



# Sovereign wealth fund investment in venture capital, private equity, and real asset funds

Douglas Cumming<sup>1,2</sup> and Pedro Monteiro<sup>3</sup>

<sup>1</sup>DeSantis Distinguished Professor, College of Business, Florida Atlantic University, 777 Glades Road, Boca Raton, FL 33431, USA; <sup>2</sup>Visiting Professor, Birmingham Business School, University of Birmingham, University House, 116 Edgbaston Park Rd, Birmingham B15 2TY, UK; <sup>3</sup>Kania School of Management, University of Scranton, 320 Madison Avenue, Scranton, PA 18510, USA

**Correspondence:**

P Monteiro, Kania School of Management, University of Scranton, 320 Madison Avenue, Scranton, PA 18510, USA  
e-mail: pedro.monteiro@scranton.edu

**Abstract**

This paper examines the performance of limited partners' (LPs) investments in venture capital, private equity, and real asset funds (referred to as "alternative asset funds") from 52 countries around the world over the period of 1995 to 2020. The data indicate that sovereign wealth funds (SWFs) are significantly slower to fully liquidate and earn lower returns from their investments, particularly from their investments in venture capital funds. The longer duration and lower performance of SWFs is more pronounced for strategic SWFs than savings SWFs. We show that SWFs tend to invest in venture capital funds located in countries with lower-quality disclosure indices. Additionally, SWFs are more often involved in buyout funds and in larger funds that have greater number of limited partners. Overall, the data indicate sovereign wealth funds make large investments in alternative asset funds with a longer-term view and earn lower financial returns, which is consistent with strategic and political SWF investment objectives.

*Journal of International Business Policy* (2023) 6, 330–355.  
<https://doi.org/10.1057/s42214-023-00162-3>

**Keywords:** sovereign wealth funds; strategic investors; active investors; delegated portfolio management; limited partnerships

*Jared Kushner's new private-equity fund plans to invest millions of dollars of Saudi Arabia's money in Israeli startups, according to people familiar with the investment plan, in a sign of warming ties between two historic rivals. Affinity Partners, which has raised more than \$3 billion, including a \$2 billion commitment from the kingdom's sovereign-wealth fund, has already selected the first two Israeli firms to invest in, these people said. The decision marks the first known instance that the Saudi Public Investment Fund's cash will be directed to Israel, a sign of the kingdom's increasing willingness to do business with the country, even though they have no diplomatic relations. This could help lay the groundwork for a breakthrough normalization pact between the two countries.*

—Wall Street Journal, May 8, 2022<sup>1</sup>

**Supplementary Information** The online version contains supplementary material available at <https://doi.org/10.1057/s42214-023-00162-3>.

Received: 24 October 2022

Revised: 12 February 2023

Accepted: 14 March 2023

Online publication date: 16 May 2023

## INTRODUCTION

Sovereign wealth funds (SWFs) are large institutional investors that manage billions of dollars of state capital in numerous countries around the world. These investors are characterized by as being extremely large, operating with a very long-term view that mixes political goals with financial goals (Clark and Dixon, 2017; Rose,



2017; Lavelle, 2017). As long-term investors with enormous size, SWFs typically face lower liquidity constraints than other types of institutional investors (Fotak et al., 2017; McKinsey, 2016). SWFs make direct investments in many asset classes including both public traded and privately held companies (Johan et al., 2013). SWFs also invest in private companies through intermediaries such as private equity funds (McCahery & De Roode, 2017; Wright & Amess, 2017).

Despite their massive scale and growing importance in shaping investment outcomes and political influence around the world, there is a dearth of evidence on the nature and performance of SWF investment in venture capital, private equity,<sup>2</sup> and real asset funds. SWFs invest in these alternative investment funds as limited partners, possibly alongside other types of institutional investors. The source of capital into venture capital funds has long been known to influence how that capital is deployed (Mayer et al., 2005). As such, it is extremely important to know the role of SWFs in venture capital funds, particularly as a vital source for financing innovation around the world. Similarly, it is important to know how buyout funds and funds that invest in real assets are being influenced by SWF involvement around the world.

In this paper, we focus our research questions on two narrow issues in ways that allow us to explore some of these broader questions. First, we consider whether SWF involvement lengthens the investment horizon of an alternative asset fund. Alternative asset funds are organized as limited partnerships, often with a 10-year horizon with the option to continue for an additional few years to enable the fund to wind up and liquidate all the investments. The limited partners can be SWFs, endowments, public or private pension funds, banks, insurance companies, or other institutional investors. The day-to-day management of the fund is with the general partner, but the limited partnership contract typically has provisions that enable the fund manager to seek permission on things like the lengthening of the investment horizon, veto rights on particular investments, and requiring permission of the limited partners to make certain changes or decisions with the fund (Cumming & Johan, 2013), and the fund objectives and anticipated horizon at the time of establishing the fund will be negotiated in agreement between all of the contracting parties. As such, there is reason to believe that the investment horizon of an

alternative investment fund may vary depending on the identity of the limited partners.

In general, the limited partners prefer to have a shorter investment horizon insofar as they may have liquidity constraints, and a longer horizon is of course associated with a lower return. However, the investment horizon of the alternative asset fund may be shorter when SWFs are involved if there is political pressure to show short-term financial results. Or the investment horizon of the fund may be longer if there is a real option value to delay for political purposes. That is, if the alternative investment fund is making investments that facilitate political goals<sup>3</sup> and those goals have not yet come to fruition or would be more appropriately harnessed in a political context that has not yet come to fruition, then there could be political reasons to delay winding up the fund. In fact, the only reason why investment horizons would be longer for SWF investments in alternative asset funds is if there is a political and strategic real options benefit.<sup>4</sup>

Our second research question involves the performance of SWF investments in alternative asset funds. SWFs make large investments, and performance may be worse in view of diseconomies of scale and limited attention associated with alternative asset fund managers (Cumming & Johan, 2013). However, controlling for size, duration, and all else being equal, it is worth examining how SWFs perform. We might expect that the stability of an SWF institutional investor would enhance returns, consistent with SWF investment in public companies (Dwenter et al., 2010; Fernandes, 2014). Or we might expect that SWF political motives diminish investment quality and outcomes, even through a somewhat arms-length intermediary of an alternative asset manager, consistent with other evidence of lower announcement returns on SWF investment in public companies (Bortolotti et al., 2015) and consistent with SWFs weakening governance standards in small equity investments (Chen et al., 2022).

To address these questions, we employ the Pitchbook dataset covering alternative asset funds in 52 countries around the world and examine fund-level data. The data comprise 538 SWF investments in alternative asset funds over the years 1995–2020, and in total 7314 limited partnership investments in alternative asset funds. The data examined are consistent with the view that alternative asset funds with SWF investors are significantly slower to fully liquidate and earn lower

returns from their investments. The longer duration and worse performance are more pronounced for strategic SWFs than savings SWFs. The poor performance associated with SWFs involvement is more pronounced for early stage venture capital funds, and these venture investments are typically in countries with lower-quality disclosure indices. SWFs tend to invest much more often in buyout funds than venture capital funds and invest into larger funds. SWFs benefit from having other types of institutional investors investing alongside in the same limited partnership.

This paper contributes to a small and new literature on the governance and performance of sovereign wealth fund institutional investors in venture capital and private equity funds. Johan et al. (2013) present evidence that SWFs are more likely to invest in private equity versus public equity in countries where investor protection is weak. McCahery and De Roode (2017) and Wright and Amess (2017) describe SWF investors as institutional investors in private equity funds. However, they do not present any statistics on performance, duration, and returns. We build off their descriptive discussion and provide formal empirical tests. We show that SWF investment in venture capital, private equity, and real asset funds tends to be substantially longer duration, and with worse financial returns than that of other types of institutional investors. We document a number of other facts and results with SWF investments in these alternative asset funds.

This paper is organized as follows. The next section develops the hypotheses. Thereafter, we describe the data and present the empirical tests. After presenting the empirical tests, we discuss limitations, extensions, and future research. The last section offers concluding remarks.

### HYPOTHESES

There is growing literature on SWF investment decisions, governance, and performance. Prior research on the topic is mixed. There are some papers that indicate that SWFs provide a positive governance role and improve performance. For example, Dwenter et al. (2010) and Fernandes (2014) find evidence that SWFs are active investors and that there is a positive governance and performance effect of SWF investors in publicly traded firms. Consistent with these results, Bertoni and Lugo (2014) show that loan spreads are lower among companies with SWF investment, showing

that banks favor the long-term commitment, size, and stability of SWF investors.

On the other hand, other papers show the SWFs do not provide a positive governance role. The differences across the earlier studies showing a positive role versus the later studies showing a negative role are striking. One explanation is from Bruce-Clark and Monk (2017) who note that there is very heterogeneous governance standards across different SWFs, which might explain in part some the differences observed across different studies. The studies showing a negative effect are as follows. Bortolotti et al. (2015) and Fotak et al. (2017) present evidence of a discount associated with SWF investment due to the negative effect of political influence on firm performance. Chen et al. (2022) find evidence that SWFs' small equity investments are detrimental to various measures of target firms' corporate governance, and Boubaker et al. (2018) show that the cost of equity increases after the announcement of SWF investment. Further, Boubakri et al. (2017) show that SWF acquisitions cause target firms' competitors to perform better after the SWF acquisition.

Apart from analyses of SWFs, there is growing literature on institutional investors in venture capital and private equity funds. Mayer et al. (2005) show that the type of institutional investor in venture capital funds affects the ways in which the fund managers invest the funds. Johan and Zhang (2021) present evidence that different types of institutional investors receive different levels of reporting quality from their venture capital and private equity investors; in particular, endowments tend to receive more frequent and accurate reports of performance than other types of institutional investors. Smith et al. (2022) show the reporting quality is improved in legal environments with easier and improved legal access to information in the U.S. Lerner et al. (2008) provide evidence that endowments perform better than other types of institutional investors in venture capital and private equity based on U.S. data to 2005. These analyses, however, do not consider the presence of SWF investment in venture capital and private equity funds.

Only three studies have examined SWF in venture capital and private equity investment decisions. McCahery and De Roode (2017) and Wright and Amess (2017) describe the large presence of SWF investors as institutional investors in private equity funds. However, they do not present any statistics on performance, duration, and returns.



Johan et al. (2013) show that SWFs are more likely to invest in cross-border private equity in countries where investor protection is weak because these investments have a dual objective of increasing political influence. By contrast, in general for all types of investors, there is more investment in venture capital and private equity and investment returns are higher in countries with stronger investor protection (Cumming and Walz, 2010).

There are competing theories as to how SWFs might influence the performance and duration of their VC/PE investments. On one hand, we might conjecture that SWFs are large stable long-term investors that are unlikely to not honor capital commitments on time and provide certification to the quality of their investees. Consistent with Dwenter et al. (2010), Fernandes (2014), Bertoni and Lugo (2014) in other contexts, we would therefore expect that SWFs positively affect VC/PE performance. Also, with their political leverage, SWFs have access to superior information that better enables VC/PE fund managers to carry out due diligence and improve investment returns. On the other hand, we might conjecture that SWFs are politically motivated investors, using the funds to push non-pecuniary objectives, possibly including political objectives and/or green mandates and/or labor policies. If so, SWFs would influence their VC/PE fund managers in respect of delaying liquidations and pursuing other strategic and political objectives consistent with the SWF mandate. This latter prediction is consistent with a larger literature by Bortolotti et al. (2015), Fotak et al. (2017), Chen et al. (2022), Boubaker et al. (2018), and Boubakri et al. (2017) in other contexts, and with Johan et al. (2013) in the context of SWF investment in private equity, and if this latter prediction should be more pronounced for SWFs that are classified as having strategic motives (as opposed to savings motives for a country). This leads us to our formal predictions:

**Hypothesis 1:** SWFs' investments as limited partners in venture capital and private equity funds take longer to fully exit than that of other types of institutional investors, particularly for strategic (as opposed to savings) SWFs.

**Hypothesis 2:** SWFs' investments as limited partners in venture capital and private equity funds generate worse returns than that of other types of institutional investors, particularly for strategic (as opposed to savings) SWFs.

In testing Hypotheses 1 and 2, we note that there are three alternative explanations SWFs inferior performance in the alternative investment funds. One explanation has to do with a lack of access to top-performing alternative investment funds. Many top-quartile fund managers have long established relationships with limited partners and do not have room for new limited partners. A second explanation is that SWFs have lower skill levels at picking good-performing SWFs. The third explanation consistent with our hypotheses is that SWFs political motives distort efficient investment in venture capital and private equity. In our empirical tests below, we consider these alternative explanations.

## DATA

We obtained our sample from the Pitchbook dataset. Pitchbook, a Morningstar company, provides data covering the private capital market. Pitchbook supplies information about the limited partners ('LPs') commitments for 25,000 alternative asset funds worldwide. We obtain the number of LPs and the types of LPs committing capital to the fund. Based on that, we capture if a sovereign wealth fund (SWF) is an investor in a fund. SWFs are defined by mandate as savings and strategic based on the Global SWF classification (Lopez, 2022).<sup>5</sup> We classify SWF's source of wealth based on Megginson et al. (2013) and Bortolotti et al. (2015).<sup>6</sup>

Our fund return sample is derived from the Pitchbook Fund Performance dataset that provides return data such as internal rate of return (IRR), total value paid-in (TVPI) ratio, distributed paid-in ratio (DPI), residual value paid-in ratio (RVPI), and net asset value (NAV) at fund level. Pitchbook obtains information both within and outside the U.S. based on Freedom of Information Act requests (Smith et al., 2022), public filings, and voluntary submissions pursuant to Pitchbook requests.

We obtain the funds' cash flow data and compute the funds' TVPI and supplement this data when such information is missing in the dataset<sup>7</sup>. Pitchbook claims to obtain data on the entire fund's life cycle, from vintage to fund liquidation. However, Pitchbook does not provide the fund's liquidation year. In order of preference, we define fund liquidation date when the distributed paid-in ratio reaches 0.90 of the total value paid-in ratio (DPI/TVPI) and the funds' last performance information if it is before the end of 2019. All the other funds

**Table 1** Summary statistics – full sample

	N	Mean	Median	p25	p75	Std. Dev.
<i>Panel A – Full Sample</i>						
Years to Liquidation	3410	10.34	11	8	13	3.79
IRR	7314	12.89	10.60	4.27	19.20	17.72
TVPI	7314	1.57	1.42	1.12	1.82	.78
Vintage	7314	2010	2011	2006	2015	6.48
Fund size (\$Millions)	7314	977.37	430.70	191.41	1000	1559.60
Number LP/Funds	7314	13.33	8	3	17	15.87
Investor_Disclosure Index	7314	8.03	8	8	8	1.31
Antidirector	7314	7.53	8	8	8	1.34
Mkt Development	7314	1.60	1.43	1.43	1.43	1.47
Country Openness	7314	1.58	1.64	1.64	1.64	.16
Buyout Funds	7314	.43	0	0	1	.50
Real Asset Funds	7314	.22	0	0	0	.41
VC Funds	7314	.19	0	0	0	.39
Other Funds	7314	.16	0	0	0	.37
<i>Panel B – SWF Funds</i>						
Years to Liquidation	304	11.09	11	9	13	3.36
IRR	538	10.46	9.05	2.50	16.22	15.84
TVPI	538	1.49	1.40	1.09	1.79	.72
Vintage	538	2008.76	2008	2005	2014	6.16
Fund size (\$Millions)	538	2250.57	1026.39	405.23	3300	2618.54
Number LP/Funds	538	31.22	23	9	48	26.84
Investor_Disclosure Index	538	8.26	8	8	8	1.13
Antidirector	538	7.43	8	7	8	1.42
Mkt Development	538	1.65	1.43	1.42	1.43	1.65
Country Openness	538	1.55	1.64	1.53	1.64	.17
Buyout Funds	538	.51	1	0	1	.50
Real Asset Funds	538	.20	0	0	0	.40
VC Funds	538	.18	0	0	0	.39
Other Funds	538	.11	0	0	0	.31

This table presents summary statistics for the fund-level variables and characteristics of 7314 funds covering the period between 1995 and 2020. Variables are winsorized at 1% and 99% levels to reduce the influence of outliers.

are considered alive in the 2021.<sup>8</sup> We carefully check and exclude funds with missing information.

Other fund-level information such as category (buyout, VC, real asset, and others), country, preferred industry, vintage, and fund size is collected from the Pitchbook Fund dataset. Based on the preferred industry provided by the dataset, we manually classify the fund into nineteen distinct industry groups. We obtain the most popular industry investment for those funds with missing preferred industry information from the Pitchbook Funds' Deals dataset. Based on this method, we identified the industry preference for 6167 funds, or 84.3% of our total sample.

Due to the scarcity of information about SWF investments before 1995, we restrict our sample to the years 1995–2020. These filters leave us with a total of 7314 funds, of which 3410 are considered liquidated, spanning 52 countries. Our sovereign wealth fund sample data contains a total of 538

funds, of which 304 are considered liquidated. We obtain country-level anti-director rights and disclosure index from the World Bank Doing Business Database. The country's market development and country openness are obtained from the Global Financial Development Database and the Penn World Tables, respectively.

Table 1 summarizes the main variables in the data for the full sample in panel A and the subsample of SWF funds in panel B. Among the 3410 liquidated funds, the average (median) time to liquidation was 10.34 (11) years. This statistic is expected since most alternative investment fund limited partnerships are established with a 10-year horizon. For SWFs, the average (median) duration is longer at 11.09 (11) years. The average (median) IRR in the full sample is 12.89% (10.6%), and in the subsample of SWF investments it is 10.46% (9.05%). The average (median) TVPI is 1.57 (1.42) in the full sample and 1.49 (1.40) in the subsample



**Table 2** Summary statistics – subsamples by fund type

	N	Mean	Median	p25	p75	Std. Dev.
<i>Panel A – VC Funds</i>						
Years to Liquidation	667	12.05	12	10	15	3.99
IRR	1363	14.29	9.89	-.40	25.67	23.41
TVPI	1363	1.80	1.47	.99	2.29	1.20
Vintage	1363	2008.06	2008	2001	2014	7.09
Fund size (\$Millions)	1363	326.89	205	100	408.39	438.03
Number LP/Funds	1363	10.21	6	3	13	11.58
Investor_Disclosure Index	1363	8	8	8	8	.83
Antidirector	1363	7.69	8	8	8	1.28
Mkt Development	1363	1.42	1.43	1.43	1.43	.74
Country Openness	1363	1.60	1.64	1.64	1.64	.14
<i>Panel B - Buyout Funds</i>						
Years to Liquidation	1537	10.88	11	9	13	3.34
IRR	3174	14.79	12.42	6.42	21.29	17.01
TVPI	3174	1.65	1.53	1.22	1.95	.69
Vintage	3174	2009.36	2009	2005	2015	6.59
Fund size (\$Millions)	3174	1232.8	515.75	228	1250	1877.17
Number LP/Funds	3174	16.49	10	4	21	18.57
Investor_Disclosure Index	3174	8.05	8	8	8	1.33
Antidirector	3174	7.42	8	8	8	1.45
Mkt Development	3174	1.65	1.43	1.43	1.43	1.66
Country Openness	3174	1.56	1.64	1.61	1.64	.17
<i>Panel C – Real Asset Funds</i>						
Years to Liquidation	727	8.89	9	7	11	3.47
IRR	1613	7.97	8.20	1.22	14.06	14.56
TVPI	1613	1.31	1.27	1.03	1.52	.50
Vintage	1613	2011.26	2012	2007	2016	5.66
Fund size (\$Millions)	1613	1010.47	515	255	1086.46	1457.88
Number LP/Funds	1613	11.75	7	3	15	13.82
Investor_Disclosure Index	1613	8.13	8	8	8	1.10
Antidirector	1613	7.56	8	8	8	1.26
Mkt Development	1613	1.59	1.43	1.43	1.43	1.42
Country Openness	1613	1.57	1.64	1.64	1.64	.16
<i>Panel D – Other Funds</i>						
Years to Liquidation	479	8.43	8	6	11	3.75
IRR	1164	12.88	10.16	6.45	16.59	14.28
TVPI	1164	1.45	1.33	1.14	1.65	.53
Vintage	1164	2012.27	2013	2008	2016	5.44
Fund size (\$Millions)	1164	996.68	505.85	198.31	1264.15	1354.4
Number LP/Funds	1164	10.55	6	3	13	13.10
Investor_Disclosure Index	1164	7.87	8	8	8	1.84
Antidirector	1164	7.57	8	8	8	1.14
Mkt Development	1164	1.69	1.43	1.43	1.43	1.62
Country Openness	1164	1.59	1.64	1.64	1.64	.14

This table presents summary statistics for sub-samples based on fund types for the period between 1995 and 2020. Variables are winsorized at 1% and 99% levels to reduce the influence of outliers.

of SWF investments. These performance figures are based on performance reports for both liquidated and non-liquidated funds.

Table 2 summarizes the main variables for the four fund types in the data: venture capital (VC), buyouts, real asset, and other funds in panels A–D, respectively. Buyout funds show better average

(median) IRR performance at 14.79% (12.42%) compared to venture capital at 14.29% (9.89%), real assets at 7.97% (8.2%), and other funds at 12.88% (10.16%). TVPI is similar for venture capital (average 1.80, median 1.47) and buyouts (average 1.65, median 1.53), and lower for real asset funds (average 1.31, median 1.27) and other funds

**Table 3** Summary statistics – subsamples by fund types – only SWF funds

	N	Mean	Median	p25	p75	Std. Dev.
<i>Panel A – VC Funds</i>						
Years to Liquidation	68	13.04	13	11.50	16	3.92
IRR	99	5.14	3.52	– 6.50	13.10	20.31
TVPI	99	1.44	1.20	.63	1.82	1.17
Vintage	99	2004.99	2004	2000	2008	6.06
Fund size (\$Millions)	99	355.01	187	86	429	476.12
Number LP/Funds	99	16.54	9	4	18	19.51
Investor_Disclosure Index	99	7.95	8	8	8	.99
Antidirector	99	7.75	8	8	8	1.11
Mkt Development	99	1.38	1.43	1.43	1.43	.25
Country Openness	99	1.61	1.64	1.64	1.64	.10
<i>Panel B - Buyout Funds</i>						
Years to Liquidation	161	11.27	11	9	13	2.65
IRR	273	13.75	11.30	5.18	19.3	14.92
TVPI	273	1.62	1.52	1.25	1.94	.60
Vintage	273	2008.43	2008	2005	2013	6.04
Fund size (\$Millions)	273	2914.43	1852	702	4225.19	2843.77
Number LP/Funds	273	40.21	34	16	62	27.78
Investor_Disclosure Index	273	8.31	8	8	9	1.30
Antidirector	273	7.16	8	7	8	1.65
Mkt Development	273	1.61	1.43	1.42	1.43	1.59
Country Openness	273	1.52	1.64	1.33	1.64	.20
<i>Panel C – Real Asset Funds</i>						
Years to Liquidation	46	9.37	9	8	11	2.88
IRR	107	7.52	7.54	2.38	13.31	14.90
TVPI	107	1.28	1.30	1.02	1.55	.49
Vintage	107	2011.64	2013	2007	2016	5.13
Fund size (\$Millions)	107	2489.94	1305	650	3586	2580.34
Number LP/Funds	107	25.81	18	9	31	23.10
Investor_Disclosure Index	107	8.37	8	8	8	.89
Antidirector	107	7.63	8	8	8	1.21
Mkt Development	107	1.85	1.43	1.43	1.43	2.10
Country Openness	107	1.56	1.64	1.56	1.64	.15
<i>Panel D – Other Funds</i>						
Years to Liquidation	29	8.21	8	6	10	3.04
IRR	59	9.51	9.30	5.63	14.10	7.80
TVPI	59	1.36	1.32	1.13	1.57	.39
Vintage	59	2011.36	2013	2007	2015	4.85
Fund size (\$Millions)	59	1925.38	1008.15	550	2594	2141.57
Number LP/Funds	59	24.05	16	6	31	24.02
Investor_Disclosure Index	59	8.32	8	8	8	.71
Antidirector	59	7.78	8	8	8	.72
Mkt Development	59	1.92	1.43	1.43	1.43	2.18
Country Openness	59	1.58	1.64	1.64	1.64	.14

This table presents summary statistics for funds with at least one sovereign wealth fund committed capital/ The sub-samples based on fund types for the period between 1995 and 2020.

(average 1.45, median 1.33). Time to liquidation is longer for venture capital (average 12.05 years, median 12 years) compared to buyout funds (average 10.88 years, median 11 years), real assets funds (average 8.89 years, median 9 years), and other funds (average 8.43 years, median 8 years).

Table 3 summarizes the main variables for the four fund types in the data for SWF investments only: venture capital (VC), buyouts, real asset, and other funds in panels A–D, respectively. Buyout funds (average 13.75%, median 11.3%) show better IRR performance for SWFs than Venture capital funds (average 5.14%, median 3.52%), real assets

**Table 4** Summary of *t* test stats

	Non-SWF N	SWF N	Non-SWF Mean	SWF Mean	Diff	Std. Error	<i>t</i> value
Years to Liquidation	3106	304	10.27	11.09	-.82	.228	- 3.6***
IRR	6776	538	13.08	10.46	2.62	.793	3.3***
TVPI	6776	538	1.58	1.49	.09	.035	2.5**
Vintage	6776	538	2010.10	2008.76	1.34	.290	4.6***
Fund size (\$Millions)	6776	538	876.28	2250.57	- 1374.29	67.989	- 20.2***
Number LP/Funds	6776	538	11.91	31.22	- 19.31	.674	- 28.65***
Investor_Disclosure Index	6776	538	8.01	8.26	-.25	.059	- 4.25***
Antidirector	6776	538	7.53	7.43	.11	.060	1.75*
Mkt Development	6776	538	1.60	1.65	-.05	.066	-.75
Country Openness	6776	538	1.58	1.55	.03	.007	4.05***
Buyout Funds	6776	538	.43	.51	-.08	.022	- 3.6***
Real Asset Funds	6776	538	.22	.20	.02	.018	1.25
VC Funds	6776	538	.19	.18	.00	.018	.15
Other Funds	6776	538	.16	.11	.05	.017	3.25***

This table presents univariate analysis of Non-SWF funds and SWF funds' characteristics. The column labeled *t*-value reports the results of a *t* test of equal means between the sample of Non-SWF funds and SWF funds. Definitions of all variables are presented in Appendix 1. \*, \*\*, \*\*\* indicate statistical significance at the 10, 5, and 1% level, respectively.

funds (average 7.52%, median 7.54%), and other funds (average 9.51%, median 9.3%). TVPI is also higher for Buyout funds (average 1.62%, median 1.52), than venture capital (average 1.44, median 1.2), real asset funds (average 1.28, median 1.3), and other funds (average 1.36, median 1.32). Time to liquidation is longer for SWF venture capital (average 13.04 years, median 13 years) compared to buyout funds (average 11.27 years, median 11 years), real assets funds (average 9.37 years, median 9 years), and other funds (average 8.21 years, median 8 years).

Table 4 presents comparison tests for SWF vs. non-SWF investments for the full sample. The data indicate that SWFs have significantly longer time to liquidation (average 11.086 years vs. 10.269 years, difference significant at the 1% level), consistent with Hypothesis 1. SWFs have lower IRRs (average 10.461% vs. 13.081%, difference significant at the 1% level), consistent with Hypothesis 2. SWFs have lower TVPI (average 1.49 vs. 1.576, difference significant at the 5% level), again consistent with Hypothesis 2. In the full sample including liquidated and non-liquidated funds, non-SWFs are more common in more recent vintage years. SWFs invest in funds with significantly more limited partners (average 31.218 vs. 11.909, difference significant at the 1% level). SWFs invest in countries with lower antidirector rights and lower country openness levels, consistent with Johan et al. (2013). SWFs are more likely to invest in

buyout funds and less likely to invest in the Pitchbook category of other funds.

Table 5 presents results for the difference between commitments of SWFs of different mandates and sources of wealth. Panel A shows the difference between savings SWFs and strategic SWFs. The data indicate that strategic SWFs are more likely to invest in venture capital funds (0.26 vs. 0.17), in funds located in countries with lower antidirector rights (6.61 vs. 7.59), and country's openness (1.47 vs. 1.56), and less likely to invest in real asset funds (0.12 vs. 0.21). The differences in performance between strategic SWFs and savings SWFs (measured by IRR or TVPI) and duration are not statistically significant. Panel B presents the differences between non-commodity and commodity SWF (Megginson et al., 2013). Compared to non-commodity SWFs, the data indicate that commodity SWFs invest in larger funds (\$2948 million vs. \$2164 million), in funds with more limited partners (51.86 vs. 28.67), in countries with lower antidirector rights (6.81 vs. 7.5) and country's openness (1.41 vs. 1.57), and countries with higher Investor Disclosure Index (9.12 vs. 8.15). Commodity SWFs are more likely to invest in buyout funds (0.73 vs. 0.48), and less likely to invest in venture capital funds (0.03 vs. 0.2). Commodity SWFs are more likely to invest in buyout funds (0.73 vs. 1.48), and less likely to invest in venture capital funds (0.03 vs. 0.2). Finally, the differences in IRR, TVPI, and duration between non-commodity SWFs

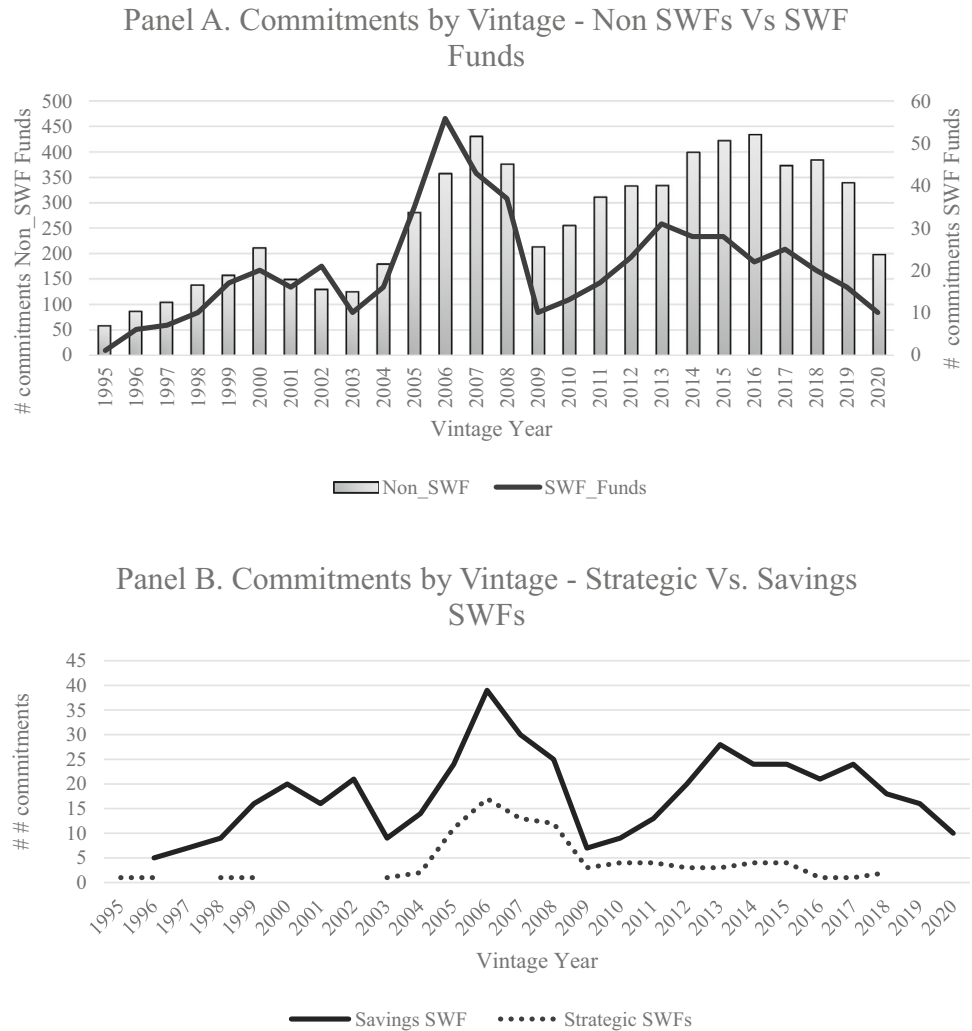


**Table 5** *T* test summary stats – SWF funds’ by mandate and source of wealth

Saving SWF		Strategic SWF		Saving SWF		Strategic SWF		t value		Saving SWF		Strategic SWF		Wilcoxon Rank Test	
N	Mean	N	Mean	Mean	Mean	Mean	Mean			Median	Median				
<i>Panel A. SWF by Mandate</i>															
Years to Liquidation	249	11.07	55	11.16	-.19	11	11			11	11			-0.21	
IRR	449	10.80	89	8.75	1.12	9.18	8.1			8.1	8.1			0.65	
TVPI	449	1.48	89	1.56	-1.00	1.4	1.43			1.43	1.43			-0.33	
Vintage	449	2008.90	89	2008.02	1.23	2008	2007			2007	2007			1.14	
Fund size (\$Millions)	449	2205.40	89	2478.43	-.90	1038.42	942			942	942			0.19	
Number LP/Funds	449	30.89	89	32.89	-.64	23	18			18	18			0.38	
Investor_Disclosure Index	449	8.25	89	8.29	-.31	8	8			8	8			-1.88*	
Antidirector	449	7.59	89	6.61	6.18***	8	8			8	8			4.70***	
Mkt Development	449	1.64	89	1.69	-.29	1.43	1.43			1.43	1.43			4.29***	
Country Openness	449	1.56	89	1.47	4.98***	1.64	1.53			1.53	1.53			4.83***	
Buyout Funds	449	.51	89	.52	-.19	1	1			1	1			-0.19	
Real Asset Funds	449	.21	89	.12	1.95*	0	0			0	0			1.94*	
VC Funds	449	.17	89	.26	-1.99**	0	0			0	0			-1.91**	
Other Funds	449	.11	89	.10	.28	0	0			0	0			0.28	
<i>Panel B. SWF by Source of Wealth</i>															
Years to Liquidation	268	11.07	36	11.17	-.15	11	11			11	11			0.28	
IRR	479	10.55	59	9.70	.39	9.1	8.7			8.7	8.7			0.03	
TVPI	479	1.49	59	1.45	.40	1.43	1.44			1.44	1.44			-0.52	
Vintage	479	2008.85	59	2008.05	.93	2008	2007			2007	2007			0.87	
Fund size (\$Millions)	479	2164.61	59	2948.46	-2.18***	917	1983.2			1983.2	1983.2			-3.87***	
Number LP/Funds	479	28.67	59	51.86	-6.50***	20	52			52	52			-5.64***	
Investor_Disclosure Index	479	8.15	59	9.12	-6.45***	8	10			10	10			-7.36***	
Antidirector	479	7.50	59	6.81	3.57***	8	7			7	7			7.56***	
Mkt Development	479	1.64	59	1.73	-.42	1.43	1.42			1.42	1.42			5.74***	
Country Openness	479	1.57	59	1.41	7.06***	1.64	1.33			1.33	1.33			7.40***	
Buyout Funds	479	.48	59	.73	-3.65***	0	1			1	1			-3.60***	
Real Asset Funds	479	.20	59	.19	.25	0	0			0	0			0.25	
VC Funds	479	.20	59	.03	3.18***	0	0			0	0			3.15***	
Other Funds	479	.12	59	.05	1.55	0	0			0	0			1.53	

This table presents univariate analysis of SWF funds’ characteristics according to their mandate and source of wealth. The column labeled *t* value reports the results of a *t* test of equal means between sub-samples. The column Wilcoxon rank test reports the median comparison using the Wilcoxon signed-rank test. Definitions of all variables are presented in Appendix 1. \*, \*\*, \*\*\* indicate statistical significance at the 10, 5, and 1% level, respectively

**Fig. 1** This figure presents the number of capital commitment by fund's vintage year for SWF funds and non-SWF funds for the period of 1995–2020. **A** Total commitments of SWF funds vs. non-SWF funds in our data. **B** Total commitments of savings SWFs vs. strategic SWFs. SWF funds are those funds in which at least one sovereign wealth fund has committed capital. Savings SWFs and strategic SWFs are those funds in which at least one savings sovereign wealth fund and strategic sovereign fund has committed capital. These figures depict the commitments utilized in our sample after undergoing the filtering process outlined in the Data section



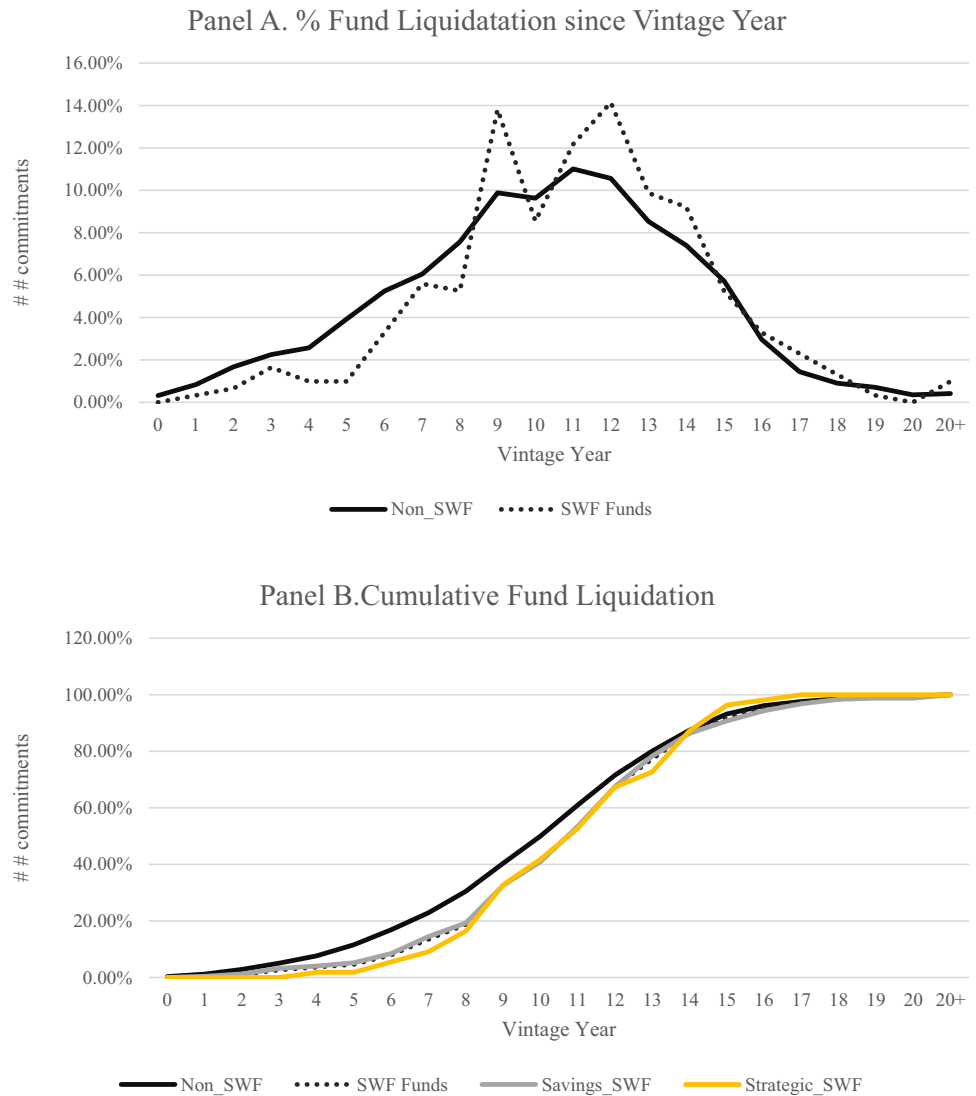
and commodity SWFs are not statistically significant.

Figure 1 presents the number of commitments to alternative investment funds by SWF vs. non-SWF investors, and by strategic SWFs vs. savings SWFs investors.<sup>9</sup> Figure 1A shows that different from non-SWF commitments, the number of SWF commitments to alternative funds has not reached its record annual levels from the period preceding the financial crisis. The data indicate that the number of commitments in 2020 has dropped significantly compared to 2019 for both non-SWF and SWF investors, which can be explained by the negative impact of the COVID-19 pandemic on the total number of commitments to alternative investments. Figure 1B splits the number of commitments of SWF investors between strategic and savings SWFs. The data indicate that the peak of commitments for both strategic and savings SWF

was reached before the financial crisis. Between 2009 and 2012, the number of savings SWF commitments increased significantly but since then has remained stable. Such an increase in the number of commitments after the financial crisis was not observed among strategic SWFs. After 2009, the number of savings SWF commitments has remained stable and significantly lower than its levels preceding the crisis.

Figure 2A, B shows that non-SWF investment in alternative asset funds are more likely to be liquidated quickly than SWFs investments, consistent with Hypothesis 1. The data presented in Figure 2A indicate the most pronounced differences where funds with SWF investors are less likely to be liquidated throughout the first 8 years. Figure 2B shows cumulative density functions of the time to liquidation for SWFs vs. non-SWFs. The data

**Fig. 2** The funds' duration based on SWF commitments. **A** Percentage of funds liquidated by year since the fund's vintage year. **B** Cumulative funds' liquidation based on the type of SWF capital commitments.



indicate that strategic SWFs are slower to fully liquidate than savings SWFs.

Figure 3A (B) shows that SWF IRRs (TVPIs) is only higher than the average of non-SWF IRRs (TVPIs) in seven out of 19 vintage years in our sample. The data indicate that SWF funds have been consistently generating worse returns than that of other types of institutional investors, which is consistent with Hypothesis 2.

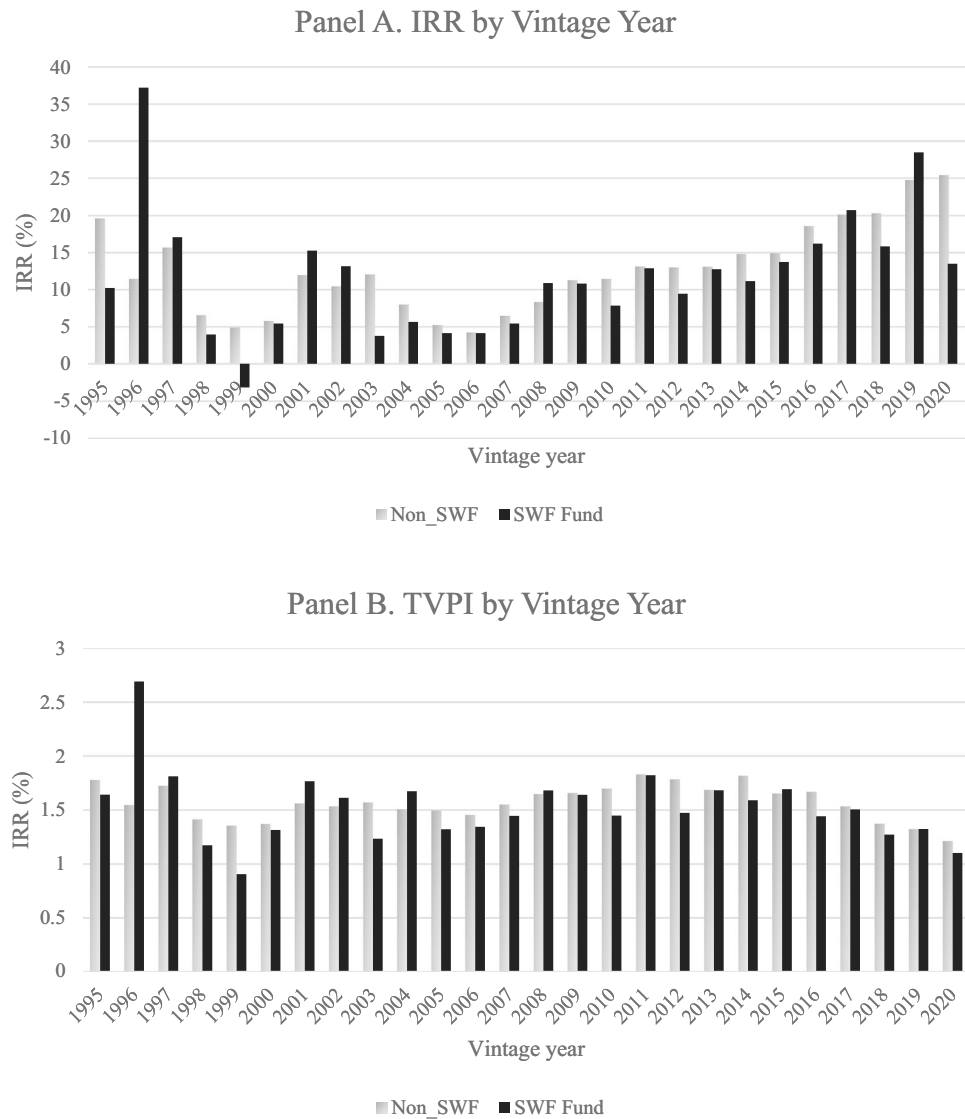
**EMPIRICAL TESTS**

This section proceeds as follows. We first present estimates of the determinants of time to fund liquidation. Thereafter, we present estimates of IRRs and TVPI. Limitations and future research are thereafter discussed in the next section.

**Time to Fund Liquidation**

The presentation of our analyses of time to fund liquidation begins in Table 6. Table 6 presents OLS estimates of time to full liquidation of funds, considering the sub-sample of funds liquidated. Standard errors are clustered by country (Petersen, 2009). We also checked standard errors clustering by vintage year and found results that were similar to those reported in Table 6. Other approaches of dealing with standard errors (e.g., Newey et al., 1987) do not influence the findings reported here. Table 6 presents subsets of the data by fund type (venture capital in models 1 and 2, private equity in models 3 and 4, real assets in models 5 and 6, other funds in models 7 and 8) and then all funds together in models 9 and 10.

**Fig. 3** The funds' performance by vintage year based on their SWF's capital commitment. **A** The means of the funds' internal rate of returns (IRR) based on their vintage year. **B** The means of the funds' total value to be paid in (TVPI) based on their vintage year.



The results for the subset of venture capital funds in Table 6 are presented in models 1 and 2. Model 1 controls for all types of institutional investors, fund size, the number of limited partners, and includes country and vintage year fixed effects. Model 2 differs from model 1 by adding fixed effects for industry. Models 3 and 4 are structured in the same way for buyout funds, and models 6 and 7 are structured in the same way for real asset funds, etc.

Models 1 and 2 show that SWFs investments in venture capital funds on average have a longer duration compared to other types of institutional investors, consistent with Hypothesis 1. SWFs are 10.1% longer than average in model 1, and 9.6% longer in model 2 controlling for industry. By contrast, in model 1, corporate pension funds are

5.9% longer, public pension funds are 5.8% shorter, insurance companies are 1.3% longer, and endowments are 5.9% shorter. Controlling for industry in model 2, corporate pensions are longer on average with the economic significance at 6.1%, while public pensions are 6.8% shorter than average, insurance companies are 2.1% longer, and endowments 2.8% shorter on average. These effects are all significant at least the 5% level.

Models 3 and 4 show the same regressions for buyouts. SWFs in model 3 are not statistically significant. By contrast, insurance companies are 5.3% shorter than the average, when industry fixed effect is used. The data also indicate that foundations investments in buyout funds are 1.5% longer

**Table 6** Funds' duration analysis – OLS regression with log of time to exit as a dependent variable

	VC Funds			Buyout Funds			Real Asset Funds			Other Funds			All Funds		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)					
SWF	.101*** (.004)	.096*** (.004)	.004 (.012)	.013 (.01)	.016 (.015)	-.007 (.008)	.076*** (.011)	.128*** (.005)	.023*** (.006)	.032*** (.006)					
Corp Pension	.059*** (.005)	.061*** (.009)	.028*** (.011)	.003 (.011)	.052** (.019)	.04** (.017)	-.005 (.022)	.039*** (.009)	.037*** (.011)	.035*** (.009)					
Public Pension	-.058*** (.01)	-.068*** (.016)	-.022 (.023)	-.012 (.029)	-.032*** (.006)	-.047*** (.007)	-.041 (.055)	-.062 (.114)	-.037 (.023)	-.035 (.031)					
Foundation	.006 (.007)	.002 (.008)	.008 (.01)	.015* (.009)	.016 (.028)	.01 (.027)	.008 (.019)	-.01 (.01)	.002 (.004)	.003 (.003)					
Insurance	.013** (.004)	.021*** (.006)	-.071*** (.007)	-.053*** (.007)	-.048*** (.006)	-.052*** (.005)	-.004 (.011)	.008 (.01)	-.038*** (.004)	-.027*** (.006)					
Banking	.012 (.014)	.011 (.019)	-.019 (.032)	-.018 (.024)	.052 (.054)	.046 (.06)	.099 (.136)	.21** (.067)	-.018 (.028)	-.018 (.025)					
Endowment	-.059*** (.003)	-.028*** (.002)	-.017*** (.004)	-.004 (.003)	0.000 (.004)	.01* (.005)	-.043 (.025)	-.04 (.04)	-.025*** (.004)	-.014*** (.002)					
Ln(Fund_Size)	.027*** (.004)	.016*** (.003)	-.012** (.005)	-.014** (.006)	-.019** (.008)	-.011 (.008)	-.022 (.012)	-.014*** (.004)	-.014*** (.003)	-.012*** (.003)					
Ln(Number_LP)	.016*** (.004)	.012*** (.002)	.045*** (.011)	.046*** (.012)	.079*** (.007)	.074*** (.008)	.087*** (.009)	.105*** (.017)	.058*** (.005)	.054*** (.006)					
VC Fund										.132*** (.006)					
Buyout Fund										.093*** (.006)					
Real Asset Fund										.062*** (.005)					
_cons	2.36*** (.01)	2.414*** (.014)	2.435*** (.017)	2.435*** (.02)	2.174*** (.033)	2.16*** (.033)	2.159*** (.097)	2.029*** (.08)	2.277*** (.028)	2.242*** (.019)					
Observations	659	606	1530	1280	720	695	474	302	3403	2915					
R <sup>2</sup>	.505	.529	.509	.465	.587	.587	.498	.509	.55	.545					
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes					
Vintage FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes					
Industry FE	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes					

This table presents the results of an OLS regression on the years to liquidation measured by the log of number of years between funds' vintage years and its liquidation. In order of preference, we define fund liquidation date when DPI reaches 0.9 of the funds' TVPI and the funds' last performance information if it is before the end of 2019. This table includes only the sample of funds liquidated and exclude alive funds in 2021. Columns (1)–(2) present the results of liquidated VC funds sample. Columns (3)–(4) present the results of liquidated Buyout funds sample. Columns (5)–(6) present the results of liquidated Real Asset funds sample. Columns (7)–(8) present the results of Other funds sample. Columns (9)–(10) present the results for the full sample. Comparison category in columns (9)–(10) is Other Funds. Country fixed effect is based on the Funds' headquarter location. Vintage fixed effect is based on the funds' vintage year. Industry fixed effect is based on the funds' preferred industry. Definitions of all the variables are presented in Appendix 1. Robust standard errors clustered at country level are presented in the parentheses. \*, \*\*, \*\*\* indicate statistical significance at the 10%, 5%, and 1% level, respectively



**Table 7** Funds' duration analysis SWF strategic x SWF savings – OLS regression with log of time to exit as a dependent variable

	VC Funds		Buyout Funds		Real Asset Funds		Other Funds		All Funds	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Strategic SWF	.166*** (.029)	.154*** (.025)	.08*** (.007)	.069*** (.004)	-.052* (.025)	-.057** (.024)	.018 (.054)	.023 (.032)	.036** (.014)	.031*** (.009)
Savings SWF	.094*** (.004)	.089*** (.003)	-.01 (.014)	.003 (.011)	.036 (.025)	.009 (.013)	.094*** (.022)	.18*** (.018)	.02*** (.007)	.031*** (.007)
VC Fund									.141*** (.012)	.132*** (.006)
Buyout Fund									.08*** (.011)	.093*** (.006)
Real Asset Fund									.013 (.013)	.062*** (.005)
Fund Controls?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Other Inst. Inv?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	659	606	1530	1280	720	695	474	302	3403	2915
R <sup>2</sup>	.506	.529	.51	.466	.588	.588	.499	.511	.55	.545
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vintage FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes

This table presents the results of an OLS regression on the years to liquidation measured by the log of number of years between funds' vintage years and its liquidation. In order of preference, we define fund liquidation date when DPI reaches 0.9 of the funds' TVPI and the funds' last performance information if it is before the end of 2019. This table includes only the sample of funds liquidated and exclude alive funds in 2021. Columns (1)–(2) present the results of liquidated VC funds sample. Columns (3)–(4) present the results of liquidated buyout funds sample. Columns (5)–(6) present the results of liquidated real asset funds sample. Columns (7)–(8) present the results of other funds sample. Columns (9)–(10) present the results for the full sample. Comparison category in columns (9)–(10) is other funds. Country fixed effect is based on the funds' headquarters location. Vintage fixed effect is based on the funds' vintage year. Industry fixed effect is based on the funds' preferred industry. Definitions of all the variables are presented in Appendix 1. Robust standard errors clustered at country level are presented in the parentheses. \*, \*\*, \*\*\* indicate statistical significance at the 10, 5, and 1% level, respectively

than average, but this effect is only significant at the 10% level

Model 6 shows that for real asset funds, SWFs have a shorter investment duration by 0.7%, but this effect is not statistically significant. Public pension funds and insurance companies are likewise shorter by 4.7 and 5.2% in model 6, respectively, while corporate pension funds are 4% longer. These effects are all significant at least the 5% level. The data also indicate that endowments investments on real estate funds are 1% longer than the average, but this effect only significant at the 10% level.

The group of other funds show that SWFs have a longer duration for other funds in models 7 and 8 with an economic significance at 7.6 and 12.3% respectively, and these estimates are both statistically significant at the 1% level. Similarly, corporate pension funds and banking investments on other funds are longer by 3.9 and 21%, respectively. The other institutional investor coefficients are either negative and significant or insignificant.

In model 9, for all fund types together, SWFs remain longer and statistically significant, consistent with Hypothesis 1. In model 10, with fixed

effect for industry, SWFs are positive and significant at the 1% level with the economic significance at 3.2%. Overall, the data are highly consistent with the view that SWFs tend have the longest investment horizon on average with all funds taken together, and particularly longer horizons for venture capital funds and the group of other funds.

The control variables in the table are likewise consistent with expectations. The data indicate that larger funds and funds with more limited partners have a longer horizon until liquidation. The economic significance is such that a one percent increase in fund size causes a 2.7 and 1.6% increase in fund duration in models 1 and 2, respectively, for venture capital funds. However, this effect is not observed for other fund types. Funds with more limited partners also have a longer duration in all the models. A 1% increase in the number of limited partners causes a 1.2–10.5% increase in fund duration, and these effects are significant at 1% level.

Table 7 provides an analyses as in Table 6, except with strategic and savings SWFs considered separately. The data indicate that strategic SWFs take 16.6% longer to exit venture capital investments,

**Table 8** Fund duration - Cox hazard model with log of time to exit as a dependent variable

	VC Funds (1)	Buyout Funds (2)	Real Asset (3)	Other Funds (4)	All Funds (5)
SWF	-.142*** (.02)	-.047 (.064)	.03 (.106)	.071 (.204)	.035 (.029)
Corp Pension	-.03 (.053)	.091 (.058)	-.1* (.058)	.046 (.173)	.01 (.026)
Public Pension	-.115 (.08)	.015 (.056)	-.034 (.055)	.544** (.228)	.015 (.035)
Foundation	.139*** (.02)	.012 (.077)	-.042 (.059)	.005 (.118)	.003 (.037)
Insurance	.311*** (.028)	.247*** (.039)	.203*** (.061)	-.115* (.066)	.187*** (.026)
Banking	-.106 (.072)	.06 (.063)	-.351 (.321)	-.961 (.7)	-.014 (.071)
Endowment	.075*** (.021)	-.05 (.043)	-.074*** (.027)	.368*** (.087)	.03 (.031)
Ln(Fund_Size)	-.079*** (.022)	.084*** (.017)	-.03 (.027)	.081* (.048)	.035*** (.009)
Ln(Number_LP)	-.146*** (.054)	-.093 (.072)	-.067*** (.02)	-.334** (.155)	-.127*** (.041)
Investor_Disclosure	.139** (.055)	.051* (.029)	.118*** (.045)	.146 (.093)	.072*** (.025)
Antidirector	.187*** (.033)	-.056** (.027)	-.077* (.044)	-.078* (.047)	-.026 (.025)
Mkt_Development	-.048** (.021)	.032*** (.008)	.082*** (.014)	.026 (.039)	.029*** (.008)
Country_Openness	-.785*** (.234)	.546*** (.177)	1.065*** (.341)	.841 (.878)	.476*** (.184)
VC Fund					-.715*** (.061)
Buyout Fund					-.455*** (.055)
Real Asset Fund					-.588*** (.036)
Industry FE	Yes	Yes	Yes	Yes	Yes
Observations	1190	2584	1495	702	5971
Pseudo R <sup>2</sup>	.007	.004	.008	.02	.008

This table presents Cox Hazard estimates with the log of number of years between fund's Vintage year and its liquidation as dependent variable. Years to liquidation of funds yet to be liquidated by the end of 2020 is right-censored at the end of calendar year 2021. Positive (negative) coefficients indicate that the covariates increases (decreases) the hazard and shorten (lengthens) the expected funds' duration. We define fund liquidation date when DPI reaches 0.9 of the funds' TVPI and the funds' last performance information if it is before the end of 2019. Columns (1), (2), (3), (4), and (5) presents the results of VC funds sample, Buyout funds sample, Real Asset funds sample, Other funds sample, and the full sample, respectively. Comparison category in column (5) is Other Funds. All models include Industry fixed effect based on the funds' preferred industry. Definitions of all the variables are presented in Appendix 1. Robust standard errors clustered at country level are presented in the parentheses. \*, \*\*, \*\*\* indicate statistical significance at the 10, 5, and 1% level, respectively

compared to 9.4% longer for savings SWFs (model 1; in model 2 the results are similar at 15.4 vs. 8.9%), consistent with Hypothesis 1. Similarly, strategic SWFs take longer to exit for buyout funds (models 3 and 4 show strategic SWFs are 8.0 and 6.9% longer, respectively, while the coefficients on savings SWFs are insignificant), and all funds considered together (model 9 the economic significance 3.6% for strategic SWFs and 2.0% for savings SWFs, while in model 10 there is no difference in

the economic significance at 3.1%). For real estate funds (models 5 and 6), strategic SWFs have a shorter duration; we do not have a good explanation for this latter result but do note that there are only 11 real estate investments by strategic SWFs (Table 5). Savings SWFs take significantly longer to exit other funds (models 7 and 8), but the coefficients on strategic SWFs in models 7 and 8 are insignificant which might be due to the fact that

**Table 9** Fund duration - Cox hazard model with log of time to exit as a dependent variable

	VC funds	Buyout funds	Real asset	Other funds	All funds
	(1)	(2)	(3)	(4)	(5)
Strategic SWF	-.032 (.211)	-.294** (.129)	.109 (.26)	.154 (.345)	-.066 (.095)
Savings SWF	-.157*** (.014)	.013 (.054)	.008 (.084)	.036 (.17)	.055** (.025)
VC Fund					-.715*** (.061)
Buyout Fund					-.455*** (.055)
Real Asset Fund					-.588*** (.036)
Fund Controls?	Yes	Yes	Yes	Yes	Yes
Other Inst. Inv?	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes
Observations	1190	2584	1495	702	5971
Pseudo R <sup>2</sup>	.007	.004	.008	.02	.008

This table presents Cox hazard estimates with the log of number of years between funds' vintage years and its liquidation as dependent variable. Years to liquidation of funds yet to be liquidated by the end of 2020 is right-censored at the end of calendar year 2021. Positive (negative) coefficients indicate that the covariates increases (decreases) the hazard and shorten (lengthens) the expected funds' duration. We define fund liquidation date when DPI reaches 0.9 of the funds' TVPI and the funds' last performance information if it is before the end of 2019. Columns (1), (2), (3), (4), and (5) presents the results of VC funds sample, buyout funds sample, real asset funds sample, other funds sample, and the full sample, respectively. Comparison category in column (5) is other funds. All models include industry fixed effect based on the funds' preferred industry. Definitions of all the variables are presented in Appendix 1. Robust standard errors clustered at country level are presented in the parentheses. \*, \*\*, \*\*\* indicate statistical significance at the 10, 5, and 1% level, respectively

there are only 9 strategic SWF investments in the 'other' Pitchbook category (Table 5).

Table 8 presents duration estimates similar to Table 6, but with the use of Cox hazard estimates with the log of number of years between fund's vintage year and its liquidation as dependent variable. Years to liquidation of funds yet to be liquidated by the end of 2020 is right-censored at the end of calendar year 2021. This approach allows us to include in the time to liquidation analysis all the funds that are eventually not liquidated. Also, instead of country fixed effects as in Table 6, we use legal indices for investor disclosure, antidirector rights, market development, and country openness. The data in model 1 indicate that SWFs survive 14.2% longer for venture capital funds, and this effect is statistically significant at the 1% level, consistent with Hypothesis 1. Foundation-backed, insurance backed, and endowment backed wind up 13.9%, 31.1%, and 7.5% quicker, respectively. In general, the evidence is consistent with the OLS estimates, albeit with slight differences in the statistical and economic significance in some of the variables. Larger funds and funds with more limited partners also survive longer. And improved legal disclosure and minority shareholder protection (antidirector rights) shortens fund duration,

while market development and country openness lengthen venture capital fund duration.

Table 8 does not show any statistically significant effect of SWFs on the duration of buyouts, real assets, and other funds, or all funds together. The evidence does show some differential effects on fund duration for other institutional investors depending on the fund type. For model 5 with all funds together, the data indicate that countries with superior investor disclosure, market development, and country openness have shorter durations. Consistent with results presented in Table 6, the data indicate that funds with more limited partners tend to experience a longer duration. Finally, venture capital funds tend to have longer durations relative to other types of funds, as expected as it typically takes earlier stage companies a longer time to bring companies to fruition and successful exit.

Table 9 separates out the impact of strategic and savings SWF investments on duration. The data indicate strategic funds take 29.4% longer to exit buyouts (significant at the 5% level) and savings funds take 15.4% longer to exit venture capital investments (model 1, significant at the 1% level), thereby providing only partial support for Hypothesis 1. Savings SWFs are 5.5% quicker to exit all funds considered together (model 5, significant at

the 5% level). The other coefficient estimates, however, are not statistically significant.

Overall, the data are consistent with the view that SWF involvement in alternative investment funds gives rise to longer investment durations, consistent with Hypothesis 1. SWFs have strategic and political incentives to invest, and a longer horizon enables real options values associated with delaying the realization and sale of alternative investments. However, we did see some differences in the results by subsamples of the data, possibly due to smaller sample sizes, particularly for strategic SWFs. Future research is warranted as more data become available.

### Determinants of IRR and TVPI

In this subsection, we report regressions with internal rate of return (IRR) and total value to paid in capital (TVPI) as the dependent variable. The PE fund IRR and TVPI are the most widely used performance metrics among financial market practitioners and academics. The IRR measures the investors' annualized internal rate of return based on funds contributions (cash inflow) and distributions (cash outflow), net of carried interest, and fees paid to the fund's managers. The TVPI measures the sum of all funds' realized and unrealized gain relative sum of all fund contributions by investors, also net of carried interest and fees.

Table 10 presents OLS estimates with IRR as the dependent variable. We present ten models, with two models each for venture capital, buyout, real assets, other, and all funds together. The first model uses country fixed effects, and the second model uses four country indices for investor disclosure, antidirector rights, market development, and country openness. Standard errors are clustered by country.

Models 1 and 2 indicate that SWFs have the lower IRRs in their investment in venture capital funds compared to all other types of institutional investors, and this effect is significant at the 1% level in model 1 and at the 5% level in model 2, consistent with Hypothesis 2. IRRs are 3.381 and 3.362% lower in models 1 and 2, respectively. Considering the average IRR for all VC funds in the sample is 14.29% (Table 2), the data indicate that SWF IRRs for venture capital investment are 23.52% lower than average. SWFs also underperform by 1.572% in buyout funds by 2.164% in other funds, and by 2.462 when all funds are considered together.

The data in Table 10 indicate that public pension funds also perform worse on average with their

investment in buyout funds, real asset funds, and in the full sample of all funds together. Similarly, insurance companies perform worse in venture capital and other funds. Endowment funds underperform in buyouts. Counter to Lerner et al. (2008), we do not see any superior performance of endowments. The differential results here are possibly due to different time periods and countries considered; their sample covers 1992–2005 and U.S. only, while our sample covers 1995–2020 and 52 countries. Also, endowments look good against SWFs if SWFs are a benchmark fund that is not controlled for, as in Lerner et al. which we assume they were unable to consider due to not having the data; we can generate specifications where endowments appear to show superior performance if we exclude controls for the underperforming institutional investors.

Interestingly, the data show some evidence of a positive impact of fund size on fund IRRs in for buyouts and all funds together. More consistently, the data indicate that a greater number of limited partners gives rise to higher IRRs across all models, with the sole exception of models 7 and 8. This latter result likely signifies more due diligence prior to investment with more limited partners involved, and better monitoring of performance with more limited partners through their (limited) ability to offer oversight. Limited partners are not actively involved in fund decision making on a day-to-day basis, but contractual provisions do enable limited partners to veto certain decisions and have fund managers seek approval from limited partners on other fund decisions (Cumming & Johan, 2013).

Table 11 presents OLS estimates of TVPI. The results are quite similar to those report in Table 10 for IRR, albeit with differences in the statistical significance and economic magnitudes in some of the specifications. Model 1 shows TVPI is 0.191 lower for SWF investments in venture capital funds, and this effect is statistically significant at the 1% level, consistent with Hypothesis 2. The average TVPI for venture capital funds is 1.81 in the data (see Table 2), so this reduction amounts to 10.62% relative to the average TVPI. Models 3 and 4 show SWFs generate lower TVPIs by approximately 0.08 for buyout funds (which is 4.8% relative to the average TVPI reported in Table 2, and this effect is significant at the 5% level. SWFs likewise underperform for the category of other funds and all funds together in models 7–10.

Endowment funds show superior TVPI performance on average in models 1–4 for venture capital

**Table 10** Performance – OLS regression with IRR as dependent variable

	VC Funds		Buyout Funds		Real Asset Funds		Other Funds		All Funds	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
SWF	–	–	–	–	.073	.08	–	–	–	–
	3.381***	3.362**	1.794***	1.572***			1.986***	2.164***	2.482***	2.462***
	(1.099)	(1.3)	(.526)	(.45)	(.646)	(.62)	(.586)	(.483)	(.418)	(.423)
Corp Pension	1.204*	.512	.712	.732	1.529***	1.294**	–	–	1.251***	1.047***
							1.523**	1.592***		
Public Pension	(.617)	(.682)	(.457)	(.451)	(.493)	(.616)	(.531)	(.546)	(.233)	(.26)
	– 1.696	– 2.29	– 4.54***	–	–	–	–.133	.127	–	–
				4.263***	3.306***	3.031***			3.519***	3.505***
Foundation	(.973)	(1.438)	(.839)	(.955)	(.95)	(.803)	(1.049)	(1.046)	(.618)	(.585)
	.708	–.049	–.334	–.199	.416*	.264	1.39***	.949**	.531***	.458**
	(.466)	(.37)	(.318)	(.296)	(.214)	(.255)	(.405)	(.404)	(.166)	(.193)
Insurance	–	– 1.792*	–.878	–.955	.213	.513*	–.763	–.698	–.447	–.399
	2.315***									
	(.529)	(.942)	(.922)	(.915)	(.374)	(.291)	(.563)	(.528)	(.378)	(.387)
Banking	– 1.788*	– 1.112	–.341	–.451	–.132	.107	–	– 2.726	–.628	–.544
							3.277**			
Endowment	(1.023)	(1.08)	(.951)	(.891)	(1.6)	(1.756)	(1.45)	(1.607)	(.925)	(.903)
	.074	–.289	– 1.19**	–	.306	.4	–	–	–.482	–.552
				1.212**			3.026**	3.276***		
Ln(Fund_Size)	(.757)	(.893)	(.544)	(.564)	(.551)	(.475)	(.955)	(.805)	(.527)	(.529)
	.305	.689	1.683***	1.691***	.284	.162	1.006	1.282**	.76***	.816***
	(.58)	(.62)	(.291)	(.267)	(.357)	(.298)	(.795)	(.564)	(.19)	(.182)
Ln(Number_LP)	2.998***	2.965***	.648***	.707***	.268**	.384***	–.394	–.445	.724***	.78***
	(.316)	(.313)	(.235)	(.255)	(.119)	(.136)	(.488)	(.438)	(.16)	(.15)
Investor_Disclosure		.31		.029		.111		.035		.118
		(.743)		(.185)		(.403)		(.458)		(.208)
Antidirector		.557		.315		–.069		– 1.127		.059
		(.555)		(.26)		(.477)		(.719)		(.28)
Mkt_Development		.117		–.129*		.165		.44*		–.009
		(.401)		(.074)		(.128)		(.242)		(.082)
Country_Openness		4.093		5.622***		8.205**		14.886**		7.166***
		(4.937)		(1.789)		(3.42)		(6.528)		(2.073)
VC Fund									2.187***	2.37***
									(.483)	(.562)
Buyout Fund									3.998***	3.887***
									(.352)	(.39)
Real Asset Fund									–	–
									1.905***	1.939***
									(.416)	(.447)
_cons	– 1.106	–	12.098***	.203	7.478***	– 6.747	15.46***	–.934	7.882***	– 5.108
		14.035								
	(1.51)	(9.052)	(1.371)	(3.874)	(1.249)	(5.805)	(1.783)	(10.695)	(1.23)	(3.425)
Observations	1227	1231	2649	2663	1534	1539	719	728	6154	6167
R <sup>2</sup>	.362	.353	.179	.173	.166	.148	.198	.188	.178	.173
Vintage FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No

This table presents the results of an OLS regression on the funds' performance measured by the fund's internal rate of return. This table includes liquidated and alive funds. IRRs for the alive sample is the value reported at the end of 2021. Columns (1)–(2) present the results of liquidated VC funds sample. Columns (3)–(4) present the results of liquidated buyout funds sample. Columns (5)–(6) present the results of liquidated real asset funds sample. Columns (7)–(8) present the results of other funds sample. Columns (9)–(10) present the results for the full sample. Comparison category in columns (9)–(10) is Other Funds. Country fixed effect is based on the funds' headquarters location. Vintage fixed effect is based on the funds' vintage year. Industry fixed effect is based on the funds' preferred industry. Definitions of all the variables are presented in Appendix 1. Robust standard errors clustered at country level are presented in the parentheses. \*, \*\*, \*\*\* indicate statistical significance at the 10, 5, and 1% level, respectively



**Table 11** Performance – OLS regression with TVPI as dependent variable

	VC Funds		Buyout Funds		Real Asset Funds		Other Funds		All Funds	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
SWF	-.191*** (.061)	-.175* (.091)	-.081** (.038)	-.079** (.036)	.018 (.029)	.022 (.027)	-.092*** (.025)	-.104*** (.019)	-.138*** (.024)	-.136*** (.026)
Corp Pension	.01 (.046)	-.017 (.062)	.036 (.022)	.036 (.022)	.036** (.015)	.033* (.018)	-.056 (.042)	-.062 (.04)	.038*** (.011)	.034*** (.011)
Public Pension	-.011 (.11)	-.042 (.133)	-.101 (.071)	-.098 (.07)	-.076*** (.022)	-.064** (.026)	.028 (.055)	.044 (.062)	-.081*** (.02)	-.08*** (.021)
Foundation	-.048** (.02)	-.072* (.038)	.029* (.015)	.032* (.017)	.037* (.02)	.032* (.018)	.106*** (.011)	.074* (.038)	.03*** (.01)	.027** (.011)
Insurance	-.059 (.047)	-.054 (.047)	-.052** (.024)	-.06** (.023)	.038** (.015)	.04*** (.014)	-.039 (.057)	-.038 (.059)	-.014 (.022)	-.019 (.02)
Banking	-.252*** (.056)	-.233*** (.045)	-.006 (.037)	-.005 (.034)	-.082 (.049)	-.065 (.047)	-.15** (.049)	-.124* (.062)	-.076** (.035)	-.062* (.034)
Endowment	.098*** (.029)	.079* (.039)	.035** (.015)	.031* (.017)	-.008 (.027)	-.002 (.023)	-.168*** (.02)	-.181*** (.022)	.02 (.022)	.015 (.025)
Ln(Fund_Size)	.033 (.028)	.06 (.046)	.043*** (.01)	.04*** (.009)	-.007 (.01)	-.01 (.012)	.094** (.038)	.11*** (.025)	.03*** (.008)	.034*** (.01)
Ln(Number_LP)	.157*** (.013)	.155*** (.015)	.003 (.01)	.011 (.011)	-.004 (.016)	-.002 (.017)	-.051*** (.01)	-.051*** (.013)	.016* (.008)	.019*** (.007)
Investor_Disclosure		.045 (.038)		.015 (.009)		.029*** (.01)		-.022 (.02)		.016 (.01)
Antidirector		.01 (.032)		.014 (.015)		.004 (.014)		-.038 (.023)		.001 (.011)
Mkt_Development		.062*** (.009)		.006 (.003)		.006 (.005)		.017 (.011)		.013*** (.004)
Country_Openness		.344 (.201)		.37*** (.092)		.21* (.119)		.382 (.279)		.356*** (.091)
VC Fund									.308*** (.026)	.304*** (.025)
Buyout Fund									.232*** (.021)	.224*** (.025)
Real Asset Fund									.033* (.018)	.03 (.02)
_cons	.917*** (.109)	-.141 (.238)	1.621*** (.08)	.766*** (.137)	1.373*** (.075)	.745*** (.206)	1.635*** (.029)	1.438*** (.5)	1.289*** (.049)	.554*** (.163)
Observations	1227	1231	2649	2663	1534	1539	719	728	6154	6167
R <sup>2</sup>	.293	.282	.126	.115	.127	.111	.235	.215	.141	.135
Vintage FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No

This table presents the results of an OLS regression on the funds' performance measured by the total value paid-in ratio (TVPI). This table includes liquidated and alive funds. TVPIs for the alive sample is the value reported at the end of 2021. Columns (1)–(2) present the results of liquidated VC funds sample. Columns (3)–(4) present the results of liquidated buyout funds sample. Columns (5)–(6) present the results of liquidated real asset funds sample. Columns (7)–(8) present the results of other funds sample. Columns (9)–(10) present the results for the full sample. Comparison category in columns (9)–(10) is other funds. Country fixed effect is based on the funds' headquarters location. Vintage fixed effect is based on the funds' vintage year. Industry fixed effect is based on the funds' preferred industry. Definitions of all the variables are presented in Appendix 1. Robust standard errors clustered at country level are presented in the parentheses. \*, \*\*, \*\*\* indicate statistical significance at the 10, 5, and 1% level, respectively

and buyout funds, and 7 and 8 for other funds. Corporate pension investments exhibit superior TVPI performance in models 5–6 for real asset funds and 9–10 for all funds together. Foundations show superior TVPI performance for all funds together in models 9–10, but the performance is

mixed with greater than average TVPI for buyouts, real assets, and other funds, and worse performance for venture capital. Banks show lower TVPI performance in venture capital funds other funds, and all funds together.

**Table 12** Performance – Strategic and Savings SWF – OLS regression

	VC Funds		Buyout Funds		Real Asset Funds		Other Funds		All Funds	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel A. Performance measured by IRR										
Strategic SWF	.252	1.01	–	–	–	–	–2.897	–2.615	–1.99**	–
	(3.117)	(3.508)	2.572***	1.948***	5.541**	6.168**	(1.714)	(1.924)	(.89)	(.85)
Savings SWF	–	–	–	–	.738	.813	–	–	–	–
	4.238***	4.601***	1.676***	1.518***	(.795)	(.74)	1.778***	2.06***	2.526***	2.539***
	(.525)	(.577)	(.567)	(.524)	(.795)	(.74)	(.401)	(.298)	(.389)	(.395)
Fund Controls?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Other Inst. Inv?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Type of Funds									Yes	Yes
Control?										
Observations	1227	1231	2649	2663	1534	1539	719	728	6154	6167
R <sup>2</sup>	.363	.354	.179	.173	.167	.15	.199	.188	.178	.173
Vintage FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Panel B. Performance measured by TVPI										
Strategic SWF	–.158	–.046	–.22***	–.183***	–.268**	–.262**	–.236**	–	–.138	–.123
	(.286)	(.362)	(.062)	(.049)	(.106)	(.099)	(.096)	.236**	(.093)	(.096)
Savings SWF	–.198***	–.211***	–.053	–.056	.051	.055	–.059**	–	–.134***	–.134***
	(.023)	(.023)	(.038)	(.04)	(.036)	(.034)	(.02)	.074***	(.015)	(.015)
Fund controls?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Other Inst. Inv?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Type of Funds									Yes	Yes
Control?										
Observations	1227	1231	2649	2663	1534	1539	719	728	6154	6167
R <sup>2</sup>	.293	.283	.127	.116	.13	.114	.236	.215	.141	.135
Vintage FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No

This table presents the results of an OLS regression on the funds' performance measured by the internal rate of return (IRR) and the total value paid-in ratio (TVPI). This table includes liquidated and alive funds. IRR and TVPIs for the alive sample is the value reported at the end of 2021. Columns (1)–(2) present the results of liquidated VC funds sample. Columns (3)–(4) present the results of liquidated Buyout funds sample. Columns (5)–(6) present the results of liquidated real asset funds sample. Columns (7)–(8) present the results of other funds sample. Columns (9)–(10) present the results for the full sample. Comparison category in columns (9)–(10) is other funds. Country fixed effect is based on the funds' headquarters location. Vintage fixed effect is based on the funds' vintage year. Industry fixed effect is based on the funds' preferred industry. Definitions of all the variables are presented in Appendix 1. Robust standard errors clustered at country level are presented in the parentheses. \*, \*\*, \*\*\* indicate statistical significance at the 10, 5, and 1% level, respectively

As in Table 10 for IRRs, Table 11 shows some evidence that fund size (models 1–4, 7–10) and the number of limited partners (models 1–2, 9–10) gives rise to higher TVPIs, and there is some evidence that market development is positively associated with higher TVPIs in models 2 and 10.

Table 12 presents similar evidence as Table 11, albeit with separate variables for strategic and savings SWFs in Table 11. The data indicate that strategic SWFs have lower TVPI than savings SWFs

in models 3–4 for buyout funds and models 5–6 for real asset funds. For example, strategic SWF buyout fund performance is 28% worse than savings SWF buyout fund performance based on TVPI in model 4. In models 1–2 and models 7–8, savings SWFs have significantly lower TVPI, but the coefficients on strategic SWFs are insignificant which likely due to the small number of strategic SWF investments in venture capital (11; see Table 5) and other types (9; see Table 5) as discussed above (text

**Table 13** Mean descriptive statistics – unmatched versus matched sample mean comparisons

	Original sample: Non-SWF funds vs. SWF funds			PS matching sample: Non-SWF funds vs. SWF funds		
	Non-SWF	SWF	Mean differences	Non-SWF	SWF	Mean differences
<b>Panel A. Full Sample</b>						
Ln(Fund_Size)	5.824	6.649	-.826***	6.691	6.649	.042
Ln(Number_LP)	2.09	3.013	-.922***	2.886	3.013	-.127
Years_to_Liquidation	10.269	11.086	-.817***	10.648	11.086	-.438
Disclosure_Index	8.015	8.316	-.301***	8.345	8.316	.03
Antidirector	7.594	7.546	.048	7.596	7.546	.05
Country_Openness	1.586	1.566	.02**	1.559	1.566	-.007
Mkt_Development	1.576	1.514	.062	1.534	1.514	.02
<b>Panel B. VC Funds</b>						
Ln(Fund_Size)	5.152	5.139	.013	5.337	5.139	.198
Ln(Number_LP)	1.99	2.249	-.26*	2.14	2.249	-.11
Years_to_Liquidation	11.94	13.044	-1.104**	11.809	13.044	-1.236*
Disclosure_Index	8.043	7.971	.073	8.133	7.971	.162
Antidirector	7.893	7.971	-.077	7.868	7.971	-.103
Country_Openness	1.614	1.617	-.003	1.599	1.617	-.018
Mkt_Development	1.429	1.375	.053	1.41	1.375	.035
<b>Panel C. Buyout Funds</b>						
Ln(Fund_Size)	6.003	7.248	-1.246***	7.236	7.248	-.012
Ln(Number_LP)	2.288	3.508	-1.22***	3.388	3.508	-.12
Years_to_Liquidation	10.835	11.267	-.432	11.006	11.267	-.261
Disclosure_Index	7.994	8.447	-.454***	8.422	8.447	-.025
Antidirector	7.439	7.317	.122	7.429	7.317	.112
Country_Openness	1.569	1.545	.025*	1.537	1.545	-.007
Mkt_Development	1.611	1.438	.174	1.516	1.438	.079
<b>Panel D. Real Asset Funds</b>						
Ln(Fund_Size)	5.994	6.961	-.967***	6.955	6.961	-.005
Ln(Number_LP)	1.931	2.872	-.941***	2.726	2.872	-.146
Years_to_Liquidation	8.861	9.37	-.509	9.674	9.37	.304
Disclosure_Index	8.144	8.326	-.182	8.457	8.326	.131
Antidirector	7.593	7.543	.05	7.696	7.543	.152
Country_Openness	1.581	1.56	.021	1.555	1.56	-.005
Mkt_Development	1.598	1.827	-.229	1.642	1.827	-.184
<b>Panel E. Other Funds</b>						
Ln(Fund_Size)	5.913	6.37	-.458*	6.418	6.37	.047
Ln(Number_LP)	1.859	2.279	-.419*	2.102	2.279	-.177
Years_to_Liquidation	8.444	8.207	.238	7.483	8.207	-.724
Disclosure_Index	7.845	8.38	-.535*	8.242	8.38	-.138
Antidirector	7.669	7.828	-.159	7.724	7.828	-.104
Country_Openness	1.606	1.574	.033	1.591	1.574	.018
Mkt_Development	1.632	1.768	-.136	1.748	1.768	-.02

This table provides the main mean descriptive statistic across different main characteristics by non-SWF funds vs. SWF funds. The table also provides the two-sample means test results between major characteristics groups in our data. We show the characteristics of the previous unmatched original sample versus the characteristics of a sample obtained based on propensity score matching methods. We use SWF funds to conduct the matching treatment group (funds with SWF as investor) and control group (funds without SWF as investor). We use the estimated propensity scores to conduct the nearest-neighbor matching on exact fund type (VC, buyout, real assets, other) and vintage year. Panel A presents the results for the full sample. Panel B presents the results for the VC funds sample. Panel C presents the results for the Buyout funds sample. Panel D presents the results for the real assets funds sample. Panel E presents the results for Other Funds sample. The means test is a two-sample t test with equal variance. \*, \*\*, \*\*\* denotes significance at the 10, 5, and 1% levels, respectively

accompanying Table 7). In general, the lower TVPI for SWFs is consistent with Hypothesis 2, and the particularly low returns for strategic SWF buyout and real asset fund investments is likewise consistent with Hypothesis 2.

Next, we employ a propensity score method to examine the impact of SWF on fund performance. The matching was done to better compare the performance of funds with similar characteristics and then assess the impact of different types of

**Table 14** Performance analysis based on the matched samples – OLS baseline regressions

Performance measure	Full Sample		VC Funds		Buyout Funds		Real Asset Funds		Other Funds	
	IRR (1)	TVPI (2)	IRR (3)	TVPI (4)	IRR (5)	TVPI (6)	IRR (7)	TVPI (8)	IRR (9)	TVPI (10)
SWF	–	–	–	–	–	–	– 2.718	– .1	– 1.697	– .022
	2.525*** (.423)	.097*** (.018)	4.912** (1.615)	.193** (.058)	1.602*** (.507)	.085* (.048)	(2.52)	(.079)	(1.339)	(.049)
Ln(Number_LP)	2.161*** (.385)	.142*** (.022)	1.019 (1.302)	.066 (.07)	.265 (1.701)	.05 (.111)	1.571 (4.321)	.095 (.119)	1.248** (.35)	.12 (.058)
Ln(Fund_Size)	.642*** (.142)	.037 (.029)	4.108** (1.305)	.207*** (.019)	.625 (.69)	.031 (.072)	1.661 (.929)	.125*** (.012)	.267 (1.305)	– .016 (.067)
Investor_Disclosure	– .992** (.439)	– .065 (.055)	4.457 (3.499)	.046 (.092)	– 1.45*** (.425)	– .08 (.071)	– 1.469 (1.235)	– (.203***)	1.335 (2.216)	– .031 (.11)
Antidirector	.166 (.363)	.009 (.023)	– .552 (1.911)	– .027 (.056)	.303 (.305)	.024 (.028)	.451 (1.724)	.031 (.057)	– 1.367* (.497)	– (.116***)
Mkt_Development	2.231 (3.276)	.088 (.357)	24.236 (19.177)	.505 (.555)	.181 (2.299)	.17 (.455)	9.122 (21.887)	– .82 (.81)	19.679 (11.349)	.604 (.458)
Country_Openness	– .008 (.149)	– .009 (.011)	– 9.666 (11.355)	– .19 (.335)	1.015*** (.123)	.017 (.019)	1.286** (.523)	– .01 (.016)		
VC Fund	– 4.46*** (1.276)	– .049 (.038)								
Buyout Fudd	1.375 (1.48)	.173*** (.028)								
Real Asset Fund	– 3.966* (2.206)	– .145** (.067)								
Other Inst. Inv.?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	607	607	134	134	322	322	90	90	58	58
R <sup>2</sup>	.269	.212	.503	.555	.328	.19	.415	.27	.501	.321
Vintage FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

This table presents the results of an OLS regression on the funds' performance measured by the fund's internal rate of return and TVPI. This table includes only liquidated funds. This table examines the relation of SWF fund and performance based on the matched sample. We use SWF Funds to conduct the matching treatment group (funds with SWF as investor) and control group (funds without SWF as investor). We use the estimated propensity scores to conduct the nearest-neighbor matching on exact fund type (VC, buyout, real assets, other) and vintage year. Details of the pre and post-matched samples are presented in Table 13. Columns (1)–(2) present the results for the full sample Comparison category in columns (1)–(2) is other funds. Columns (3)–(4) present the results of liquidated VC funds sample. Columns (5)–(6) present the results of liquidated buyout funds sample. Columns (7)–(8) present the results of liquidated real asset funds sample. Columns (9)–(10) present the results of other funds sample. All the regressions include vintage and Industry fixed effects. Vintage fixed effect is based on the funds' vintage year. Definitions of all the variables are presented in Appendix 1. Robust standard errors clustered at country level are presented in the parentheses. \*, \*\*, \*\*\* indicate statistical significance at the 10, 5, and 1% level, respectively

institutional ownership. For each treatment sample (liquidated funds with SWF), we construct a propensity-score matched control sample of liquidated funds that have similar likelihoods of having SWF as an investor. Furthermore, to reduce the potential impact of duration on internal rate of return (IRR), we match the treatment group to the control group using the fund's duration. We use the estimated propensity scores to conduct the nearest-neighbor matching on exact fund type (VC, buyout, real assets, other) and vintage year.

In Table 13, we provide the results of a matching procedure. The match resulted in no statistically significant differences between SWFs and non-SWF investments at 5% level. Overall, therefore, we are confident that the matching provides suitable benchmarking to compare the returns for SWFs and non-SWFs.

Table 14 shows the results of OLS regressions on the full matched sample with both IRR and TVPI as the dependent variable. The data indicate that SWFs perform worse in the full sample, and in the subsample of venture capital funds and buyout

funds, for both IRR and TVPI in models 1–6, consistent with Hypothesis 2. The economic significance is such that, for SWFs, IRR is 2.525% lower in the full sample, 4.912% lower in the venture capital subsample, and 1.602% lower in the buyout sub-sample. These numbers represent a reduction of 19.58, 34.41, and 10.83% relative to the average IRR for the full sample, venture capital subsample, and buyout subsample, respectively. Similarly, the economic significance is such that TVPI is 0.097 lower for SWFs in the full sample, 0.193 lower in the venture capital subsample, and 0.085 lower in the buyout subsample. The SWF variable is insignificant in the other models in Table 13. The variables for the number of limited partners and fund size are positively associated with performance, which is consistent with results presented in Table 11.

Table 14 shows OLS estimates of IRRs on matched subsample by type of fund for liquidated funds only. We present five panels to show all funds together (panel A), and then for the subsamples of venture capital funds, buyouts, real assets, and other funds in panels B–E, respectively. We include interaction terms between SWFs and other types of institutional investors as limited partners, to test whether the negative impact of SWFs on performance is mitigated by the presence of other types of institutional investors.

### LIMITATIONS AND FUTURE RESEARCH

Our analyses were based on fund-level data from Pitchbook for the years 1995–2020 spanning 52 countries. Ideally, we would have more detailed information about the nature of each institutional investor, and their board and governance structure. Further, we would be better off if we knew the details in the limited partnership contracts with each of the investments studied here. Those details do not exist in our dataset. Future research could gather this type of information to better understand the issues raised in this paper.

IRR has a well-reported limitation of not satisfying the reinvestment rate assumption, while TVPI has the limitation of not considering the time value of money. Moreover, neither IRR nor the TVPI provides a direct way to estimate how LPs performance compares with investments in public stocks. The literature provides a variety of metrics that do compare public and private returns, such as the public market equivalent (PME). However, such methods require a full performance history for a

fund and its exact timing for cash inflows and outflows. Unfortunately, Pitchbook only offers this information for limited subsets.

Future research could examine in more detail other investment outcomes. For example, it would be useful to know the financial and real outcomes of investee firms, including innovation outcomes, as well as risk (Boubakri et al., 2020a, 2020b), and liquidity (Boubakri et al., 2020a, 2020b). Again, those details are not in our sample beyond what we have reported here, but future work could usefully examine those details possibly with different datasets. Future research could also examine more detailed information pertaining to investment choices, style drift (Dai, 2022; Koenig & Burghof, 2022), and characteristics of fund managers employed across different types of institutional investors (Fuchs et al., 2022).

Another aspect here is the difference between the institutional settings of the SWF country and the target investment country. This is called, among others, the liability of foreignness (Boubakri et al., 2016). A greater gap may imply greater information asymmetry between the SWF and target firms/funds. It may also shape SWF investments toward “easier-to-analyze”, transparent, safer target firms/funds, etc., which may in turn affect investment performance/duration. However, there is insufficient data available for many countries in our sample. This limits the number of observations for foreign SWF and as such the results are inconclusive.

We controlled for several national level institutional variables and considered country fixed effects. However, there are other national level legal, cultural, and political variables that could affect investment decisions and outcomes. We checked many plausible variables from the World Bank’s Doing Business<sup>10</sup> database but did not find anything that caused us to revisit the inferences that we have drawn from the data. We present numerous additional specifications in the Online Appendix, in line with the Chen et al. (2021). Overall, the data remain consistent with our main findings reported here. When SWFs are involved in a private fund, performance is worse. The institutional environment may exacerbate or mitigate the results depending on the specific context, as shown in the Online Appendix. Future research could examine the evolving political landscape and possible institutional shifts with elections and other national changes on various SWF strategies in their alternative investment fund goals and





performance, including but not limited to those referenced herein.

### CONCLUSIONS

This paper presented unique evidence on the horizon and returns to sovereign wealth fund investment in alternative asset funds around the world, between 1995 and 2020. The data indicate that SWFs are longer term investors than their other institutional investor counterparts, including endowments, public and private pension funds, insurance companies, and banks, among other institutional investors. The longer horizon is observed even among the top quartile institutional investors, signifying a unique inference that SWFs pursue a longer horizon for real options associated with political and strategic objectives. The finding is likewise robust to matched samples, including controls for vintage years, investment size, asset classes, industries, and other controls.

The data further indicate that the involvement of SWFs as a limited partner in a fund gives rise to lower investment returns. Prior research has shown superior performance of endowments in venture capital and private equity funds (Lerner et al., 2008); however, that evidence does not consider SWFs as a separate class of institutional investor. When we account for SWFs, we do not find consistent evidence of superior endowment performance in venture capital and private equity funds, and we find that SWFs perform worse than other types of institutional investors. Our evidence contributes to this literature by providing a global analysis of different types of institutional investors into venture capital and private equity investments, and by showing the unique decisions and performance features of SWF investors into venture capital and private equity funds.

The negative performance of SWFs is particularly pronounced for SWF investments in venture capital funds. Relatedly, it is noteworthy that SWF investment in venture capital funds is more likely in countries where there are lower disclosure requirements, consistent with Chen et al. (2022). These findings point to possible strategic reasons for SWF investment in early stage companies whereby political benefits outweigh the financial losses. SWF buyout fund investments are more common and fit with the larger size SWF investment mandates.

It is possible that there are other explanations for the findings reported here. We suggested several additional extensions to these analyses here. Some

of the suggestions included ways of improving our understanding with more detailed data. For example, with information on investee innovation we would better understand the strategic motives of SWFs, and with additional information about each SWF, we could better understand how the structure and governance of SWFs affects their investment performance in alternative investment funds. We hope our first step at these questions inspires more research on topic in the coming years.

### NOTES

<sup>1</sup><https://www.wsj.com/articles/jared-kushners-new-fund-plans-to-invest-saudi-money-in-israel-11651927236>

<sup>2</sup>In this paper, we refer to the class of private equity funds generally as buyout funds..

<sup>3</sup>e.g., see *supra* note 1. More generally, other work shows that state ownership carries with it political objectives that diminish investment efficiency, see, e.g., Boubakri et al., (2005, 2013, 2021) and Cuervo-Cazurra (2018).

<sup>4</sup>Technically, another reason could be simply a lack of skill if SWFs systematically pick worse general partners or themselves are less skilled as limited partners and make inefficient decisions. Herein, we consider this alternative possibility in the data.

<sup>5</sup>Global SWF examines the SWFs' mission statement and investment behavior to classify SWFs into three major categories according to their investment mandate: savings, strategic, and stabilization funds. We do not have any stabilization SWFs commitments in our data. Therefore, we include only savings and strategic SWFs in our analysis (more information can be found at <https://globalswf.com/>).

<sup>6</sup>Commodity SWFs are those established in countries that are rich in natural resources (i.e., oil-related).

<sup>7</sup>Pitchbook reports TVPI for a total of 5634 funds, or 77% of our sample. We use the funds' cashflow to compute the TVPI for the 23% remaining. The correlation of 0.8 between the TVPI reported and our self-constructed TVPI is strong evidence that our method is valid.

<sup>8</sup>Aerospace, agriculture, biotech, chemicals, construction, electronic, energy, financial, hardware, real estate, retail, software, textile & equipment, medical, services, transportation, travel & entertainment, utilities, and wholesale.

<sup>9</sup>It is noteworthy that these numbers do not reflect the entire universe of commitments in the Pitchbook dataset. Using a manually assembled process, we only include funds with reliable performance data.

<sup>10</sup>Doingbusiness.org

## ACKNOWLEDGMENTS

We owe thanks to participants of the 2022 Conference on the Evolving Role of Sovereign Wealth Funds: Issues and Challenges, Sponsored by the Bank of Sharjah, Dubai, UAE and Anis Samet who served as the

discussant. Their helpful comments and insights were greatly appreciated. Additionally, we would like to extend our thanks to the seminar participants at Florida Atlantic University, the Insper Institute of Education and Research in São Paulo, Brazil, and the University of South Carolina Darla Moore School of Business. We would also like to acknowledge the valuable suggestions made by two anonymous referees and the Editors of the Special Issue, Narjess Boubakri, Veljko Fotak, Omrane Guedhami, and Yukihiko Yasuda. Finally, we owe thanks to Florida Atlantic University and the Social Sciences and Humanities Research Council of Canada for financial support.

## REFERENCES

- Bertoni, F., & Lugo, S. 2014. The effect of sovereign wealth funds on the credit risk of their portfolio companies. *Journal of Corporate Finance*, 16: 95–119.
- Bortolotti, B., Fotak, V., & Megginson, W. L. 2015. The sovereign wealth fund discount: Evidence from public equity investments. *The Review of Financial Studies*, 28: 2993–3035.
- Boubaker, S., Boubakri, N., Grira, J., & Guizani, A. 2018. Sovereign wealth funds and equity pricing: Evidence from implied cost of equity of publicly traded targets. *Journal of Corporate Finance*, 53: 202–224.
- Boubakri, N., Chen, R., El Ghoul, S., & Guedhami, O. 2021. State ownership and debt structure. *Review of Corporate Finance*, 1(1–2): 223–257.
- Boubakri, N., Chen, R., El Ghoul, S., Nash, R., & Guedhami, O. 2020a. State Ownership and Stock Liquidity: Evidence from Privatization. *Journal of Corporate Finance*, 65: 101763.
- Boubakri, N., Cosset, J. C., Fischer, K., & Guedhami, O. 2005. Postprivatization corporate governance: The role of ownership structure and investor protection. *Journal of Financial Economics*, 76(2): 369–399.
- Boubakri, N., Cosset, J. C., & Grira, J. 2017. Sovereign wealth funds investment effects on target firms' competitors. *Emerging Markets Review*, 30: 96–112.
- Boubakri, N., Cosset, J. C., & Saffar, W. 2013. The Role of State and Foreign Owners in Corporate Risk-Taking: Evidence from Privatization. *Journal of Financial Economics*, 108(3): 641–658.
- Boubakri, N., El Ghoul, S., Guedhami, O., & Hossain, M. 2020b. Postprivatization State Ownership and Bank Risk-Taking: Cross-Country Evidence. *Journal of Corporate Finance*, 64: 101625.
- Boubakri, N., El Ghoul, S., Wang, H., Guedhami, O., & Kwok, C. C. 2016. Cross-listing and corporate social responsibility. *Journal of Corporate Finance*, 41: 123–138.
- Bruce-Clark, P., & Monk, A. H. B. 2017. Sovereign development funds: The governance and management of strategic investment institutions. In D. J. Cumming, G. Wood, I. Filatotchev, & J. Reinecke (Eds.), *Oxford Handbook of Sovereign Wealth Funds*. Oxford University Press: 63–86.
- Chen, R.R., El Ghoul, S., Guedhami, O., & Liu, F. 2022. The Corporate Governance Consequences of Small Shareholdings: Evidence from Sovereign Wealth Fund Cross-Border Investments. *Corporate Governance: An International Review*, forthcoming.
- Chen, R., El Ghoul, S., Guedhami, O., Kwok, C., & Nash, R. 2021. International Evidence on State Ownership and Trade Credit: Opportunities and Motivations. *Journal of International Business Studies*, 52: 1121–1158.
- Cuervo-Cazurra, A. 2018. Thanks but no thanks: State-owned multinationals from emerging markets and host-country policies. *Journal of International Business Policy*, 1: 128–156.
- Cumming, D.J., & Johan, S.A. 2013. *Venture Capital and Private Equity Contracting: An International Perspective*, 2<sup>nd</sup> Ed., Elsevier Science Academic Press.
- Dai, N. 2022. Empirical Research on Private Equity Funds: A Review of the Past Decade and Future Research Opportunities. *Review of Corporate Finance*, 2(3): 427–450.
- Dwenter, K. L., Han, X., & Malatesta, P. H. 2010. Firm value and sovereign wealth fund investments. *Journal of Financial Economics*, 98: 256–278.
- Fernandes, N. 2014. The impact of sovereign wealth funds on corporate value and performance. *Journal of Applied Corporate Finance*, 26: 157–174.
- Fotak, V., Gao, X., & Megginson, W. L. 2017. A financial force to be reckoned with? In D. J. Cumming, G. Wood, I. Filatotchev, & J. Reinecke (Eds.), *An overview of sovereign wealth funds, in Oxford Handbook of Sovereign Wealth Funds*. Oxford University Press: 16–62.
- Fuchs, F., Füss, R., Jenkinson, T., & Morkoetter, S. 2022. Should Investors Care Where Private Equity Managers Went To School? *Review of Corporate Finance*, 2(3): 451–492.
- Johan, S. A., Knill, A., & Mauck, N. 2013. Determinants of sovereign wealth fund investment in private equity vs public equity. *Journal of International Business Studies*, 44(2): 155–172.
- Johan, S., & Zhang, M. 2021. Information asymmetries in private equity: Reporting frequency, endowments, and governance. *Journal of Business Ethics*, 174: 199–220.
- Koenig, L., & Burghof, H.-P. 2022. The Investment Style Drift Puzzle and Risk-Taking in Venture Capital. *Review of Corporate Finance*, 2(3): 527–585.
- Lerner, J., Schoar, A., & Wang, J. 2008. Secrets of the academy: The drivers of university endowment success. *Journal of Economic Perspectives*, 22(3): 207–222.
- López, D. 2023. SWF 3.0: How sovereign wealth funds navigated COVID-19 and changed forever. *Journal of International Business Policy*. <https://doi.org/10.1057/s42214-023-00147-2>.
- Mayer, C., Schoors, K., & Yafeh, Y. 2005. Sources of funds and investment activities of venture capital funds: evidence from Germany. *Israel, Japan and the United Kingdom, Journal of Corporate Finance*, 11(3): 586–608.
- Megginson, W., You, M., & Han, L. 2013. Determinants of Sovereign Wealth Fund Cross-Border Investments. *The Financial Review*, 48: 539–572.



- McKinsey (2016) *Financing change: How to Mobilize Private Sector Financing for Sustainable Infrastructure*. McKinsey Center for Business and Environment January 2016
- Newey, W. K., & West, K. D. 1987. A Simple, Positive Semi-Definite, Heteroskedasticity and Autocorrelation Consistent Covariance Matrix. *Econometrica*, 55(3): 703–708.
- McCahery, J. A., & de Roode, A. 2017. Co-investments of Sovereign Wealth Funds in Private Equity. In D. J. Cumming, G. Wood, I. Filatotchev, & J. Reinecke (Eds.), *Oxford Handbook of Sovereign Wealth Funds*. Oxford University Press: 247–273.
- Smith, E.E., Smith, J.K., & Smith, R.L. 2022. Bias in the reporting of venture capital performance: The disciplinary role of FOIA, *Review of Corporate Finance 2*, forthcoming.
- Petersen, M. A. 2009. Estimating standard errors in finance panel data sets: comparing approaches. *Review of Financial Studies*, 22: 435–480.
- Wright, M., & Amess, K. 2017. Sovereign wealth funds and private equity. In D. J. Cumming, G. Wood, I. Filatotchev, & J. Reinecke (Eds.), *Oxford Handbook of Sovereign Wealth Funds*. Oxford University Press: 231–246.

### ABOUT THE AUTHORS

**Douglas Cumming**, JD, PhD, CFA, is the DeSantis Distinguished Professor of Finance and Entrepreneurship at the College of Business, Florida Atlantic University, and a Visiting Professor of Finance at Birmingham Business School, University of Birmingham. Douglas has published 21 books

and over 200 articles in leading journals, including 40 in the FT top 50 journals such as the *Academy of Management Journal*, *Journal of International Business Studies*, *Journal of Financial Economics*, *Review of Financial Studies*, and *Journal of Financial and Quantitative Analysis*. Douglas' work has been cited over 25,000 times on Google Scholar. Douglas was listed by Clarivate as one of the top 92 cited scholars in the world in the business and economics category in 2022. Douglas' Country of Birth and citizenship: Canada.

**Pedro Monteiro**, PhD, CFA, is Assistant Professor of Finance in the Department of Finance, Economics and International Business in the Kania School of Management at the University of Scranton, Pennsylvania. Pedro has published and working papers covering different aspects of Finance, including hedge funds, sovereign wealth funds, corporate short-termism, international markets, and entrepreneurial finance. Pedro's Country of Birth and citizenship: Brazil.

**Publisher's Note** Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Springer Nature or its licensor (e.g. a society or other partner) holds exclusive rights to this article under a publishing agreement with the author(s) or other rightsholder(s); author self-archiving of the accepted manuscript version of this article is solely governed by the terms of such publishing agreement and applicable law.

Accepted by Narjess Boubakri, Area Editor, 14 March 2023. This article has been with the authors for one revision.