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Venture capital in Texas has been in both absolute and relative decline for more than a decade. In 2005, Texas was the third biggest venture capital (VC) jurisdiction in the world. In 2015, Texas ranked fourth in growth VC investment in the U.S. with $900m invested. In 2017, Texas ranked seventh with $780m invested. If the current trends hold, Texas will drop out of the top 10 states for growth venture capital investment around 2022.

Venture capital is an urban phenomenon. Texas has four major urban centers and each has some venture investment. However, only Austin, ranked sixth in the U.S., is doing well. Dallas, with its communications and media firms, is ranked 30th and is likely poised to hold this position. Houston is ranked 39th, and its ranking is still falling, perhaps precipitously. And finally, San Antonio is ranked 110th. At this point, San Antonio is essentially unranked, just besting Bozeman, Montana.

Venture capitalists manage money on behalf of other investors, who are usually referred to as limited partners (LPs). However, not all venture capitalists are equal. Unlike mutual funds, or many other types of fund, there is strong persistence to returns in venture capital. This means that the best funds make the greatest returns year on year. Texas should be targeting the top quartile of venture funds in its initiatives. The bottom quartile of funds loses money.

There are a number of factors that affect venture fund performance, including fund size and sequence number. Funds between around $150m and $600m generally perform best, and later funds from a venture firm tend to outperform earlier ones. But the single most important factor is probably the source of the fund's capital. Institutional investors, as well as some funds-of-funds, are experts in pricing venture capital investment. Most high-net worth individuals (former high-tech entrepreneurs and venture capitalists excepted), private equity or hedge funds, state controllers, and others are not. Accordingly, Texas should only invest in funds that receive the majority of their investment from institutional investors and certain funds-of-funds. These institutional-investor-backed funds are referred to as market-based venture funds, as they compete in a market based on price.

Non-market funds, include corporate venture capital funds, government-sponsored venture capital funds, or indeed any fund where the compensation of fund managers is not linked directly and exclusively (except for management fees) to the performance of the fund. These non-market funds do not compete on price to raise investment, and they do not make comparable returns to market-based funds. Many, if not most, non-market funds make negative returns. Sometimes non-market funds are justified on the basis of economic development. This is a fallacy as market-based funds both create greater impact and return money.

Venture capitalists do not just select the best firms and provide them with capital. They also provide them with value-added services and professionalization. Non-market funds can "crowd-out" market-based funds. Non-market funds are typically inferior in their selection of portfolio companies and provide little, if any, value added. This makes their investment cheaper for the entrepreneur since non-market funds typically ask for less equity from their investments. A naïve entrepreneur may then take investment from a non-market

fund, reducing their own odds of success and removing potential deal flow for market-based funds. A state or locality can therefore potentially poison their own well by bringing in non-market funds.

A typical venture fund charges a management fee of between 1-2% of capital under management, and takes a carry – a share of the profits – which is usually an 80-20 split between LPs and the GP (General Partner, who manages the fund). Some high-performance funds forgo the management fee and ask for higher carry. Correctly choosing venture funds, and negotiating terms, requires significant expertise.

A material portion of high-growth, high-technology startup firms receive 'growth' venture capital investment. This is investment from a VC at the seed, early, and later stages of a startup firm's growth, sometimes referred to as series A, B, C, or D rounds. A typical successful startup firm will receive three to four rounds of growth venture capital investment, over approximately five or six years, from about 12 venture capitalists (with their syndicates varying over time), prior to a liquidity event. Successful liquidity events include an initial public offering (IPO), an acquisition by an incumbent firm, and, more recently, private equity (PE) investment.

Growth venture capital investment creates jobs that pay above median wages and, in Texas, is crucial to diversifying the state's economy, making it more robust to idiosyncratic shocks.

There is another type of venture capital investment: transactional venture capital investment. Transactional VC is targeted at established firms in a wide range of industries. It does not grow startup firms. Texas needs growth VC, not transactional VC.

By some estimates between half and two-thirds of all current economic growth in the U.S. comes from high-growth, high-technology firms. Most of this growth comes once startups firm mature, after an IPO (or acquisition or sometimes PE investment). Likewise, by some estimates, as much as 80% of the remaining U.S. economic growth comes from technological innovation, from benefits from automation, data analytics, communications, and other applications of productive knowledge. A locality with a healthy venture capital ecosystem attracts new facilities from incumbent high-technology firms, increases the competitiveness of local firms, encourages the training, retention, and relocation of STEM talent, and offers many other economic benefits. If Texas is unable to address its decline in venture investment, it risks being shut out of America's innovation economy and forgoing these benefits.

There are a broad range of potential policies, which would, or at least could, increase venture capital investment in Texas. The single simplest, and most impactful action that Texas state government can take, is essentially costless. It is to pass a resolution endorsing Economically Targeted Investments (ETIs). ETIs are authorized by the Employee Retirement Income Security Act of 1974 (ERISA). Essentially these resolutions provide for 'tie-breaker' rules for pension funds. A resolution endorsing ETIs is sufficient to incentivize pension funds to use them. ETIs have been adopted in more than 20 states, including most top 10 states for venture capital.

If a pension fund faces two investment opportunities with equal expected returns, then the tie-breaker rule says that the investment should go to the one that provides some additional economic benefit to the state. The additional economic benefit can be simply opening a branch office or committing to visit to see local deal flow (for example, by taking a flex office at a startup hub like the Capital Factory in Austin, or Station Houston in Houston). However, it is crucially important not to force suboptimal deal flow on venture capitalists. The state must not impair the venture capitalists' ability to choose their investments to maximize their profit, and thus, the economic benefits to society.

The second easiest policy works in tandem with the first. Texas has a large number of state pension and investment funds, including the Teachers Retirement System of Texas (TRS), the Employees Retirement

System of Texas (ERS), the University of Texas Investment Management Company (UTIMCO) funds (which includes the Permanent University Fund - PUF), the Texas Treasury Safe Keeping Trust, the National Research University Fund (NRUF), and, of course, the Economic Stabilization Fund (ESF or rainy-day fund). The legislature could pass a resolution to target holding some level of their assets in venture capital.

Currently, these funds collective hold more than one-quarter of a trillion dollars. The proportion of each fund allocated to alternative assets, which includes venture capital as well as private equity and hedge funds, varies ranging from 0% for the ESF to over 12%. There is currently little data on where these investments take place, but most experts expect that the vast majority take place outside of Texas. Only the PUF has published data and says that it has used ETIs to make $188m of venture capital investment inside of Texas.

Provided that these funds invest in top quartile market-based venture capitalists, increased allocations to venture capital from these funds, especially in combination with ETIs, could potentially single-handedly resolve Texas' venture capital shortfall. This also would generate additional returns to funds, helping them to meet their future obligations without (or with less) tax payer support.

For the ESF, investment in alternative assets would likely dramatically increase the funds internal rate of return from the current level of around 2%. However, some portion of the fund would then be less liquid. It should also be noted that a material portion of the fund's income comes from oil and gas production taxes, which will be relevant later. The ESF could also be directed to use its own tie-breaker rule.

Other states have pursued this strategy to develop their venture capital levels. CalPERS, the California Public Employees Retirement System, is of comparable size to the collection of Texas public funds, and has around $12b invested in venture capital and private equity, accounting for about 1% of the global market. Florida, Oregon, Alaska, and Virginia all have between $10b and $7b in venture capital and private equity. Most states have around 10-12% of their portfolio in venture capital and private equity. Outliers include Washington State at 23% and New Jersey at 7% (in 2015).

The next simplest prospect is to create one or more fund-of-funds. A fund-of-funds is a fund that invests as a limited partner in one or more venture capital (or other alternative asset) funds. However, like venture funds themselves, most fund-of-funds charge a management fee of around 1-2% of capital under management and ask for an 80-20 split on the carry. Investing through a fund-of-funds is therefor subject to two levels of fees, which materially reduces the IRR to the capital providers.

The capital for a fund-of-funds can come solely from government sources, such as through an appropriation, contingent tax credits, or other sources. But most government backed funds-of-funds leverage private investment. The private capital for a fund-of-funds should come predominantly from incumbent firms with an interest in startup firms. This incentivizes the incumbents to engage with startups, which is almost as valuable as the financing itself.

The Ohio Capital Fund provides an example of a fund that used contingent tax credits and leveraged its private-to-public investment at 8:1. Despite its mix of predominantly second-tier venture capitalists, the Ohio Capital Fund looks to provide a positive internal rate of return (IRR) to investors comparable to that of the S&P 500, while also generating material economic benefits for the state. They claim $1.22b has been invested into 95 Ohio startup companies as a consequence of the fund.

Fund-of-funds make their own investment decisions, and thus, can implement their own version of the tie-break rule. Again, it should be stressed that terms that alter VC investment choices away from their most profitable options should be avoided.

The State of Texas could also take this opportunity to consolidate the management of its limited partner investments, perhaps as well as any new fund-of-fund investments. The Florida Investment Authority provides an example such an effort.

There are four main advantages to this approach. First, the consolidated entity manages a much larger investment pool and so can negotiate better terms and is more likely to achieve access to top quartile venture capitalists. Second, fund-of-fund carry can be eliminated and management fees for funds of funds, as well as pension/investment funds, benefit from economies of scale, generating higher IRRs. Third, the state can consolidate the staff who make the investment decisions. This saves redundant replication of effort and allows for the hiring of fewer but more experienced personnel for an overall potential cost saving. And finally, and perhaps most importantly, having consolidated management would allow the state to build capabilities. With these capabilities, the state could train local fund managers, act as a common intermediary between local institutions and recipient funds, and make expert assessment of Texas' ecosystems.

It should be mentioned that there are two notable difficulties with this approach: It is difficult to recruit experienced professionals to work in the public sector, and selecting these individuals will likely require outside expertise, and a single institution is more easily subject to potential influence by incumbent corporations, special interests, and other entities/individuals which might attempt to direct its investments in a fashion that would undermine performance. Nevertheless, overall, a well-designed consolidated entity should confer positive benefits. I would recommend relying upon a mix of academic and industry experts to design such an institution.

There are a large variety of other models that have been tried with varying success. According to a report by the Texas Foundation for Innovative Communities, as of 2006, 45 U.S. states had more than 150 early-stage capital programs, and as of 2015, 42 states had initiated at least one state venture-funding program, of which more than 60 are currently active. In the next paragraphs, I will briefly cover the most common of these options before I discuss what I believe will be the best option for Texas.

Government Sponsored Venture Capital (GSVCs) funds, like the former Texas Emerging Technology Fund, have been used extensively in U.S. states and many foreign jurisdictions. Although government reports often claim positive returns and economic benefits from these funds, there is little academic evidence to support this. There is evidence that some GSVC crowds-out private venture capital and actually damage entrepreneurship ecosystems. (Canada provides an example of this from 1995 to 2007.) Most managers of GSVC are lawyers or accountants, not VCs or successful entrepreneurs, and so are unqualified to assess the prospects of their portfolio companies or provide valuable assistance. And most GSVCs are non-market funds, where the general partner is paid on the funds managed or invested, not returned.

Side car or matching funds are also a popular option. These vary from things like the McNair Houston Ignition Fund (provided by private/philanthropic investment), which issued warrants to startups accepted to the Houston Technology Center's accelerator program, to matched SBIR/STTR grants, to co-investment along with 'accredited' VCs or other investors. In almost all cases, the accreditation of the matching institution or award is problematic, and in some cases, matched investment is simply redundant. Both of these issues lead to suboptimal investment. However, matching investment with that from a top-tier VC, for example, would almost surely provide positive returns.

Direct investment, through tax credits, grants, or other means, into 'accredited startup firms' is also commonly used, and again, these programs vary massively in their implementation and efficacy. For example, the City of St. Louis, with support from the Missouri Technology Corporation, offered any startup that located to St. Louis and met some basic criteria a $50,000 grant. Our analysis of this program is that it did not generate positive economic returns.

In some jurisdictions, accredited startup firms receive investment from an angel investor who meets Rule 501 of Regulation D of the U.S. Securities Act. In other jurisdictions, tax credits are given to individuals, generally to offset state income tax, provided that they make and hold an equity investment into a startup firm that meets certain criteria. The key problem is that these investments are "picking winners." Accreditation can be misaligned with the market and often encourages naïve investors who are unable to bring value added to startup firms. In general, I believe that these programs should be avoided unless they are designed by professional economists so that they have well-aligned incentives.

Finally, there are a plethora of state and local incentives used to create innovation districts, encourage incumbent relocation or branch office opening, incentivize research and development activity, and so forth. Some of these programs bear directly upon local venture capital investment. These incentives can be very productive when done properly, but their execution requires considerable expertise. Having a single investment authority and/or leveraging economic experts in these fields, is a likely prerequisite to success. I would be happy to discuss these options with the committee upon request.

Texas is different from other states and so (ETIs, pension/investment funds, and some fund-of-fund designs aside) I believe it should develop a solution that addresses its unique needs and takes advantage of its unique opportunities. Such a solution should be designed by professional economists who specialize in entrepreneurship and innovation policy, and I will only outline one potential design here to conclude my testimony.

Venture capitalists, startups, and ecosystem participants come to and stay in a locality for one of two reasons: pre-existing deal flow or some specialized economic opportunity (usually incumbent industry). As we have little pre-existing deal flow outside of Austin, we should rely on the second factor.

Some estimates put the percentage of Texas' economy in the oil and gas sector as high as 40% (including up and downstream firms – see a 2013 study by Center for Community and Business Research at the University of Texas at San Antonio's Institute for Economic Development). A more reasonable estimate is probably around 16%, which is still very large. Harnessing the oil and gas industry, which currently accounts for a tiny fraction of U.S. growth venture capital deals, is the most obvious potential driver of Texas' success in this field. Other important Texas industries include healthcare treatment centers, chemicals and industrials, transport and logistics, manufacturing, and (some) semiconductors, IT, life sciences, and aerospace.

Moreover, appropriations are difficult in Texas, and there is no state income tax to forgive. This presents funding challenges. However, oil and gas production and severance taxes and the margin tax offer an exciting possibility.

Texas could create transferable (i.e., sellable) oil and gas production/severance and margin tax credits. These credits could be issued to startup firms that receive investment from top venture capital funds, as judged by past IRR performance, and top accelerators, incubators, hubs, and other ecosystem support organizations, as judged by past VC raise rates. This approach would solve the selection problem as experts, and the market, would choosing the investments.

Startups might simply sell these credits to the highest bidding incumbent firms, essentially giving them a form of matched funding. But this would almost surely offer a positive economic benefit, as we would be effectively lowering the cost of capital of the best startup firms, allowing them to do more for each dollar of investment and making them more attractive to better investors in turn.

But we should expect something better to happen. Startups could trade these credits for partnerships, joint ventures, intellectual property licenses, and other assets or relationships that are more valuable than simple funding. The credits could facilitate mutually beneficial and productive engagement with incumbents! Such

engagement could unleash Texas' potential – it could let startups empower and enhance the industries that make Texas strong.