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# Resource Richness, Absorptive Capacity, and the Ownership of Domestic Sovereign Wealth Funds in the U.S.

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## Abstract

The United States government's recent decision to establish a sovereign wealth fund has boosted interest in these vehicles in the U.S. and beyond, even though several U.S. states have maintained domestic sovereign wealth funds for decades. This study offers the first examination of why some U.S. states currently possess sovereign wealth funds while others do not. In doing so, we find high-income and resource-rich states are more likely than their lower-income and resource-poorer counterparts to currently possess a sovereign wealth fund. Additionally, state spending on K-12 education is negatively related to the likelihood the state currently owns a sovereign wealth fund, perhaps owing to their limited absorptive capacities relative to the scale of their resource revenues.

## Keywords

Domestic Sovereign Wealth Funds, Public Finance, Financial Economics

## 1. Introduction

On February 3, 2025, U.S. President Donald J. Trump signed Executive Order 14196 titled "A Plan for Establishing a United States Sovereign Wealth Fund."[1] The announcement, conducted before a worldwide television and internet audience, sent people around globe scrambling for an explanation of "sovereign wealth fund", as evidenced by Figure 1, which shows Google Trends interest data from January 21, 2025, Trump's inauguration day, through February 20, 2025. As shown in Figure 1, there was very little worldwide interest in the term prior to

[1]See Federal Register's 2025 *Donald J. Trump Executive Orders* (https://www.federalregister.gov/documents/2025/02/10/2025-02477/a-plan-for-establishing-a-united-states-sovereign-wealth-fund).

February 3, 2025. However, with Trump's public announcement, Google Trends interest in the term soared to 97, and by the following day, February 4, 2025, it reached the highest possible Google Trends interest score of 100.[2] Many of the internet searches described above likely led to *Investopedia*, which defines a sovereign wealth fund simply as a state-owned investment fund comprised of money and other assets emanating from a variety of sources and used for a variety of purposes. Contemporaneous news reports added to this definition and surrounding discussion, as *Reuters* reported that tariffs would likely constitute a source of income to the new U.S. sovereign wealth fund and that its assets sheet might also include TikTok [1].

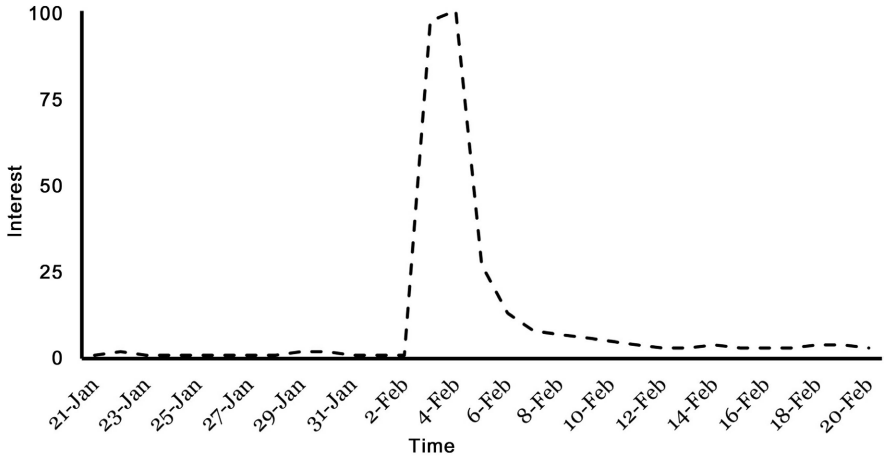


**Figure 1.** Google trends—"Sovereign Wealth Fund".

Unbeknownst to many Americans during this time is that the U.S. is home to more than 20 domestic sovereign wealth funds, with the first being the Texas Permanent School Fund, which was established in 1845 to fund K-12 education in the state and currently boasts a balance of $57.3 billion. This study offers the first examination of why some U.S. states possess sovereign wealth funds while others do not. In doing so we find, consistent with prior research on sovereign wealth funds at the national level, that various demographic and economic variables explain this choice. More specifically, following Carpantier and Vermeulen [2] linear probability and probit regression analyses find that high-income and resource-rich states are more likely than their lower-income and resource-poorer counterparts to currently possess a sovereign wealth fund. Additionally, spending on K-12 education per pupil in a state is negatively related to the likelihood the state owns a sovereign wealth fund, perhaps because states that spend more heavily on education have limited absorptive capacities relative to the scale of their resource revenues. Lastly, public finance innovations, such as the presence of lottery systems, are also negatively related to the probability of observing a sovereign wealth fund as both tend to be used to finance similar public projects.

[2]Even over the next week the interest in the term was four to 27 times what it had been before Trump's announcement.

Before turning to our empirical results and discussion, this study first offers a brief review of the prior academic literature on sovereign wealth funds. The section is followed by another offering a primer on the existing domestic sovereign wealth funds in the U.S. After this, we provide a discussion of our empirical strategy, econometric model and the data used to test our hypotheses. This discussion is followed by another concerning our empirical results, while the paper closes with some concluding thoughts.

## 2. Prior Literature on Sovereign Wealth Funds: A Brief Review

A search of academic literature on either the ownership and structure of sovereign wealth funds or their political activities (and other behavior) and macroeconomic impacts revealed a flurry of activity beginning just after 2005 and running through the mid-2010s, after which study of the topic fell off somewhat. All the research that was found in conducting this study considers national-level sovereign wealth funds, and much of it focused on whether politics and other non-market concerns influenced the management of sovereign wealth funds. For example, an early study by Bahgat [3] points to rising crude oil prices at the turn of the 21st century as the catalyst for interest in sovereign wealth funds across the globe, like those held by the Persian Gulf countries, along with Norway and Russia. Given that their investment portfolios involve western countries, organizations like the International Monetary Fund (IMF) have sought to regulate sovereign wealth funds so that they are free from political interference [3]. Other studies share the IMF's concerns as reported by Bahgat [3]. Bernstein *et al.* [4], for example, focus on the involvement of leading politicians in the management of sovereign wealth funds. They find that sovereign wealth funds with greater involvement of political leaders in fund management are associated with investment strategies that seem to favor short-term economic policy goals in their respective countries at the expense of longer-term maximization of returns [4]. An interesting approach in a more recent study by Carpantier and Vermeulen [2] demonstrates that both domestic economic and political characteristics explain whether a country possesses a sovereign wealth fund. Among other results, the study reports that sovereign wealth funds tend to exist in autocratic countries that lack gainful opportunities for domestic investment [2].[3]

A larger body of academic research conflicts with that discussed above by demonstrating that sovereign wealth funds operate like traditional investors. For example, a follow-up study by Bahgat [5] reports that sovereign wealth fund investments are driven more by commercial interests and less by political objectives, and that too much regulation of sovereign wealth funds' activities is likely to weaken cross-border trade and investment.[4] Similarly, despite assertions that

[3]On the positive side, the study finds that natural resources profits and socially beneficial investment opportunities are positively related to the likelihood of observing a sovereign wealth fund in a country [2].
[4]In their investigation of the influence of political relations on sovereign wealth fund investment choices, Knill *et al.* [6] find that sovereign wealth funds tend to invest in countries to which they are only weakly tied politically.

sovereign wealth funds expropriate minority investors and pursue political activities, Fernandes (2014) finds that they are associated with increases in both corporate market values and operating returns. This occurs, as Fernandes [7] reports, because sovereign wealth funds provide a stable source of financing, a relatively low-cost source of equity capital, and connections that promote investments in new product markets. Based on an analysis of 24 major international sovereign wealth funds, Meng [8] fails to find evidence that sovereign wealth funds act politically but instead exhibit the types of asset allocations and investment strategies that suggest that their objective is the maximization of financial returns. A contemporaneous study by Alhashel [9] allays concerns of political interference by reporting results from a literature review suggesting that the motives guiding the management of $6 trillion in sovereign wealth fund portfolios around the world are market-based, not political. Lastly, more recent research by Megginson and Gao [10] explains that although studies on cross-border sovereign wealth fund investments indicate that sovereign wealth funds differ from institutional investors, there is no evidence that sovereign wealth funds have exerted political pressure on recipient countries through their cross-border deals.

In terms of how sovereign wealth funds tend to behave, Dewenter *et al.* [11] find that sovereign wealth funds are often active investors and that there are significant positive (negative) returns after public announcements of sovereign wealth fund (dis)investments. Similarly, a contemporaneous study by Caner and Grennes [12] reports that, based on the case of the Norway Fund, sovereign wealth funds resemble mutual funds that have accepted a bit more risk over time. They also find that sovereign wealth funds do not appear to disrupt international financial markets any more than mutual funds [12]. More recent work by Boubakri *et al.* [13] employs a large sample of firms targeted by sovereign wealth funds to explore the variations in the propensity of sovereign wealth funds and pension funds to invest in publicly traded firms.[5] Their results suggest that sovereign wealth funds are more likely than pension funds to invest 1) in companies in the financial, natural resources, mining, transportation, telecommunications and utility sectors, otherwise known as strategic sectors of the economy, and 2) in countries with sustainable economic growth [13].[6]

Next, there is a growing body of academic research on the indirect benefits of sovereign wealth funds. In this regard, Affuso *et al.* [16] investigate whether sovereign wealth funds explain the economic growth of a country. To do so, they focus of the emerging economy of Trinidad and Tobago and report that the country's sovereign wealth fund contributed more than $5100 to its real per capita gross domestic product. Moreover, they find that the long-term welfare improvement from the activities of the fund is, in real terms, more than $170,000 per capita

[5]A contemporaneous study by Jen [14] predicts that sovereign wealth funds will continue to diversify into corporate bonds, equities, private equities, real estate and other assets.

[6]Beck and Fidora [15] assert that if sovereign wealth funds act like private investors and concern themselves with market capitalization, their portfolios will sell off major reserve currencies and more capital will flow from high-income to lower-income countries.

[16]. A recent study by Niles and Moore [17] asserts that a sovereign wealth fund can assist in achieving a country's sustainable development goals. More specifically, they explain that investment of the rents earned from natural resources can broaden the scope of sovereign wealth funds in a way that boosts inter-generational wealth and redresses some of the costs of climate change [17].

In terms of prior literature, our study most closely resembles that of Carpantier and Vermeulen [2], which explains why some countries have a sovereign wealth fund and others do not. In doing so, Carpantier and Vermeulen [2] expect that the domestic political and economic facets of a country affect its decision whether to own a sovereign wealth fund. First among these is resource rents, such that resource-rich countries are more likely to possess a sovereign wealth fund than are resource-poor countries [2]. Relatedly, Carpantier and Vermeulen [2] posit that higher-income countries are also more likely to possess a sovereign wealth fund than their lower-income counterparts. Next, the authors posit that the probability of observing a sovereign wealth fund in a country will decrease the higher a government's spending on domestic investments, in particular items such as education and infrastructure [2]. As they explain, a government might choose to forgo domestic investments for long-term growth due to its limited absorptive capacity relative to the scale of the resource revenues. In this situation, the optimal policy would be to own a fund whose investment earnings can be used to increase a country's absorptive capacity [2] [18] [19].

Although other variables considered to impact the probability that a country owns a sovereign wealth fund by Carpantier and Vermeulen [2] are appropriate for a national-level investigation, our model includes substitute variables for state-level or domestic consideration. Before turning to our econometric model, however, we first provide a primer on domestic sovereign wealth funds in the U.S. That section of the paper is followed by an introduction to our econometric model and the data used to test it.

## 3. U.S. Domestic Sovereign Wealth Funds: A Primer

There are currently 22 separate domestic sovereign wealth funds in the U.S. that are owned by 21 separate U.S. states. Each of these is discussed in the sub-sections below, beginning with The Alabama Trust Fund and moving forward alphabetically by state. A major issue with sovereign wealth funds concerns transparency, which Berstein *et al.* [4] argue is critical in allowing for the replication of investment strategies.[7] A relatively early study by Das [20] finds that sovereign wealth funds have independently undertaken efforts to establish best practices, including transparency.[8] Even so, more is known about some of the funds than about others, even in high-income countries like the U.S., as evidenced in the sub-sections below.

[7]Transparency is also critical in supporting academic study of the performance and activities of sovereign wealth funds.

[8]More recent research by Megginson and Gao [10] also points out that sovereign wealth funds are improving their transparency.

### 3.1. The Alabama Trust Fund

Upon discovery, in 1978, of a major offshore natural gas field in Mobile Bay, the state government accepted a bid of $449 million for development rights. Alabama used the proceeds to fund the establishment of the Alabama Heritage Trust Fund (AHTF) in 1982 and income from the fund was used to finance a $520 million bond issue for capital outlays [21]. Two years later, in 1984, the State of Alabama received an additional $347 million for additional leases. The following year the Alabama Trust Fund (ATF) was established and the funds from the AHTF were transferred to the ATF [21]. Today, 99% of the royalties paid to the State of Alabama go to the ATF, with one percent being allocated to conservation and lands. Beginning in 1989, one percent of the ATF's income is allocated to grow the principal until a maximum of 10% is allocated for this purpose each year [21]. According to the Sovereign Wealth Fund Institute, the fund currently has a principal balance of $3.5 billion.

### 3.2. The Alaska Permanent Fund

Founded in 1976, the largest and most recognized sovereign wealth fund in the U.S. is the Alaska Permanent Fund (APF). The APF is divided into a non-spendable principal account that is allocated funds annually to cover inflation and an earnings reserve account that is available for consumption and issuance of annual dividends to Alaska's residents [21]. In 2018, the dividend was $1600, while in 2021 it had risen to $3284.[9] According to the Sovereign Wealth Fund Institute, the fund currently has a principal balance of $82.2 billion.

### 3.3. Colorado Public School Fund Investment Board

The *Land Governance Act of* 1787 granted Colorado four million acres of land that became the foundation for the Colorado Public School Fund Investment Board. Today, 2.8 million acres remain in the fund, whose earnings come from hunting licenses, grazing permits and metallic minerals severance taxes [21]. According to the Sovereign Wealth Fund Institute, the fund currently has a principal balance of $1.7 billion.

### 3.4. Idaho Endowment Fund Investment Board

When Idaho became a state in 1890, it was granted 3.6 million acres of land, 2.4 million acres of which currently belong to the Idaho Endowment Fund Investment Board (IEFIB). Today, the IEFIB also manages the financial assets of the State Insurance Fund, the Idaho Department of Environmental Quality, the Idaho Department of Fish and Game, the Idaho Department of Parks and Recreation, the Idaho Department of Lands and the Credit Enhancement Program, which works to reduce the cost of financing of public school bonds [21].[10] According to the Sovereign Wealth Fund Institute, the fund currently has a principal balance of

[9]For a family of six, the total dividend distribution would, in 2021, amount to almost $20,000 [21].
[10]Public schools are the largest beneficiary of Idaho's Endowment Fund [21].

$3.4 billion.

### 3.5. The Louisiana Education Quality Trust Fund

The Louisiana Education Quality Trust Fund (LEQTF) was established in 1986 by a popular vote of Louisiana residents to improve the quality of education in Louisiana [21]. The LEQTF is funded through the federal *Outer Continental Shelf Lands Act*. Investment earnings are retained as additions to principal and allocated to both pre-K-12 and higher education [21]. According to the Sovereign Wealth Fund Institute, the fund currently has a principal balance of $1.7 billion.

### 3.6. Minnesota Permanent School Fund

The Minnesota Permanent School Fund was created when Minnesota became a state in 1858 [21]. Much of the income earned by the fund comes from taxes on iron mining and timber harvesting activities on the 2.5 million acres of school trust lands. Other revenue generating activities include aggregate mining, peat mining, leasing for mineral exploration, the sale of land, and licensing of utility crossings [21]. As reported by Carroll [21], the fund had a principal balance of $1.5 billion in 2019.

### 3.7. Mississippi Public School Trust Land

The Mississippi Public School Trust Land was formed when Mississippi received statehood in 1817. At that time, the U.S. Congress mandated that land be set aside to fund education in the new state [21]. The Mississippi legislature followed up by leasing the land, in some cases for up to 99 years. The history of these leases, and uses of the funds earned by the trust, is one of mismanagement and graft [21]. As reported by Carroll [21], the trust had a principal balance of about $0.3 billion in 2012.

### 3.8. Montana Coal Severance Tax Trust and Public School Fund

The Montana Coal Severance Tax Trust and Public School Fund was established as a result of a constitutional amendment by the voters in 1976 [21]. The Fund receives one-half of all tax revenue generated by royalties from companies that extract coal and oil from Montana's state lands. The principal value of the trust fund cannot be withdrawn and much of the investment return on the fund's principal is reinvested [21]. The investment income that is not channeled back into the trust fund is disbursed to the general fund of Montana's state budget. As reported by Carroll [21], the fund had a principal balance of $1.2 billion in 2020.

### 3.9. The Nebraska Permanent Fund and Temporary School Trust Fund

The Nebraska Investment Council is responsible for managing the investments of The Nebraska Permanent Fund and Temporary School Trust Fund [21]. The monies from these funds are co-mingled for investments within Nebraska's General

Endowment. As reported by Carroll [21], the funds are thought to have a principal balance of $0.845 billion.

### 3.10. The Nevada Permanent Fund

When Nevada became a state in 1864, it was granted land to fund its public schools. However, the original land grant included desert and mountainous terrain, so the state was allowed to select a more suitable two million acres of land for the fund [21]. Still, corruption and graft have accompanied the fund over the years. As reported by Carroll [21], the fund had a principal balance of $0.371 billion at the end of 2021.

### 3.11. New Mexico State Investment Council

The New Mexico State Investment Council began with the entry of New Mexico as a territory of the U.S. [21]. The initial land grant for the council came from the public lands given to New Mexico in 1893, while additional funds were given to the council in 1912 when New Mexico became a state. The council typically contributes 15% of New Mexico's state budget, saving each taxpayer about $1300 in taxes annually [21]. The council also funds free tuition for the citizens of New Mexico who enroll at state universities, colleges and community colleges. According to the Sovereign Wealth Fund Institute, the fund currently has a principal balance of $59 billion.

### 3.12. The North Dakota Legacy Fund

The North Dakota Legacy Fund was created in 2010 as the result of a successful statewide ballot measure. Based on provisions in the law, 30% of the oil and gas tax collected by North Dakota was to be placed into the fund, while neither the principal nor the interest earnings of the fund could be spent until 2017 [21]. Earnings after 2017 are transferred to North Dakota's general fund, whereas a supermajority vote is necessary for the state to use the fund's principal. In such a case, only 15% of the principal may be used in any fiscal year [21]. According to the Sovereign Wealth Fund Institute, the fund currently has a principal balance of $11.9 billion.

### 3.13. Oklahoma Tobacco Settlement Endowment Trust

The Oklahoma Tobacco Settlement Endowment Trust (TSET) was established in 1998 after a lawsuit was settled with major cigarette manufacturers in the U.S. [21]. Two years later, Oklahoma voters passed a constitutional amendment to create a sovereign wealth fund to deal with the health problems caused by use of tobacco products [21]. According to the Sovereign Wealth Fund Institute, the trust currently has a principal balance of $2.1 billion.

### 3.14. Oregon Common School Fund

The Oregon Common School Fund began with Oregon's statehood in 1859 when

3.4 million acres of land came under the ownership of the state [21]. Owing to mismanagement, the sale of fund lands has left only 750,000 acres. To increase the size of the fund, Oregonians who die with no known heirs have their wealth seized and transferred to the fund [21]. Moreover, unclaimed money received by the state is transferred to the fund until the owner of the funds applies to have them returned. The purpose of the fund is to support Oregon's schools [21]. In 2018, for example, disbursements from the fund came to $100 per Oregon student. As reported by Carroll (2024), the fund had a principal balance of $2.1 billion in 2022.

### 3.15. The South Dakota Permanent Trust Fund

When it became a state in 1889, the federal government awarded South Dakota 3.5 million acres that became known as the Common School Lands [21]. Earlier in its history, the trust fund invested only in bonds and direct loans. Today, the trust fund also invests in public equities [21]. That portion of the earnings of the trust fund exceeding the annual rate of inflation are set aside to fund K-12 and higher education in the state each year. As reported by Carroll [21], the fund has a principal balance of $0.222 billion.

### 3.16. The Texas Permanent School Fund

The Texas Permanent School Fund (TPSF) was created by the Texas legislature in 1954 to finance the state's public school system [21]. The TPSF was initially endowed with $2 million from the U.S. federal government in return for Texas' surrender of its claims to parts of New Mexico, Colorado, and Oklahoma. The fund was boosted by sales of an additional land grant of millions of acres. Investment earnings by the TPSF are distributed to the state's public schools, which, in 2022 for example, amounted to $1.7 billion [21]. According to the Sovereign Wealth Fund Institute, the trust currently has a principal balance of $56.4 billion.

### 3.17. The Texas Permanent University Fund

The Texas Public University Fund (TPUF) was founded in 1876 by the Texas legislature and was originally funded through land grants authorized by the law. The lands generate income from oil, gas, and mineral interests, and grazing. Investment earnings by the TPUF are divided between the Texas A&M University System and the University of Texas System. According to the Sovereign Wealth Fund Institute, the fund currently has a principal balance of $78.9 billion.

### 3.18. The Utah School Fund

The Utah School Fund was established upon Utah's receipt of statehood in 1894 [21]. Investment earnings from the fund are distributed to every school in Utah, utilizing a per-pupil formula. In 2019, for example, this process resulted in Utah schools receiving more than $82 million [21]. According to the Sovereign Wealth Fund Institute, the fund currently has a principal balance of $3.7 billion.

### 3.19. Washington Permanent Funds

The Washington Permanent Funds were established upon Washington's statehood in 1889, when the federal government granted the state more than three million acres of land. Since then, the fund has acquired an additional 620,000 acres of land either through the non-payment of taxes or from the abandonment of forests by loggers [21]. Earnings of the funds are used to fund education, construction of prisons, institutions, and capitol buildings. The principal balance of the funds is co-mingled with other State of Washington trusts, hence the principal balance is not public [21].

### 3.20. The West Virginia Future Fund

The West Virginia Future Fund was created by the state legislature in 2014, with the goal of creating a renewable source of funding for the state [21]. To that end, three percent of revenue derived from the extraction of non-renewable energy such as coal, limestone, natural gas, and oil is added to the fund. The minerals levy is 60%, while that on coal is five percent [21]. As reported by Carroll [21], the fund had a principal balance of about $0.13 billion in 2019.

### 3.21. Wisconsin Board of Commissioners of Public Lands

According to *Governing Wisconsin*, the federal government deeded 10 million acres of land to Wisconsin when it became a state in 1848. Over the state's first 100 years, all but about 78,000 acres of this land were sold, and the proceeds were used to establish two separate education trust funds that are managed by the board. One of these continues to grow through revenues from unclaimed property and civil and criminal fees, fines and forfeitures. The other's growth continues through timber production revenues. The investment income earned by the board is used to fund public school libraries, the University of Wisconsin, and other educational pursuits of Wisconsin's residents. According to the Sovereign Wealth Fund Institute, the fund currently has a principal balance of $1.4 billion.

### 3.22. The Permanent Wyoming Mineral Trust Fund

The Permanent Wyoming Mineral Trust Fund (PWMTF) was preceded in 1969 by a one-percent severance tax on mineral extraction [21]. After political upheaval concerning the tax, a constitutional amendment to establish the PWMTF, whose principal was to be built on a 1.5% extraction tax on coal, petroleum, natural gas and oil shale, was ratified by voters in 1974. Investment earnings, to include returns on public equities, are transferred to the state's general fund each year [21]. According to the Sovereign Wealth Fund Institute, the fund currently has a principal balance of $30.3 billion.

### 3.23. A Summary

The 22 U.S. domestic sovereign wealth funds are each listed in **Table 1**. Also provided there are the current or most recent principal balances. As indicated in the

table, with a principal balance of $82.2 billion, The Alaska Permanent Fund is the largest domestic sovereign wealth fund in the U.S. This fund is followed closely by The Texas Permanent University Fund, which has a principal balance of $78.9 billion. The third largest domestic sovereign wealth fund in the U.S. is the New Mexico State Investment Council, followed by The Texas Permanent School Fund. These funds have principal balances ranging from $56.4 billion to $59 billion. Rounding out the top five is The Permanent Wyoming Mineral Trust Fund, which has a principal balance of $30.3 billion.

**Table 1.** U.S. domestic sovereign wealth funds.

| State | Sovereign Wealth Fund | Principal Balance |
|---|---|---|
| AL | The Alabama Trust Fund | $3.5 billion |
| AK | The Alaska Permanent Fund | $82.2 billion |
| CO | Colorado Public School Fund Investment Board | $1.7 billion |
| ID | Idaho Endowment Fund Investment Board | $3.4 billion |
| LA | The Louisiana Education Quality Trust Fund | $1.7 billion |
| MN | Minnesota Permanent School Fund | $1.5 billion~ |
| MS | Mississippi Public School Trust Land | $0.262 billion# |
| MT | Montana Coal Severance Tax Trust & Public School Fund | $1.2 billion^ |
| NE | The Nebraska Permanent Fund and Temporary School Trust Fund | $0.845 billion |
| NV | The Nevada Permanent Fund | $0.371 billion′ |
| NM | New Mexico State Investment Council | $59 billion |
| ND | The North Dakota Legacy Fund | $11.9 billion |
| OK | Oklahoma Tobacco Settlement Endowment Trust | $2.1 billion |
| OR | Oregon Common School Fund | $2.1 billion* |
| SD | The South Dakota Permanent Trust Fund | $0.222 billion |
| TX | The Texas Permanent School Fund | $56.4 billion |
| TX | The Texas Permanent University Fund | $78.9 billion‡ |
| UT | The Utah School Fund | $3.7 billion |
| WA | Washington Permanent Funds | — |
| WV | The West Virginia Future Fund | $0.127 billion~ |
| WI | Wisconsin Board of Commissioners of Public Lands | $1.4 billion |
| WY | The Permanent Wyoming Mineral Trust Fund | $30.3 billion |

Notes: # = 2012; ′ = 2018; ~ = 2019; ^ = 2020; ‡ = 2021; * = 2022. Sources: Sovereign Wealth Fund Institute and [21].

The rest of the data in Table 1 indicates that, except for The North Dakota Legacy Fund, which has a principal balance of $11.9 billion, the remaining U.S. domestic sovereign wealth funds have principal balances of less than $5 billion. At $0.127 billion in 2019, The West Virginia Future Fund is likely the smallest of the domestic sovereign wealth funds in the U.S.

## 4. Empirical Strategy, Econometric Model and Data

This section of the study is divided into subsections concerning the empirical strategy, econometric model and data used to test hypotheses related to the probability of observing the presence of a sovereign wealth fund in one of the U.S. states. The last subsection below discusses some empirical issues that were confronted in providing the econometric output that is discussed in the next section of the study.

### 4.1. Empirical Strategy

The statistical framework for the possession of a sovereign wealth fund assumes that the tendency of state $i$ to currently possess a sovereign wealth fund is given by a latent variable, $Y^*$. What is observed is whether state $i$ currently owns a sovereign wealth fund, $Y$ [22]. If $Y^* > 1$, the state currently possesses a sovereign wealth fund, and $Y = 1$. If $Y^* \leq 1$, the state does not currently own a sovereign wealth fund, and $Y = 0$. A reduced-form model of the tendency to currently possess a sovereign wealth fund can be written,

$$Y_i^* = X_i\beta + \varepsilon_i, \tag{1}$$

where $X_i$ is a vector of exogenous variables representing demographic and economic pressures affecting current possession of a sovereign wealth fund, $\beta$ is a vector of parameters to be estimated, and $\varepsilon_i$ is a random error term. If $\varepsilon_i$ follows the standard logistic distribution, the probability that a state currently owns a sovereign wealth fund, $P$, is given by the familiar formula [22] [23],

$$P(Y=1) = \frac{\exp(X_i\beta)}{\left[1+\exp(X_i\beta)\right]}. \tag{2}$$

Lastly, the probability that a state does not currently possess a sovereign wealth fund is 1 – $P$. The next subsection of the study presents the econometric model of the process described above.

### 4.2. Econometric Model

The econometric specification used to explain the probability that state $i$ currently owns a sovereign wealth fund is,

$$P(SWF_i=1) = \alpha + \sum_{g=1}^{h}\lambda_g D_{gi} + \beta_1 Land_i + \sum_{j=1}^{k}\delta_j X_{ji} + \beta_2 RK12SpendPP_i + \sum_{v=1}^{w}\gamma_v PFI_{vi} + \varepsilon_i, \tag{3}$$

where $SWF_i$ is a dummy variable equal to 1 if state $i$ currently owns a sovereign wealth fund and 0 otherwise. Also included in (3) are $D_{gi}$, which is a set of $h$ variables capturing the current demography, $g$, of each state $i$, $Land_i$, which is the size of each state, $i$, in square miles, $X_{ji}$, which is a set of $k$ variables capturing extraction activities, $j$, in each state $i$, $RK12SpendPP_i$, which is the current real value of state $i$'s spending on K-12 education per pupil each year (thousands $), $PFI_{vi}$, which is a set of $w$ variables capturing public finance innovations, $v$, in each state $i$, and a

stochastic error term, $\varepsilon_i$.

As Carpantier and Vermeulen [2] explain, having economic means is a precondition to the ability to save. Thus, resource-rich countries are more likely to possess sovereign wealth funds than resource-poor countries [2]. The same holds for domestic sovereign wealth funds. As such, (3) includes $X_{ji}$, which contains both $RMinProd_i$ and $OilProd_i$. These variables capture the current real value of mineral production (extraction) in state $i$ each year and the annual number of barrels of oil currently produced (extracted) in state $i$, respectively. Additionally, one of the variables in $D_{gi}$, or $RPCPI_i$, measures current real per capita personal income in each state. Consistent with Carpantier and Vermeulen [2], each of these is expected to be positively related to the probability that state $i$ currently possesses a sovereign wealth fund, *ceteris paribus*.

The other variable included in $D_{gi}$ is $Pop_i$, or the current population of state $i$. Many of the states where land is used for grazing and governments capture some of the returns to grazing rights have sparse populations. Thus, it may be expected that the estimate of $\beta_1$ will be negatively signed. That is also the case for the estimate of $\beta_2$, which is attached to $RK12SpendPP_i$, based on the assertion in Carpantier and Vermeulen [2] that the probability of currently observing a sovereign wealth fund in a state decreases the higher a government's current spending on domestic investments like education. As they add, a government might choose to forgo educational investments due to its limited absorptive capacity relative to the scale of the resource revenues and instead possess a fund whose investment earnings can be used to increase a country's absorptive capacity [2] [18] [19].

Lastly, the variables included in $PFI_{vi}$ are $Lottery_i$ and $NoIncTax_i$. The latter is a dummy variable equal to 1 if state $i$ does not currently employ an income tax, and 0 otherwise. According to Carroll [21], given that the investment income from sovereign wealth funds is generally used to support public education in a state, the presence of sovereign wealth funds partially explains why states can afford to have low state income taxes, or no state income tax at all. This explanation suggests that the parameter estimate attached to $NoIncTax_i$ will be positively signed. A similar argument can be made about the first variable listed above, $Lottery_i$, which is a dummy variable equal to 1 if state $i$ currently employs a lottery for public finance, and 0 otherwise. State lotteries are often used to finance public education (e.g., Georgia's HOPE scholarship program). As such, the current presence of a lottery system reduces the tendency for a state to currently possess a sovereign wealth fund, *ceteris paribus*. This argument suggests that there is a negative relationship between the probability state $i$ currently owns a sovereign wealth fund and the current presence of a lottery in that state.

### 4.3. Data

The dependent variable, $SWF_i$, is coded using data from Carroll [2] and the Sovereign Wealth Fund Institute. On the righthand side of (3), the data used for $RMinProd_i$ and $OilProd_i$ are collected from the U.S. Geological Survey (USGS)

and U.S. Energy Information Administration (USEIA), respectively. The former is measured in billions-$, while the latter is measured in barrels-1000. Next, data for the demographic variables, $RPCPI_i$ and $Pop_i$, are taken from the Federal Reserve Bank of St. Louis (FRED) and the U.S. Census Bureau. Data for $Land_i$, which is measured in square miles, come from State Symbols USA, while those used to measure $RK12SpendPP_i$ are collected from the Education Data Initiative. Lastly, the data used to measure the public finance innovations variables—$Lottery_i$ and $NoIncTax_i$, are taken from GamblingSites.com and the Tax Foundation, respectively.

### 4.4. Estimation Issues

We note before getting to the next section of the study that our attempt to apply logit regression to (3) as explained above encountered the problem of quasi-complete separation, which occurs on occasion when the outcome variable separates a regressor or a combination of regressors quasi-completely [24].[11] Earlier research on this issue, which includes Oskanen [26], Anderson [27] and Caudill [28] [29], indicates that an entire class of dichotomous choice models, including but not limited to logit, may encounter estimation difficulty in the presence complete and quasi-complete separation. These studies go further by describing how the linear probability model (LPM) can rescue empirical research that has encountered separation issues. Subsequent research has offered another alternative. Also, as explained in Caudill *et al.* [24], the bias-reduced logit estimation procedure based on Firth [30] [31], Heinze and Schemper [32], and Heinze [33] often provides a straightforward alternative to traditional logit in the present of complete and quasi-complete separation. Our case is an exception, however, as its use failed to adequately solve the separation issue. Thus, our empirical work below relies on the merits of LPM, particularly given that robust standard errors can be obtained [34]. For additional prudence, these results are supplemented by estimates from a probit regression, which were possible to obtain.

## 5. Summary Statistics and Econometric Results

Variable names and descriptions, and summary statistics are reported in **Table 2**. As indicated there, 21 states, or 42% of all states, currently own a sovereign wealth fund. The mean state size is 70,725 square miles and the mean state population is about 6.8 million. The mean of real mineral production is almost $2 billion, while the typical state currently produces about 228,000 barrels of oil each year. The average value of current real annual per capital personal income exceeds $72,000, while the typical state currently spends about $17,600 per K-12 pupil and $11,160 per full-time college or university student. Lastly, 88% of states currently have a lottery system, and 18% of states do not currently employ income taxes.

[11]As Albert and Anderson [25] describe the problem, there is a vector α that correctly allocates most observations to their group.

**Table 2.** Variable descriptions and summary statistics.

| Variable | Description | Mean | Std Dev |
|---|---|---|---|
| $SWF_i$ | Dummy variable equal to 1 if state $i$ currently has a sovereign wealth fund, and 0 otherwise | 0.420 | 0.499 |
| $RPCPI_i$ | Current real annual per capita personal income of citizens of state $i$ | $72,381 | $7209 |
| $Pop_i$ | Current population of state $i$ | 6,788,175 | 7,630,883 |
| $Land_i$ | Size of state $i$ (square miles) | 70,725 | 85,387 |
| $RMinProd_i$ | Current real value of minerals production in state $i$ per year (billions $) | $1.979 | $2.252 |
| $OilProd_i$ | Current oil production in state $i$ per year (thousands of barrels) | 228.42 | 857.08 |
| $RK12SpendPP_i$ | Current real value of state $i$'s spending on K-12 education per pupil each year (thousands $) | $17.664 | $4.196 |
| $Lottery_i$ | Dummy variable equal to 1 if state $i$ currently has a lottery, and 0 otherwise | 0.880 | 0.328 |
| $NoIncTax_i$ | Dummy variable equal to 1 if state $i$ does not currently have an income tax, and 0 otherwise | 0.180 | 0.388 |

Pearson correlation coefficients for the covariates included in (3) are reported in Table 3. Real per capita personal income, $RPCPI_i$, is strongly correlated with real per pupil spending on K-12 education, $RK12SpendPP_i$, as expected. State population, $Pop_i$, and the real value of mineral production, $RMinProd_i$, are moderately correlated, as are real oil production, $OilProd_i$, and three variables—state size, $Land_i$, state population, $Pop_i$, and the real value of mineral production, $RMinProd_i$. Other coefficients suggest that high-income states are moderately more likely to have lotteries and not have income taxes than their lower-income counterparts. These and a few other relationships detected in Table 3 suggest that our empirical estimates will exhibit some degree of multicollinearity, and, as such, we will provide several alternative specifications of our base model to explore where some significant statistical relationships are perhaps being hidden by multicollinearity.

**Table 3.** Correlation coefficients.

| | $RPCPI_i$ | $Pop_i$ | $Land_i$ | $RMinProd_i$ | $OilProd_i$ | $RK12SpendPP_i$ | $Lottery_i$ |
|---|---|---|---|---|---|---|---|
| $Pop_i$ | −0.010 | | | | | | |
| $Land_i$ | 0.028 | 0.148 | | | | | |
| $RMinProd_i$ | −0.127 | 0.404 | 0.500 | | | | |
| $OilProd_i$ | −0.040 | 0.390 | 0.400 | 0.365 | | | |
| $RK12SpendPP_i$ | 0.515 | −0.051 | −0.088 | −0.389 | −0.098 | | |
| $Lottery_i$ | 0.285 | 0.193 | −0.320 | −0.222 | 0.054 | 0.206 | |
| $NoIncTax_i$ | 0.263 | −0.083 | 0.288 | 0.201 | −0.072 | −0.142 | −0.308 |

Results from LPM and probit estimation of (3) are provided in Table 4. As indicated there, all of the models are jointly significant, while the values for $R^2$ and

Estrella $R^2$ [35] are all quite encouraging. The first set of results in each case provides estimates for what we refer to as a Carpantier-Vermeulen specification as they include information on a state's per capita income, resource richness and real education funding. The LPM output shows, as expected, that real per capita personal income is positively and significantly (at the 0.094 level) related to the probability that a state currently possesses a sovereign wealth fund [2]. According to the point estimate, a $1000 increase in *RPCPI* is associated with a 1.6 percentage point increase in $P(SWF = 1)$.[12] Next, oil production is also positively and significantly (at the 0.055 level) related to the probability that a state currently owns a sovereign wealth fund. In this case, a boost in oil production of 100,000 barrels per year leads to a 1.1 percentage point increase in the probability that a state currently owns a sovereign wealth fund. Similarly, *Land* is positively and significantly (at the 0.001 level) related to the likelihood that a state currently possesses a sovereign wealth fund, where an additional 1000 square miles of space adds 2.4 percentage points to that likelihood. Lastly, both real K-12 education spending per pupil and real mineral production are negatively related to the probability that a state currently owns a sovereign wealth fund.[13] The former achieves statistical significance at the 0.000 level and the point estimate indicates that an additional $1000 in educational support reduces the probability by five percentage points.[14]

Probit estimation of the Carpantier-Vermeulen [2] specification is not as promising. Although the estimates are appropriately signed, except that attached to *RMinProd*, the significance levels are not as encouraging. The size of a state (*i.e.*, *Land*) and real K-12 educational spending per pupil are positively related to the probability that a state currently possesses a sovereign wealth fund, with both results being consistent with Carpantier and Vermeulen [2]. In this case, *Land* is significant at the 0.018 level, while *RK*12*SpendPP* is significant at only the 0.182 level.[15] Across the second through fourth sets of probit results, state population is negatively and significantly associated with the probability that a state currently owns a sovereign wealth fund, while the size of a state (square miles) is positively and significantly related to that probability. Oil production and education spending are generally signed as expected [2], however aside from the most parsimonious specification neither is statistically significant. Lastly, the positively signed estimate attached to *NoIncTax* supports the assertion in Carroll [20], while the negatively signed estimate attached to *Lottery* is consistent with arguments made above about lottery support for education. However, the former is at best signifi-

[12]The *i* subscripts are omitted from the variable names from here on for convenience.

[13]We note that there is potential reverse causality regarding K-12 spending, given that many sovereign wealth funds explicitly mandate distributing investment returns to public education, thereby increasing per-pupil spending.

[14]Note that each of the changes in regressors (e.g., the $1000 increase in *RPCPI*) assumed here amount to only 1.2% to 23.8% of one standard deviation of the relevant regressors.

[15]This and other results like it are reported, following Leamer [36] and Kennedy [37], recognizing that genuinely interesting hypotheses are neighborhoods, not points. This level of recognition would be more common if, following Leamer [38] and Attfield [39], researchers more commonly adjusted significance levels upward (downward) as the sample size decreases (increases).

cant at only the 0.197 level, while the latter reaches the 0.122 level of significance.[16]

**Table 4.** LPM and probit results.

| | LPM Results | | | | | Probit Results | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Variable | (1) | (2) | (3) | (4) | (5) | (1) | (2) | (3) | (4) | (5) |
| cons | 0.067<br>(0.10) | 0.060<br>(0.10) | −0.065<br>(−0.11) | 0.052<br>(0.09) | −0.092<br>(−0.14) | −0.240<br>[0.01] | 1.580<br>[0.14] | −1.193<br>[0.14] | 0.416<br>[0.02] | −0.499<br>[0.05] |
| *RCPCI* | 0.2e−4†<br>(1.71) | 0.2e−4‡<br>(2.05) | 0.2e−4†<br>(1.88) | 0.2e−4†<br>(1.94) | 0.2e−4<br>(1.65) | 0.00<br>[0.15] | −0.00<br>[0.08] | 0.00<br>[0.08] | 0.00<br>[1.04] | 0.00<br>[0.77] |
| *Pop* | | −0.00*<br>(−4.14) | −0.00*<br>(−2.84) | −0.00*<br>(−4.13) | | | −0.00‡<br>[5.13] | −0.00‡<br>[5.19] | −0.00‡<br>[4.69] | |
| *Land* | 0.2e−5*<br>(3.46) | 0.2e−5†<br>(1.78) | 0.2e−5‡<br>(2.16) | | | 0.00‡<br>[5.61] | 0.00‡<br>[6.05] | 0.00*<br>[10.5] | | |
| *RMinProd* | −0.057<br>(−1.48) | −0.027<br>(−0.87) | | | | −0.276‡<br>[3.95] | −0.294<br>[2.11] | | | |
| *OilProd* | 0.1e−3†<br>(1.97) | 0.2e−3*<br>(4.54) | | 0.3e−3*<br>(6.36) | 0.2e−3‡<br>(2.55) | 0.001<br>[0.66] | 0.005<br>[0.51] | | 0.012<br>[1.87] | 0.005‡<br>[3.99] |
| *RK*12*SpendPP* | −0.050*<br>(−4.19) | −0.044*<br>(−3.17) | −0.043*<br>(−2.92) | −0.039*<br>(−2.79) | −0.042*<br>(−3.13) | −0.126<br>[1.78] | −0.015<br>[0.01] | 0.003<br>[0.00] | −0.181†<br>[3.11] | −0.131†<br>[3.54] |
| *Lottery* | | −0.326<br>(−1.53) | −0.251<br>(−1.20) | −0.413‡<br>(−2.06) | | | −1.319<br>[1.66] | −1.520<br>[2.39] | −1.051<br>[1.41] | |
| *NoIncTax* | | −0.026<br>(−0.15) | −0.098<br>(−0.56) | 0.031<br>(0.17) | | | 0.912<br>[0.77] | 0.644<br>[0.50] | 0.468<br>[0.39] | |
| *F*-statistic | 3.75* | 4.16* | 4.05* | 4.89* | 3.35‡ | | | | | |
| Model $\chi^2$ | | | | | | 24.6* | 42.7* | 37.2* | 32.1* | 17.1* |
| $R^2$ | 0.299 | 0.448 | 0.361 | 0.406 | 0.179 | | | | | |
| Estrella $R^2$ | | | | | | 0.457 | 0.740 | 0.659 | 0.581 | 0.325 |

*Notes*: The numbers in parentheses are, following White [34], robust *t*-values; the numbers in brackets are $\chi^2$ statistics. *(‡)[†] denotes the 0.01 (0.05) [0.10] level of significance.

The second through fourth set of LPM results in Table 4 are generally stronger than their probit counterparts. For example, *RPCPI* is negatively signed and significant in each case, as are *Pop* and *RK*12*SpendPP*. The first of these results is consistent with Carpantier and Vermeulen [2], while the last is consistent with van der Ploeg [18], van der Ploeg and Venables [19] and Carpantier and Vermeulen [2]. Interestingly, states with lottery systems are 25.1 to 41.3 percentage points less likely to currently own a sovereign wealth fund. Although the lower bound estimate of this range is significant at only the 0.237 level, the upper bound estimate achieves the 0.045 level of significance.[17] The results for *NoIncTax* are mixed, and unlike their probit counterparts do not support the assertions in Car-

[16]The marginal effect associated with *Lottery* ranges from −0.180 to −0.256, while that associated with *NoIncTax* ranges from 0.094 to 0.125.

[17]The intermediate estimate of 32.6 percentage points reaches the 0.134 level of significance.

roll [21]. The final sets of results in Table 4 come from a version of the Carpantier-Vermeulen [2] specification that omits *Land* and *RMinProd*. The LPM results are generally consistent with those from the unrestricted Carpantier-Vermeulen [2] specification. The probit results in this case are much more promising than their unrestricted counterparts. Here, the estimates attached to *RPCPI*, *OilProd* and *RK*12*SpendPP* are appropriately signed, while the latter two are significant at the 0.046 and 0.060 levels, respectively. These results support the contentions in van der Ploeg [18], van der Ploeg and Venables [19] and Carpantier and Vermeulen [2].

Neter *et al.* [40] describe a case like that explored in this study wherein Bayesian analysis offers a maximum likelihood approach with some of the traditional properties of the LPM. The case described in Neter *et al.* [40] involves survival time of patients after a medical treatment, with survival time measured with discrete count data. Recalling that Texas currently maintains two sovereign wealth funds, an alteration of $SWF_i$ in (3) to $NSWF_i$, which captures the *number* of sovereign wealth funds currently owned by state $i$ (*i.e.*, a discrete count), allows us to employ Neter *et al.*'s [40] count data approach. Results from that approach for the first four of the five probit specifications tested in Table 4 are presented in Table 5.

Table 5. Bayesian analysis—maximum likelihood results.

| Variable | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| cons | 0.045<br>[0.01] | 0.043<br>[0.01] | −0.100<br>[0.02] | 0.306<br>[0.27] |
| *RPCPI* | 0.00†<br>[2.73] | 0.00†<br>[4.20] | 0.00†<br>[2.90] | 0.00<br>[0.60] |
| *Pop* | | −0.00‡<br>[6.48] | −0.00<br>[1.82] | −0.00*<br>[6.83] |
| *Land* | 0.00*<br>[7.34] | 0.00†<br>[3.10] | 0.00*<br>[10.9] | |
| *RMinProd* | −0.049<br>[2.14] | −0.022<br>[0.45] | | |
| *OilProd* | 0.3e−3*<br>[11.92] | 0.4e−3*<br>[23.0] | | 0.4e−3*<br>[32.9] |
| *RK*12*SpendPP* | −0.048*<br>[7.60] | −0.043*<br>[6.82] | −0.046*<br>[6.12] | |
| *Lottery* | | −0.338†<br>[2.98] | −0.228<br>[0.95] | −0.389†<br>[3.76] |
| *NoIncTax* | | −0.019<br>[0.01] | −0.142<br>[0.52] | 0.172<br>[1.07] |
| pseudo $R^2$ | 0.349 | 0.746 | 0.624 | 0.454 |

*Notes:* The numbers in brackets are $\chi^2$ statistics. *(‡)[†] denotes the 0.01 (0.05) [0.10] level of significance.

In three of four specifications presented in Table 5, the estimate attached to

*RPCPI* is positively signed and statistically significant at the 0.098 level or better, with two of these three estimates achieving the 0.089 level of significance. Similarly, *Land* and *OilProd* are both positively signed and statistically significant in the three specifications wherein they are included, suggesting that larger states (square miles) and oil producing states tend to currently possess more sovereign wealth funds than their smaller, less oil-intensive counterparts. These results support the resource-rich hypothesis related to sovereign wealth fund ownership that is tested by Carpantier and Vermeulen [2]. Next, the absorptive capacity argument related to public support of K-12 education explained by van der Ploeg [18], van der Ploeg and Venables [19] and Carpantier and Vermeulen [2] is supported by the negatively signed and significant estimate attached to *RK*12*SpendPP* across all three specifications in **Table 5**. The negatively signed estimate attached to *Pop* suggests that sovereign wealth funds occur more often in sparsely populated states, while the results concerning *Lottery* indicate that states with lottery systems currently have fewer sovereign wealth funds than those that do not. Taken as a whole, these results are consistent with those from the LPM and probit regressions and generally support prior research by Carpantier and Vermeulen [2] and others.

## 6. Concluding Comments

As noted by *Investopedia*, a sovereign wealth fund is a state-owned investment fund comprised of money and other assets emanating from a variety of sources and used for a variety of purposes. By "state-owned", the internet investment dictionary is referring to central governments of the many nations, recently including the United States, that own sovereign wealth funds. In our case, however, the term is a reminder that the governments of many U.S. have for decades owned sovereign wealth funds. This study above is the first examination of why some U.S. states own sovereign wealth funds while others do not. According to our econometric models, the reasons relate to real per capita income, resource richness and the absorptive capacity of state governments. More specifically, we find that high-income and resource-rich states are more likely than their lower-income and resource-poorer counterparts to possess a sovereign wealth fund, while a state's spending on K-12 education is negatively related to the likelihood the state owns a sovereign wealth fund, perhaps because states that spend more heavily on education have limited absorptive capacities relative to the scale of their resource revenues. Other results suggest that sparsely populated states are most likely to own a sovereign wealth fund, *ceteris paribus*, while the presence of sovereign wealth funds is less likely in states with lottery systems, perhaps because these two mechanisms are often employed to finance similar government activities.

After converting the dichotomous choice dependent variable to a discrete count, in recognition that Texas owns multiple sovereign wealth funds, additional regression estimates suggest that the same factors explaining the presence/absence of sovereign wealth funds also explain the number of sovereign wealth funds across the U.S. states. Not only do these additional tests support the other empirical re-

sults and prior research on sovereign wealth funds at the national level, they also provide an idea regarding future research on this topic. That is, given that states established sovereign wealth funds at different times, future research might examine the diffusion of sovereign wealth funds across the U.S. states. This could be done by utilizing a Tobit regression approach that employs data from the different years that sovereign wealth funds were established across the U.S.

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## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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