 |
| Ontario × 2003 | 0.0017 | [0.03] | 0.037 | 0.002 |
| Ontario × 2004 | −0.0491 | [1.44] | 0.074 | 0.016 |
| Ontario × 2005 | −0.0857** | [2.16] | 0.101 | 0.023 |
| Ontario × 2006 | −0.0481 | [0.87] | 0.052 | 0.016 |
| Ontario × 2007 | −0.0753 | [0.88] | 0.149 | 0.083 |
| Ontario × 2008 | −0.1937** | [3.33] | | 0.495 |
| Ontario × 2009 | −0.1950*** | [4.04] | 0.495 | |
| Ontario × 2010 | −0.0617 | [1.33] | 0.073 | 0.070 |
| Ontario × 2011 | 0.0139 | [0.32] | 0.010 | 0.010 |
| Venture | −0.1829*** | [2.66] | | |
| Num VC | −0.0001 | [0.25] | | |
| Public | −0.0915* | [1.80] | | |
| Fixed | −0.2825*** | [2.97] | | |
| Technology | −0.0636*** | [3.18] | | |
| Early stage | −0.0359 | [1.46] | | |
| Age | −0.0010 | [0.25] | | |
| Management fee | −6.8241*** | [5.77] | | |
| Log (total assets) | 0.0204*** | [3.04] | | |
| GDP Growth _{t-1} | −0.0702 | [0.11] | | |
| Year fixed effects | Yes | | | |
| Observations | 223 | | | |
| R-squared | 0.474 | | | |

4.6. Effect on Management Fees

After having established that investors in tax-subsidized LSVCCs faced large negative returns after the subsidies were phased out, we now turn to the potentially harmful behavior of managers. As [Johan et al. \(2014\)](#) show, Ontario LSVCCs shifted their investment portfolios from local private equity to public firms. In other words, LSVCCs transformed into mutual fund-like companies. This is consistent with the negative and significant coefficient on *Ontario* \times *PostEnactment* in [Table 4](#) with *Venture* as the dependent variable. If LSVCC managers changed their investment style from venture capital—where generally higher fees (median fixed annual fee of about 2%, and an incentive fee (carry) of about 20%) are charged compared to mutual funds—the fees should also reflect this shift (see [Metrick and Yasuda, 2010](#)).

We observe the reverse when mutual fund managers move to the hedge fund industry or work “side-by-side” for a hedge fund, because a hedge fund’s compensation scheme also averages a 2% fixed annual fee and an additional 20% performance-based fee (see [Deuskar et al., 2011](#); [Nohel et al., 2010](#); [Cumming et al., 2015a,b](#)). This example shows that manager compensation typically changes in accordance with the scope of duties inherent in the respective industry. In our sample, we observe that LSVCC managers charged fixed management fees over 2% of total assets. Thus, if Ontario LSVCCs changed their investment structure, but continued to charge higher fees, the value for investors would be ultimately destroyed.

Table 8 shows the results from a regression with *Management Fee* as the dependent variable. We follow the same difference-in-differences approach. We test whether the management fees of LSVCCs in Ontario decreased around the announcement and enactment of the tax subsidy phase-out. We again subsequently added fund-level control variables. Year fixed effects are included in all specifications. All specifications are estimated using OLS.⁸

⁸ In an unreported robustness check, we also use an ordered logit method to account for a potential ordinal distribution of management fees. We find similar results. The table is available from the authors upon request.

Table 8

Effect on management fees. This table gives regression results on management fees of LSVCCs in Canada. The dependent variable is the fund's management fee relative to total assets. Independent variables are as defined in Table 1. All models are estimated using OLS. We include year fixed effects in every specification. We report robust standard errors clustered at the fund level in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

| | (1) | (2) | (3) | (4) | (5) |
|--------------------------------|--------------------|--------------------|--------------------|---------------------|---------------------|
| Ontario | −0.005** [2.41] | −0.005** [2.20] | −0.005** [2.70] | −0.006*** [2.82] | −0.005*** [2.76] |
| Ontario × PostAnnouncement | −0.002 [1.07] | −0.002 [1.55] | −0.002 [1.59] | −0.001 [0.65] | −0.001 [0.90] |
| Ontario × PostEnactment | −0.001 [0.70] | −0.002 [1.29] | −0.001 [0.85] | −0.001 [0.82] | −0.002 [1.04] |
| Venture | | −0.006 [1.10] | | | −0.006 [1.49] |
| Num VC | | −0.000 [0.04] | | | −0.000 [0.03] |
| Public | | −0.002 [0.42] | | | −0.002 [0.32] |
| Fixed | | −0.003 [0.59] | | | −0.001 [0.26] |
| Technology | | | 0.002 [0.80] | | 0.002 [0.98] |
| Early stage | | | −0.002 [0.64] | | −0.001 [0.42] |
| Age | | | | 0.000 [1.27] | 0.000 [1.35] |
| Log (total assets) | | | | −0.001 [1.05] | −0.001 [0.53] |
| GDP Growth _{t-1} | | | | | 0.026 [1.23] |
| Year fixed effects | Yes | Yes | Yes | Yes | Yes |
| Observations | 223 | 223 | 223 | 223 | 223 |
| R-squared | 0.198 | 0.219 | 0.221 | 0.244 | 0.293 |

Our results indicate that management fees were not adjusted following the tax subsidy phase-out. The coefficient estimate is statistically insignificant in all specifications. We thus conclude that, despite large negative RoA and a transformation toward more mutual fund-like behavior, Ontario LSVCCs continued to charge their investors inappropriately high management fees compared to mutual funds. A reduction in fees mirroring the change in investment style would have at least partially absorbed the negative performance. The fact that individual investments tend to be sticky, and that individuals can be slow to respond to new circumstances (see, e.g., Jones, 2012, on inertia), served to enable the value-destroying behavior of the LSVCC managers.

4.7. Different investment durations of Ontario LSVCCs

In our final step, we explore the concern that differences in investment duration may drive our results. In general, the duration of fixed income products and venture capital investments are related to security returns. The yield to maturities of bonds are positively associated with duration (assuming a normal interest rate curve). Higher durations also imply large bond price changes in response to interest rate changes.

In contrast, in the case of VC investments, fund managers can provide added value to their portfolio companies during the holding period by, e.g., supporting strategic planning, financial forecasting, and granting access to venture capitalist networks, if they are actively involved in management (see Cumming et al., 2015a,b). However, LSVCC management in general is not permitted to take a “controlling” stake in their portfolio companies. This effectively limits their potential influence on important value levers such as strategic decision making (see Cumming and MacIntosh, 2003a).

To this end, we include the number of venture investments (Num VC), as well as the percentage investment of Venture, Public, and Fixed Income to overall investment amount, as control variables in our main regression (Table 5). However, we are not able

to include control variables for the fixed income portfolio duration. For Fixed Income securities, we searched LSVCC annual reports for portfolio duration. Unfortunately, these data were generally not available. Furthermore, the vast majority of LSVCCs do not provide a complete list of bond holdings. Instead, they show at most only the ten or twenty-five largest positions. Given this lack of information, we are unable to use direct measures to control for this alternative explanation. Instead, we can only use indirect measures to proxy as closely as possible for a potential influence. However, one key advantage of our research design (difference-in-differences approach) is that such concerns are not an issue as long as the variables do not change differently in Ontario than in other provinces.

To test for any influence of a fixed income portfolio's duration on performance, we run a robustness test where we add the change in interest rates from one year to the subsequent year (Δ Interest Rate), interacted with the percent of fixed income investments as a control variable. As a proxy variable, we use the yields of a 10-year Canadian bond. The results for our main variables are very similar, as shown in Appendix 2.

5. Conclusions

This paper focuses on how phasing out government subsidy programs impacts investor costs. We exploit an exogenous policy shock in order to show how LSVCC fund managers responded to a phase-out of tax subsidies that encouraged retail investment in their funds. Our aim is to study the potentially value-destroying behavior of fund managers in response to the removal of the subsidies, and to measure how the phase-out policy impacted LSVCC performance.

Using a difference-in-differences approach, we find that LSVCC investors in Ontario experienced a 16% average loss over the enactment period (2008–2011). The poor performance was at least partly driven by a shift in investment strategy away from VC and

Appendix 1

Definition of variables. This table defines the dependent, independent, and control variables.

| Variable name | Definition |
|---|--|
| Return on assets under management (RoA) | LSVCCs' net income over total assets in prior year. Source: Fund Annual Report |
| <i>Policy indicators</i> | |
| Ontario | A dummy variable equal to 1 if the LSVCC is incorporated in Ontario and the Ontario tax regime applies |
| PostAnnouncement | A dummy variable equal to 1 for years 2005, 2006, and 2007 |
| PostEnactment | A dummy variable equal to 1 for year 2008 and later |
| OntarioxPostAnnouncement | A dummy variable equal to 1 if the LSVCC is incorporated in Ontario, the Ontario tax regime applies, and the year is between 2005 and 2007 |
| OntarioxPostEnactment | A dummy variable equal to 1 if the LSVCC is incorporated in Ontario, the Ontario tax regime applies, and the year is greater or equal to 2008. |
| <i>Investee characteristics</i> | |
| Venture | Amount of VC investment relative to overall investment. Source: Fund Annual Report |
| Num VC | Number of ventures in LSVCC's investment portfolio |
| Public | Amount of public company investment relative to overall investment. Source: Fund Annual Report |
| Fixed Income | Amount of fixed interest asset investment relative to overall investment. Source: Fund Annual Report. |
| Early stage | A dummy variable equal to 1 if the fund's investment strategy is focused on early-stage companies. Source: Fund Annual Report |
| Technology | A dummy variable equal to 1 if the fund's investment strategy is focused on high tech companies. Source: Fund Annual Report. |
| Δ Interest | Annual changes in 10-year Canadian bond interest rate |
| <i>Fund characteristics</i> | |
| Fund age | The number of years since the fund was incorporated, up to 2011. Sources: Fund Annual Report, SDC, Morningstar |
| Management fee | The ratio of total fees to managers to total assets. Source: Fund Annual Report |
| Log (total assets) | Log of the fund's total assets in U.S. millions in the lagged period. Source: Fund Annual Report |
| <i>Market/economic variables</i> | |
| GDP growth | The lagged provincial GDP growth rate (in percent) in the lagged period. Source: Statistics Canada |

Appendix 2

Robustness to bond portfolio duration. This table gives regression results on the return on assets of LSVCCs in Canada. The dependent variable is the fund's return on assets. Independent variables are as defined in Table 1. We include change in interest rate (Δ Interest) and year fixed effects in every specification. We report robust standard errors clustered at the fund level in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

| | (1) | (2) | (3) | (4) | (5) |
|-------------------------------------|----------------------------------|-----------------------------------|----------------------------------|----------------------------------|-----------------------------------|
| Constant | 0.032 [0.97] | 0.155*** [2.98] | 0.073 [1.48] | −0.041 [0.27] | −0.011 [0.08] |
| Ontario | 0.066* [1.84] | 0.103** [2.48] | 0.071 [1.48] | 0.039 [0.76] | 0.048 [0.95] |
| Ontario × PostAnnouncement | −0.067 [1.62] | −0.108** [2.28] | −0.082* [1.78] | −0.080* [1.75] | −0.109* [1.95] |
| Ontario × PostEnactment | −0.139** [2.35] | −0.177*** [2.79] | −0.165** [2.42] | −0.148** [2.17] | −0.164*** [2.76] |
| Venture | | −0.217** [2.46] | | | −0.211*** [2.97] |
| Num VC | | 0.000 [1.00] | | | −0.001** [2.04] |
| Public | | −0.114 [1.65] | | | −0.104** [2.06] |
| Fixed | | −0.289*** [3.33] | | | −0.292*** [3.20] |
| Technology | | | −0.063** [2.52] | | −0.054** [2.72] |
| Early stage | | | −0.038 [1.13] | | −0.038 [1.59] |
| Age | | | | 0.000 [0.04] | 0.001 [0.18] |
| Management fee | | | | −6.007* [1.99] | −6.922*** [5.84] |
| Log (total assets) | | | | 0.011 [1.38] | 0.020*** [3.04] |
| GDP Growth _{t-1} | | | | | 1.677** [2.07] |
| Δ Interest | 0.029 [0.93] | 0.036 [1.26] | 0.032 [0.84] | 0.038 [1.15] | 0.015 [0.30] |
| Year fixed effects | Yes | Yes | Yes | Yes | Yes |
| Observations | 223 | 223 | 223 | 223 | 223 |
| R-squared | 0.256 | 0.311 | 0.297 | 0.307 | 0.422 |

toward public equity. LSVCC managers thus simultaneously deprived their investors of the potentially high returns from private equity investments and the added diversification benefits. Moreover, the shift toward public equity was not accompanied by a decrease in fee structure. We posit that this contributed to the underperformance of Ontario LSVCCs when compared with other Canadian LSVCCs and mutual funds.

Taken together, the tax subsidy phase-out alone, without regard to fund regulation, ultimately did an inordinate amount of harm to retail investors. Even without considering lockup effects, we know that retail investors tend to be slow to respond to regulatory changes, and exhibit somewhat stickier investment behavior. We believe these factors contributed to the ease with which fund managers were able to alter their investment behavior, which eroded investors' portfolio values, while continuing to charge exorbitant fees, and yet face little or no fund outflows from household asset reallocations.

Our findings have certain implications for structuring tax subsidy phase-out policies for investment vehicles. For example, if a fund like Montreal's Solidarity Fund, which has about C\$8 billion in assets, faced a similar loss, this would translate into a C\$800 million loss for retail investors (this is a conservative estimate based on the univariate result of a 10% reduction in RoA). First, regulators in other provinces that are planning a tax subsidy phase-out could consider limiting fund managers' discretionary freedom to change investment strategy. Second, regulators could consider increasing transparency for LSVCC investors. This could be done fairly simply by, e.g., providing sample calculations of how their investments have performed relative to other (mutual) funds and markets, both with and without tax subsidies. Additionally, regulators could also consider requiring co-investments with private venture capital funds taking an active role in the venture firm, which is generally not allowed for LSVCCs. Finally, regulators should reconsider the long holding period of eight years, because it prevents investors from reallocating their assets more profitably.

Appendix A

See Appendix 1 and 2.

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