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Permanent Trust Funds: Funding Economic Change with Fracking Revenues

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The recent boom and bust of unconventional oil and gas development, or "fracking," has reopened serious questions about resource management in many U.S. states. While the oil and gas boom generated revenue, jobs, and economic development, the recent bust has adversely impacted state budgets due to declining industry investments in exploration and production and job cuts.

The boom-bust cycle of unconventional oil and gas development highlights the need for strategic management by state governments of fracking-related revenues, not only to minimize the less desirable aspects of the boom-bust cycle but also to enhance long-term prosperity. States can address these challenges by imposing a reasonable severance (extraction) tax on their oil and gas industry and channeling a portion of the revenue into permanent trust funds. In doing so, states can convert volatile near-term revenues from unconventional oil and gas development into a longer-term and continuous source of investment funds for building sustainable and dynamic economies.

To that end, this report advances five elements of good fund governance and management that states should consider in the design and implementation of permanent trust funds:

- Establish an effective governance framework
- Define the fund's revenue source, deposit, and withdrawal rules
- Design the investment strategy
- Seize the opportunity to invest fund earnings to economic transformation
- Formulate explicit disclosure and transparency standards

Introduction

The application of high-tech horizontal drilling and hydraulic fracturing, or "fracking," technologies to previously inaccessible shale formations from Pennsylvania to North Dakota and Texas has given numerous states and local communities the opportunity to begin building lasting prosperity—a cleaner, more advanced economy that works for all.

Over the last decade, the new technologies have fueled oil and gas booms in new places, increased local incomes and job growth, and created the opportunity to generate significant revenues for public purposes.

To capture the opportunity, advocates in several fracking states have suggested applying or increasing severance taxes (levied on resource extraction) on new oil and gas extraction and managing the revenues for long-term use through the creation of permanent trust funds.[1] Such strategies comport well with the emerging principles of inclusive economic development.[2]

Unfortunately, the ongoing bust in energy prices, thanks in part to a glut of U.S. production, has ended the shale boom before most states could or would act. Numerous states and localities are now watching the familiar commodity price cycle take back recent gains—with substantial budgetary implications.

Shale oil and gas producers are ratcheting back drilling in Pennsylvania and Texas.[3] Layoffs are accelerating in North Dakota and Wyoming.[4] And in several states such as Alaska and Louisiana, plummeting revenues are forcing governments to cut spending or dip into reserves.[5]

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1. Contrary to perception that imposing or increasing severance taxes in the current bust period would hurt the oil and gas industry, a growing body of research shows that increasing severance taxes do not impact the industry in a meaningful way due to a variety of reasons. See, for example, Shelby Gerking and others, "Mineral Tax Incentives, Mineral Production and the Wyoming Economy" (2000) available at http://eadiv.state.wy.us/mtim/StateReport.pdf; and Mark Haggerty, "Do Tax Subsidies Influence Domestic Oil Production?" (Boise: Headwater Economics, 2012).
2. Amy Liu has suggested that the goal of state or regional economic development should be to achieve "deep prosperity—growth that is robust, shared, and ensuring." See Amy Liu, "Remaking Economic Development: The Markets and Civics of Continuous Growth and Prosperity" (Washington: Brookings Institution, 2016).
3. See Erin Ailworth, "Shale Sector Starts to Cut Production," Wall Street Journal, March 1, 2016, p. B1.
4. See, for example, Debbie Carlson, "North Dakota's Oil-Heavy Economy is Hanging on, But for How Long?" The Guardian, December 27, 2015.
5. See, for example, Chico Harlan, "Oil Prices Plunge Louisiana Even Deeper Into Red," Washington Post, March 5, 2016, p. A1; and Jeff Daniels, "Falling Oil Prices Put the Squeeze on State Budgets," CNBC, January 22, 2016.

All of which raises anew the question of how states should manage the boom and bust cycle associated with oil and gas development. More specifically, the current bust brings to the fore the opportunity for states that lack severance taxes to impose them and, once enacted, to channel future oil and gas revenue into permanent trust funds—public investment funds, often funded through non-renewable resource revenues, that invest tax or fee revenues in the capital markets to produce a steady flow of income long into the future.[6]

Permanent trust funds—including those in nations like Norway, Chile, Kuwait, Israel, and U.S. states like Alaska, North Dakota, and Texas, among others—have a long history, with the funds generating new sources of capital that have helped smooth out the volatility of commodity price cycles and invested the returns for longer-term economic development. Moreover, numerous U.S. states already have some form of severance tax that can be utilized to capitalize such funds.

States as diverse as Pennsylvania, Ohio, North Dakota, and Alaska could establish or improve on fees and funds whose wise management will not only cushion their economies from the volatility of future booms and busts but help finance the investments needed to catalyze economic diversification, promote economic inclusion, and accelerate decarbonization of the economy to reduce climate change.

In view of this potential, this paper seeks to provide a better understanding of the role that severance taxes coupled with permanent trust funds can play in sustaining long-term economic growth and shared prosperity in the face of resource-based boom-bust cycles. Specifically, it offers guidelines on design and management to inform the creation of new, and the improvement of existing, state-controlled trust funds.

The paper begins by laying out in the next section some of the challenges posed by the boom and bust dynamic of unconventional oil and gas development, especially its impact on state economies.[7] In the following section, it defines permanent trust funds and

6. This paper uses the term “permanent trust funds” as they have historically been known for U.S. states. The term “sovereign wealth funds” is used to refer to investment funds operating at the national level.

7. Unconventional oil and gas includes tight oil and tight gas which are found in rock formations such as siltstone, sandstone, limestone, and dolostone; shale gas which is natural gas found in shale; and coalbed methane which is natural gas found in coalbeds. The growth in U.S. oil and natural gas production has been mainly driven by tight oil and shale gas.

distinguishes the types of funds operating in the United States before outlining five key guiding principles for states interested in creating these funds or making adjustments to their existing funds. A final section concludes.

Challenges posed by boom-bust dynamic of unconventional oil and gas development

The current bust of the unconventional oil and gas revolution has been a brutal reminder of the volatility of resource driven economic cycles.[8] Plunging oil prices and a massive U.S. oil and gas glut have triggered economic downturns in multiple fracking states.[9]

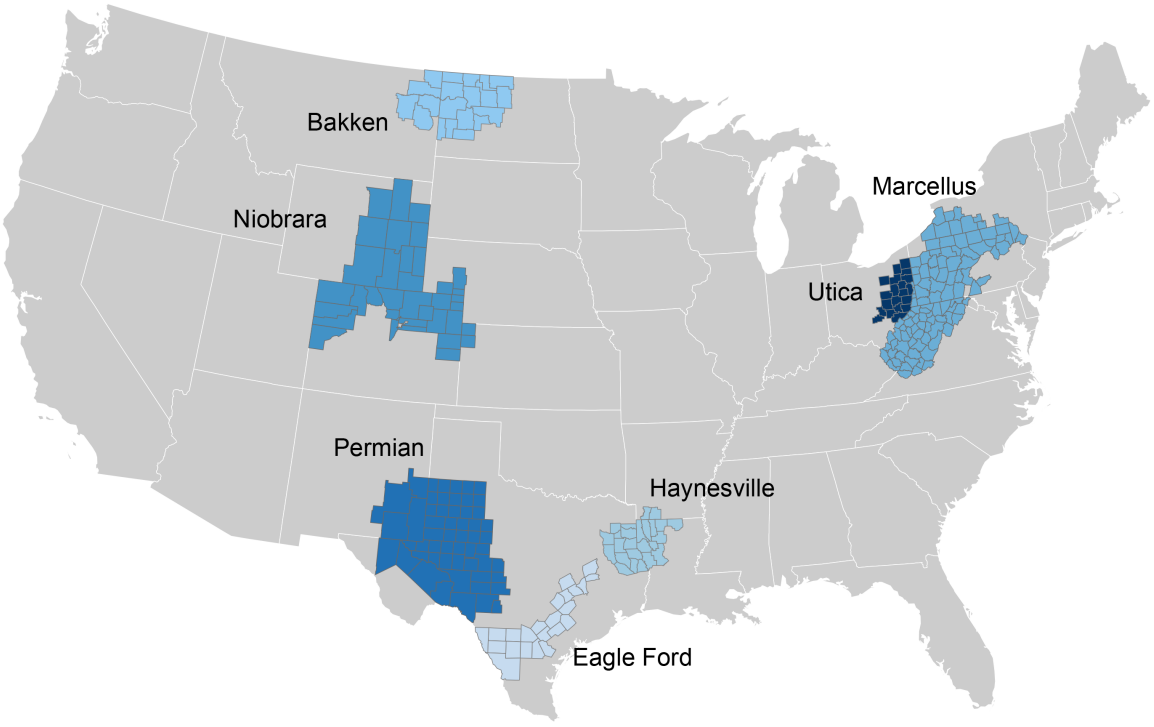
For much of the past decade, of course, prices rose. After peaking in 2008 at the highest inflation adjusted monthly average crude price of $136 per barrel and then dropping during the global economic crisis, oil prices continued to hover around $100 per barrel in the years after 2010.[10] Such prices—combined with technological advancement in horizontal drilling and hydraulic fracturing—led companies in the United States to rapidly exploit hard-to-reach deposits of oil and gas trapped in so-called "tight" shale formations in the Bakken, Eagle Ford, and Marcellus shale plays, among others. High volume fracking contributed to a boom in unconventional oil and gas production in states like Pennsylvania, North Dakota, and Texas, among others (Figure 1).

8. See, for example, Richard Dobbs and others, "Reverse the Curse: Maximizing the Potential of Resource-Driven Economies" (McKinsey Global Institute, 2013); and Frederick van der Ploeg and Steven Poelhekke, "Volatility and the Natural Resource Curse," Oxford Economic Papers, 61 (4) (2009). Both papers stress that volatility is a quintessential feature of natural resource dependent economies.

9. See Jack Healy, "Built up by Oil Boom, North Dakota now has an Emptier Feeling," The New York Times, February 7, 2016; Ernest Scheyder, "An Oil Boomtown that Became a Symbol of the Fracking Revolution is Dropping Fast," Business Insider, August 6, 2015; David Wethe and Kelly Gilblom, "The Oil Industry's 'Man Camps' are Dying," Bloomberg Businessweek, April 15, 2015.

10. See, for example, John Kemp, "A Brief History of the Oil Crash," Reuters, January 16, 2015; Brad Plumer, "Why Crude Oil Prices Keep Falling and Falling, in One Simple Chart," Vox Energy and Environment, February 8, 2016.

Figure 1. Seven most prolific shale regions in the United States



Source: U.S. Energy Information Administration

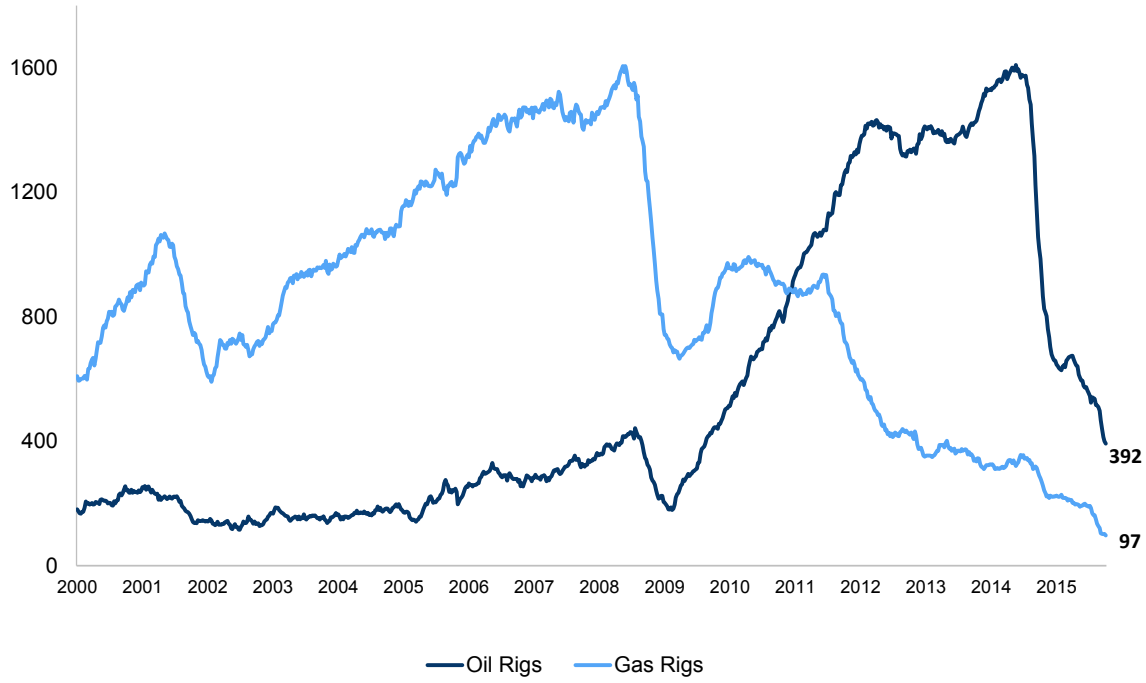
Then, over the last year, a combination of factors—slowing demand for oil in places like Europe and Asia, aggressive production by the Organization of Petroleum Exporting Countries, and steady production in the United States—created a supply glut and a crash in oil prices that has in recent months upended the economies of U.S. states with heavy oil exposure. A similar situation is unfolding with natural gas prices, which fell to their lowest level since 1999 in December 2015, following the slide in oil prices as supply continues to overrun demand.[11]

U.S. oil and gas drillers have responded to falling prices by slashing capital expenditures, including drilling. The U.S. active rig count has collapsed from a record high of 1,931 in September 2014 to just 489 at the beginning of March 2016—hitting an all-time low in recorded data (Figure 2).[12] The steep decline in drilling rigs is leading to cuts in

11. Nicole Friedman, "Natural-Gas Prices Drop to Lowest Level Since 1999," The Wall Street Journal, December 15, 2015. See also Carolyn Davis, "Bad Feeling for Natural Gas Prices; Henry Hub Forecast to Collapse Below $2.00," NGI's Daily Gas Price Index, January 12, 2016.
12. See Baker Hughes data on North America Rig Count, available at http://phx.corporate-ir.net/phoenix.zhtml?c=79687&p=irol-reportsother. The North American rig count data is released

employment. Nationwide, employment in the oil and gas extraction sector alone fell to 183,000 in January 2016, with employers shedding 15,700 jobs since the same time last year.[13]

Figure 2. U.S. oil and gas rig count hits all-time low since 1949



Source: Baker Hughes North America Rig Count

To be sure, the plunge in drilling activity has only recently begun to result in reduced oil and gas production, given increased efficiencies and many producers' need to keep pumping in order to make interest payments on their heavy debt loads, or to satisfy

weekly and is an important barometer for the drilling industry and its suppliers.

13. Bureau of Labor "Oil and gas Extraction: NAICS 211" data. The total decline in the oil and gas industry is expected to be more widespread. See, for example, Jason Brown, "The Response of Employment to Changes in Oil and Gas Exploration and Drilling" Economic Review (Federal Reserve Bank of Kansas City) 100 (2) (2015) and Mark Agerton and others, "Employment Impacts of the Upstream Oil and Gas Investment in the United States" RISE Working Paper 14-004, Rice University (2014).

lease obligations.[14] However, significant layoffs have begun to spread, underscoring the fact that the boom and bust cycle of unconventional oil and gas development is already prompting significant economic disruption as well as dire revenue gyrations in states that are dependent on oil and gas revenues for balancing their budgets.

In many cases, these dependent states rely heavily on severance tax revenue—taxes on oil, gas, and other natural resources severed from the ground (though some states impose oil and gas conservation fees, impact fees, levies or assessments in addition to, or instead of, a traditional severance tax).[15] Revenues from severance taxes typically account for 2 percent or less of total tax collection for a majority of states, but severance taxes assume greater importance for the budgets of roughly 10 energy-producing states involved in fracking.[16] Moreover, the taxes—which are affected by global energy prices—remain an extremely volatile revenue source if they are not managed through a prudently run fund.

Consequently, the ongoing crash of the fracking-driven oil and gas boom is already wreaking havoc on some shale state budgets (Figure 3):

- Alaska received practically no revenue from its severance tax in 2015, compared to $5 billion in 2012.[17] That's a problem since the state relies on oil

14. See Erin Ailworth, "U.S. Shale Producers Face Reality, Cut Output," The Wall Street Journal, February 29, 2016,

15. Severance tax can be imposed on the market value, the volume produced (per barrel of oil or per one thousand cubic feet natural gas), or some combination of the two. For a discussion of state severance taxes, see Cassarah Brown, "State Revenues and the Natural Gas Boom: An Assessment of State Oil and Gas Production Taxes" (Washington: National Conference of State Legislatures, 2013).

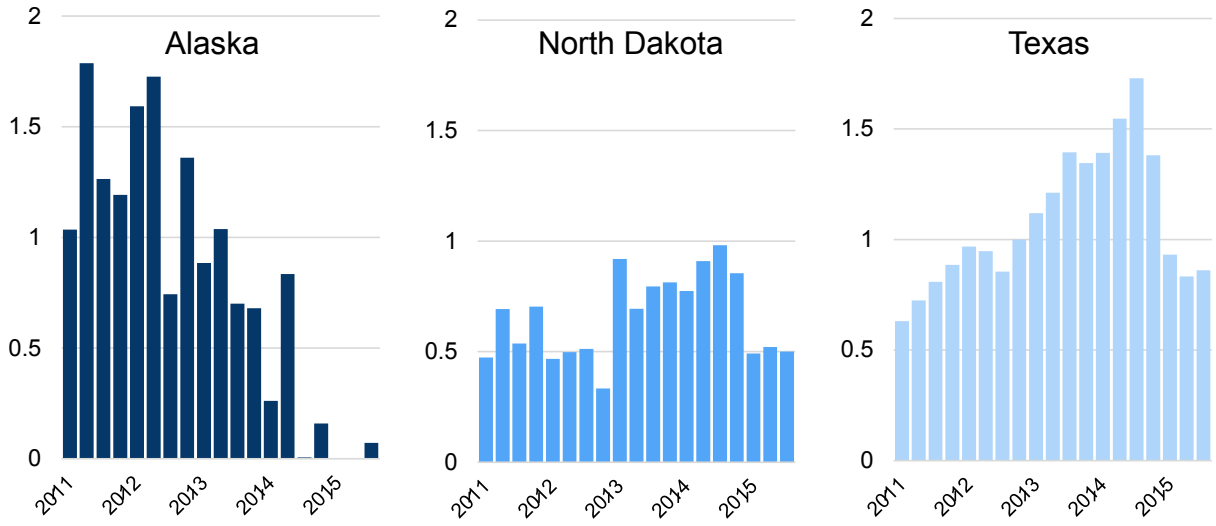
16. According to the U.S. Census, 15 states do not collect severance taxes. Pennsylvania falls into that category and it is the only major gas producing state without a severance tax. In another 25 states that includes Arkansas and Ohio (as energy-producing states), severance tax accounts for a very small share of total tax collections. However, in the remaining 10 states, severance taxes assume greater significance. In 2014, state severance tax revenue as percentage of total state tax collections was as high as 72 percent in Alaska, 54 percent in North Dakota, 39 percent in Wyoming, 19 percent in New Mexico, 13 percent in West Virginia, 11 percent in Texas, 9 percent in Louisiana, and 7 percent in Oklahoma. Brookings analysis of U.S. Census Bureau, 2014 Annual Survey of State Government Tax Collections. www.census.gov/govs/statetax/index.html.

17. Ibid. Alaska's severance tax is based on the operators' net income rather than on the volume or value of oil extracted. As a result, its severance tax revenue has fallen faster and further than most states.

revenues to fund three-quarters of state government expenses. Pending now is Gov. Bill Walker's budget proposal to impose the state's first income tax in four decades and scale back the payout of dividends from Alaska Permanent Fund in order to address a $3.5 billion shortfall[18]

Figure 3. Severance tax revenues decline with falling fossil fuel prices

Quarterly severance tax revenues (Q1 2011 - Q3 2015) (billion dollars)



Source: Quarterly Summary of State and Local Taxes, U.S. Census Bureau

- Louisiana—the Gulf Coast's most oil-revenue dependent state—has announced across-the-board program cuts to address an estimated $900 million gap in the current fiscal year. Next year's shortfall is expected to be more than $2 billion. While Louisiana's economic turmoil predates the past year's declining oil prices, the oil price slump is adding to the economic pressure the state is facing. It is the only other energy state other than Alaska whose credit rating has been downgraded in more than a decade[19]

18. Melanie Eversley, "Alaska Governor Calls for Income Tax," USA Today, December 9, 2015. See also Kirk Johnson, "As Oil Money Melts, Alaska Mulls First Income Tax in 35 Years," The New York Times, December 25, 2015.

19. See, for example, Chico Harlan, "Battered by Drop in Oil Prices and Jindal's Fiscal's Policies, Louisiana Falls Into Budget Crisis," Washington Post, March 4, 2016. Liz Farmer, "Louisiana's

- North Dakota's total severance revenue fell from more than $3.5 billion in 2014 to $2 billion in 2015, despite oil production remaining largely flat throughout 2015.[20] As a result, the state has imposed a 4 percent budget cut and appropriated nearly $500 million from rainy day reserves, the Budget Stabilization Fund, to close a $1 billion budget shortfall[21]
- Oklahoma announced a 7 percent cut in its annual state allocations to address a $900 million budget shortfall, caused in large part by the significant decline in revenue collected from the oil and gas gross production tax. Collection of these taxes fell $410 million, or 46 percent, compared to 2015[22]
- Pennsylvania is expected to lose is millions of dollars in impact fees—an important source of revenue for its local governments—because of lower gas prices in 2015. Since 2012, the fee has raised about $854 million and has been used to compensate municipalities and counties for the adverse impacts of the natural gas industry and make environmental improvements[23]

Implicit in these near-term fiscal problems, moreover, are a number of longer-term public management issues associated with fracking states' exposure to highly cyclical energy markets and the inherent economic and revenue impacts.

To begin with, the cyclical expansion and contraction of fracking state economies may impede economic diversification toward more innovation- and skill-driven advanced pursuits. This concern assumes greater significance given that some fracking states exhibit low to middling standing on key indicators of technology prowess, workforce productivity, and participation in the crucial high-R&D, STEM worker-oriented advanced industry sector that represents the chief anchor of America's economy.[24]

Budget has More Than Just an Oil Problem," Governing, March 2, 2016; Mark Armstrong, "$135 Million State Revenue Loss Predicted from Low Oil Prices," WBRZ, September 25, 2015.

20. Energy Information Administration (EIA), "State Severance Tax Revenues Decline as Fossil Fuel Prices Drop" (Washington: Department of Energy, January 2016).

21. Jack Healy, "Built up by Oil Boom, North Dakota now has an Emptier Feeling," The New York Times, February 7, 2016.

22. See, for example, Sidney Lee, "Oil-Dependent Oklahoma Cuts Budget Deeper," Governing, March 7, 2016 and Oklahoma State Treasurer Press Release: "Gross Receipts to the Treasury Shrink During 2015" January 7, 2016.

23. See, for example, Jon Hurdle, "Low Gas Price Cuts Impact-Fee Revenue for Pa. Counties and Municipalities," NPR StateImpact, February 1, 2016 and Marie Cusick, "Drilling Downturn Hits Marcellus Shale Industry Hard," NPR StateImpact, February 17, 2016.

24. For instance, North Dakota and West Virginia's advanced industry density - defined as share

The danger here is substantiated by a large body of literature that documents how economies based on natural resources grow more slowly relative to diversified economies due to what is broadly known as the "resource curse."[25] This literature confirms that a boom in extractive industries can stunt the development of other higher-skill, higher-tech sources of prosperity that are more conducive to long-term economicgrowth as more resources flow into the booming industry.[26] Fracking states need to guard against this dynamic. In this regard, Texas provides a telling example of how a state with a more diversified economy can weather oil's boom and bust compared to states with heavier dependence on oil and gas revenues.[27] The Texas economy is less reliant on the energy sector, so the impact of falling oil prices is not as damaging to the state's employment and revenue as it is for some other oil-producing states. Therefore, Texas may be poised to avoid the kind of deep downturn it experienced when oil prices plunged in the 1980s.

Secondly, the fracking boom-bust dynamic has highlighted, and in some cases created, significant social needs—such as unemployment, crime, housing, and public health problems—that relate to the nation's continued need to promote social welfare,

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of private sector employment in the state's advanced industries - are 5.6 percent and 5.9 percent respectively, giving them a national ranking of 47 and 43 among all states. Brookings defines advanced industries as those that spend at least $450 per worker per year on R&D and employ at least 20 percent of their workforce in STEM-intensive occupations. See Mark Muro and others, "America's Advanced Industries: What They Are, Where They Area, and Why They Matter" (Washington: Brookings, 2015). Similarly, North Dakota was ranked 36th and West Virginia 49th by the Information Technology and Innovation Foundation in its 2014 State New Economy Index. See Robert Atkinson and Adams Nager, "The 2014 State New Economy Index" (Washington: ITIF, 2014).

25. The term, coined in the 1990s by British economist Richard Auty in 1993, refers to the tendency of resource-rich countries to have slower GDP growth. See Michael Betz and others, "Coal Mining, Economic Development, and the Natural Resources Curse" Energy Economics 50 (2015); Elissaios Papyrakis and Reyer Gerlagh, "Resource Abundance and Growth in the United States," European Economic Review 51 (4) (2007); and Alexander James and David Aadlan, "The Curse of Natural Resources: An Empirical Investigation of U.S. Counties," Resource and Energy Economics 23 (2) (2011).

26. This phenomenon is referred to as the "Dutch Disease" and is one of the earliest arguments linking resource abundance to lower economic growth. See Jeffrey Sachs and Andrew Warner, "The Curse of Natural Resources," European Economic Review 45 (4) (2001). See Michel Beine, Charles Bos, and Serge Coulombe, "Does the Canadian Economy Suffer from Dutch Disease?" Resource and Energy Economics 34 (4) (2012).

27. See Laila Assanie and others, "At the Heart of Texas: Cities' Industry Clusters Drive Growth" A special report of the Federal Reserve Bank of Dallas, 2016.

economic access, and inclusion.[28] These economic concerns come at a time when states are grappling with the need to build an equitable, long-lasting, and shared prosperity. Take North Dakota, for instance, which has been on the front lines of the oil boom between 2011 and 2014. An influx of workers quickly led to a housing shortage, which pushed up prices.

Now the boom has reversed and according to some estimates, North Dakota homes are 20 percent overvalued at this point with a 46 percent chance that house prices will decline over the next two years.[29] More importantly, as the boom goes bust or when the resource curse hits, states and local communities are faced with rising unemployment—either because it takes time for people in the oil and gas sector to move to the sectors where jobs are available or because unemployed oil and gas workers are waiting for conditions to improve. Six of the major oil and gas states saw their total employment contract at the end of 2015, while employment increased on average by 1.6 percent for the country as a whole.[30] To overcome these challenges, states will need to make continued investments in their education and training systems as well as in technological innovation at public universities and other institutions.

Finally, the fracking revolution underscores the urgency of protecting the environment and accelerating the decarbonization of the economy to reduce greenhouse gas emissions and slow climate change. Much discussion has revolved around environmental concerns over dangers of air pollution, groundwater contamination, and large withdrawals of surface water.[31] These negative side-effects of unconventional oil and

28. Local communities in the middle of the shale boom are more likely to perceive the effects of local economic gains, but also report increased inequality, heightened vulnerability of disadvantaged community members, and pronounced strains on local infrastructure. For a good discussion of the social impacts of fracking see Bret Weber, Julia Geigle, and Carenlee Barkdull, "Rural North Dakota's Oil Boom and Its Impact on Social Services," Social Work 59 (1) (2014); and Kai Schafft and others, "Local Impacts of Unconventional Gas Development within Pennsylvania's Marcellus Shale Region," Society and Natural Resources 27 (4) (2014).

29. Nick Cunningham, "Cheap Oil Hits Housing in North Dakota, Texas, and Others," OilPrice.com, January 13, 2016.

30. Alaska (-0.3 percent), North Dakota (-4.3 percent), Louisiana (-0.5 percent), Oklahoma (-0.7 percent), West Virginia (-1.8 percent), and Wyoming (-2.4 percent) saw decline in employment between January 2015 and December 2015. Only New Mexico (0.2 percent), Pennsylvania (0.9 percent), and Texas (1.3 percent), among the major oil and gas states, saw gains. Brookings analysis of Bureau of Labor Statistics "Regional and State Employment and Unemployment" data.

31. See Deborah Stine and others, "Shale Gas and the Environment: Crticial Need for a Gov-

gas development need to be addressed as states continue extracting these resources. Yet there is also a larger need. Recent studies have found that methane emissions can negate some of the climate benefits of fracking and because of that natural gas should only be viewed as a short-term transition strategy and not a long-term replacement for oil and coal.[32] The decarbonization imperative, therefore, requires significant new investments in no-carbon technologies. States can commit to long-term decarbonization planning by leveraging revenues from unconventional oil and gas development for research and development (R&D) and deployment of renewable technologies.

In short, unconventional oil and gas development is confronting states with both near-term "boom and bust" dynamics and longer-term economic development needs. Strategic oil and gas development requires that states not only address near-term disruptions but leverage their non-renewable resources for long-term benefit.

The next section describes how permanent trust funds can facilitate this transition and enumerates key considerations for states wanting to establish them.

Funding economic change with permanent trust funds

States such as Pennsylvania and Ohio at the center of the unconventional oil and gas boom-bust should follow the lead of other energy states—and several nations—by establishing or increasing severance taxes and creating permanent trust funds that will essentially convert volatile near-term revenues from shale gas and oil development into

ernment-University-Industry Research Initiative" (Pittsburgh: Carnegie Mellon Univ., 2013). See also Susan Riha and Brian G. Rahm, "A Framework for Assessing Water Resource Impacts from Shale Gas Drilling." In Susan Christopherson, ed., The Economic Consequences of Marcellus Shale Gas Extraction: Key Issues (Ithaca: Cornell University, 2011).

32. Advocates of shale boom see it as a way to reduce carbon emissions while the world eases off fossil fuels and moves toward no-carbon technologies. But this "bridge fuel" argument has been controversial. Some studies note that the world is warming too quickly to even consider the concept legitimate. Other studies have found that the process of extracting natural gas at the wellhead emits enough methane to negate any benefits of lower carbon dioxide emissions at natural gas power plants. See Michael Levi, "Climate Consequences of Natural Gas as a Bridge Fuel," Climatic Change 118 (3-4) (2013). See also Robert Howarth, "A Bridge to Nowhere: Methane Emissions and the Greenhouse Gas Footprint of Natural Gas," Energy Science and Engineering 2 (2) (2014).

a stable, longer-term source of investment funds for building a sustainable economy. Such taxes and funds would protect these states against future recessions and yearly revenue volatility while ensuring that the fiscal benefits of the shale boom persists long after the states' shale resources are depleted. More importantly, in an era of fiscal austerity, such funds can provide a powerful instrument for marshaling new resources and channeling them toward the support of the kind of economic development strategies required to create innovation-driven, opportunity rich, and inclusive economies.

At the same time, states that already have created permanent trust funds with oil and gas revenues as their primary income source should take a fresh look at how their funds are managed, executed, and the investment income spent. Doing so will not only enable them to return their funds to stable financial footing but also help them direct investment income from the fund toward large-scale, transformational priorities over the long-term.

To help states investigate this opportunity, the rest of this paper introduces the concept of permanent trust funds, distinguishes between types of funds, and suggests a number of strategies that states should keep in mind as they set out to create their own entities.

What is a permanent trust fund?

Permanent trust funds—often funded through non-renewable resource revenues—are state-owned investment vehicles that invest in a variety of assets classes such as stocks, bonds, real estate, private equity, and hedge funds and use the investment income for strategic or long-term use. Similar to endowments, only the earnings and the investment gains from the funds can be used as expenditure of the principal is usually prohibited (unless allowed by legislative approval or constitutional amendment in the U.S. examples).

Over the past few decades, permanent trust funds have been created in many resource-rich countries including Norway, Chile, Kuwait, Israel, and Canadian provinces, as well as in a few U.S. states.[33] The Sovereign Wealth Fund Institute—an international organization dedicated to studying trust funds—lists over 80 funds that have amassed,

33. For a good discussion on the forms and functions of SWFs and the mapping of the global footprints of these institutions see Gordon Clark, Adam Dixon, and Ashby Monk, Sovereign Wealth Funds: Legitimacy, Governance, and Global Power (Princeton: Princeton University Press, 2013); and Patrick Bolton, Frederic Samama, and Joseph Stiglitz (eds.), Sovereign Wealth Funds and Long-Term Investing (New York: Columbia University Press, 2012).

as of March 2015, $7.1 trillion in assets under management, up from $3.4 trillion at the beginning of 2008.[34] About two-thirds of those are funded by tax revenues from natural resources while the rest are funded by non-commodity income such as fiscal surplus and foreign exchange reserves.[35] Of total assets around the world, $4.29 trillion come from oil and gas trust funds.

In the United States, permanent trust funds can be broadly classified into two groups: severance tax funds and land grant funds.[36] Severance tax funds are a more recent phenomenon and are funded by a portion of severance taxes paid on natural resource extraction. Only a handful of states including New Mexico, North Dakota, West Virginia, and Wyoming have created trust funds capitalized by severance tax revenues even though most states generally impose severance taxes on resource extraction.

Land grant funds, on the other hand, have a longer history going back to the mid- to late-1800s when the federal government granted control of millions of acres of federal land to each state as it entered the Union. These lands were given in trust, with the stipulation that proceeds from their sale or lease be used to support various public institutions, most notably, public school systems.[37] These land grant funds are capitalized through royalties and related income like lease-bonus payments. Texas has two of the nation's largest land grant funds—the Texas Permanent School Fund and Texas Permanent University Fund—with combined assets of $55 billion.[38]

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34. See Sovereign Wealth Fund Institute (SWFI), "What is a SWF?" at www.swfinstitute.org/sovereign-wealth-fund/. For a full list of funds, see SWFI's list available at www.swfinstitute.org/sovereign-wealth-fund-profiles/

35. Glenn Yago and Yuan-Hsin Chiang, "Structuring Israel's Sovereign Investment Fund: Financing the Nation's Future" (Santa Monica: Milken Institute, 2011)

36. For a discussion of types of state SWFs, see Paul Rose, "North American Dream: The Rise of U.S. and Canadian Sovereign Wealth," Public Law and Legal Theory Working Paper Series No. 246 (2014). See also Barry Rabe and Rachel Hamilton, "Trusting in the Future: The Re-Emergence of State Trust Funds in the Shale Era," CLOSUP Working Paper Series, Number 38, 2015.

37. These land grant funds came into existence long before the term "sovereign wealth fund" was created and neither were they voluntarily created by states. Beginning with Colorado in 1876, the federal government required the establishment of these funds as part of the enabling acts which admitted states to the Union. See Lincoln Institute of Land Policy's "History of the Trust Land Grants" available at www.lincolninst.edu/subcenters/managing-state-trust-lands/ . See also Rose, "North American Dream."

38. See Sovereign Wealth Fund Institute's fund profiles at www.swfinstitute.org/sovereign-wealth-fund-profiles/. Also see Texas Permanent University Fund's profile available at http://

In addition, two Gulf Coast states—Alabama and Louisiana—set up their own funds, funded by royalty payments received from oil and gas companies, in response to offshore oil and gas production opportunities.

In any event, despite a long history with state-controlled permanent trust funds in the country, not enough fracking states have established both severance taxes and permanent funds. Neither Pennsylvania nor Ohio—two of the states most heavily enmeshed with the shale energy boom—have set up trust funds. And now both of them are grappling with questions related to management of their fracking generated revenues. Pennsylvania is the only major gas-producing state without a severance tax and recent efforts by Gov. Tom Wolf to impose one have failed so far.[39] And in Ohio, Gov. John Kasich has been advocating to increase the state's severance tax to 6.5 percent on high-volume horizontal oil and gas wells—a proposal that has not been supported by state lawmakers.[40]

It is in these two states, at the epicenter of oil and gas growth, where the best opportunity to create permanent trust funds lies. Specifically, Pennsylvania would be wise to levy a severance tax on its oil and gas industry and deposit a portion of that in a permanent trust fund, while Ohio should increase its severance tax in line with other oil and gas producing states and use a portion of that revenue to create a fund.[41] The boom and bust cycle of energy prices, combined with the natural resource curse, highlights why states need to take a long-term perspective in adopting realistic tax rates aimed

ccsi.columbia.edu/files/2014/04/nrf_Texas_October2013_RWI_VCC.pdf

39. Pennsylvania, Maryland, and New York are among the 32 gas-producing states do not impose such a tax. See Brown, "State Revenues and the Natural Gas Boom." Gov. Wolf's proposal would have imposed a five percent severance tax on the value of gas at the wellhead. However, the proposal ran into strong headwinds in a Republican-controlled legislature and is dead, at least for this year. Gov. Wolf has taken another shot at imposing the tax in his Feb. 2016 budget package. See, for example, Paul Gough, "Wolf Tries Again with Severance Tax, " Pittsburgh Business Times February 9, 2016..

40. Ohio currently assesses just 3 cents per thousand cubic feet of natural gas extracted and 20 cents per 42-gallon barrel of oil. See Brown, "State Revenues and the Natural Gas Boom." Ohio's severance tax on fracking is low compared to other states, a fact recently confirmed by Ohio 2020 Tax Policy Study Commission charged with reviewing the state's severance tax and producing a recommendation on a new severance tax for shale fracking. However, here too lawmakers are in no rush to increase the state's severance tax. See, for example, Jim Siegel, "Lawmakers Find Ohio's Frack tax to be Low but Reluctant to Increase it," The Columbus Dispatch October 23, 2015.

41. Barry Rabe, "Lessons from the Popular Energy Tax," Brookings FixGov blog, August 14, 2015.

at mitigating the long-term costs of energy development and enhancing their long-term prosperity.[42] A reasonable severance tax based on the economic value of the resource, coupled with a trust fund, can help these states offset the permanent loss of their oil and gas resources through strategic investments in transformational state priorities.

At the same time, states that do possess a trust fund supported by fracking revenues should make sure to manage their funds in a strategic manner. Currently few existing state trust funds appear truly effective.

Some states' funds are simply too small (Figure 4). Despite a legacy of energy production, both Alabama and Louisiana have small funds with a market value of $2.5 billion and $1.3 billion respectively. Louisiana, whose Education Quality Trust Fund was set up using money the state received from an oil and gas settlement with the federal government, is the only state among the top producing oil and gas states that allows a severance tax suspension for horizontal wells. As a result, even as shale gas production increased in the Haynesville shale play, the state has forfeited more than $1.1 billion in revenue from fiscal years 2010 to 2014.[43] Alabama, for its part, has raided the Alabama Trust Fund (ATF) several times—most recently in 2012 when the state, through a constitutional amendment, moved $437.4 million from the ATF to its general fund over three years—reducing the fund's value and earnings trajectory.[44]

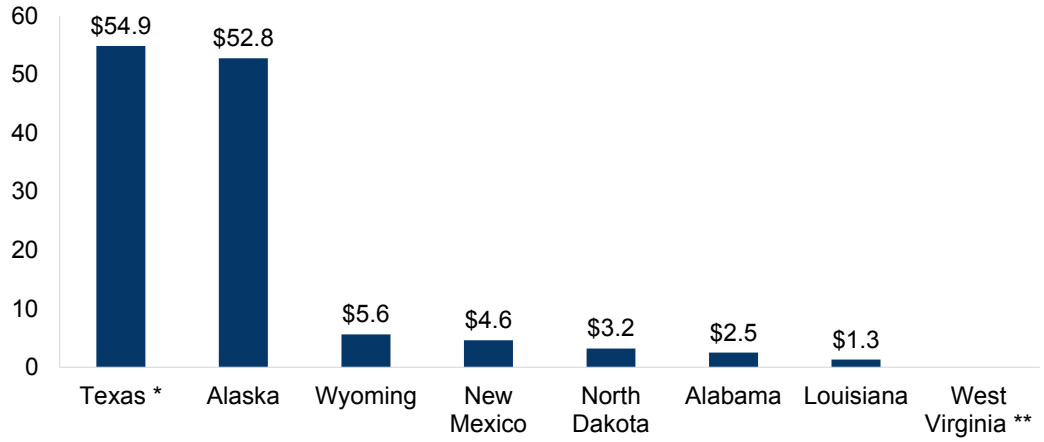
42. There has been a very cautious approach to severance tax creation and reform in the shale era. In the last decade, states have made only modest adjustments in their severance tax rates and in some cases have even attempted to reduce them, in response to growing national production. See Barry Rabe and Rachel Hampton, "Taxing Fracking: The Politics of State Severance Taxes in the Shale Era," Review of Policy Research 32 (4) (2015).

43. Louisiana Legislative Auditor, "Severance Tax Suspension for Horizontal Wells" Performance Audit Services, Informational Report, Issued August 19, 2015.

44. In addition to this latest move, Alabama owes ATF $437 million which was due in 2015 and $162 million due in 2020. The state has made no payments on these so-called bridge loans and has set up a dangerous precedent of raiding the ATF to cover ongoing operating expenses—defeating the purpose for which the fund was created. See, for example, Dana Beyerle, "Gov. Bentley Optimistic Alabama Trust Fund Amendment will be Approved," Tuscaloosa News, September 17, 2012. See also Alabama Policy Institute, "The Alabama Trust Fund Payback" available at www.alabamapolicy.org/wp-content/uploads/2013-Alabama-Trust-Fund-Payback.pdf

Figure 4. Size of permanent trust funds varies widely across eight states

Fund balance ($ billion)



Source: Sovereign Wealth Fund Institute

Note: Texas includes both Permanent School Fund and Permanent University Fund ** West Virginia's fund is too new to show a measurable balance*

Other states have followed management practices that undercut the value of their funds. New Mexico, for instance, does not reserve a set percentage of severance tax revenue for its trust fund each year. Over the years, the state has changed the funding formula and intercepted money going into the fund. In 2006, $58.7 million in severance taxes went into the Severance Tax Permanent Fund. In 2013, it had dropped to a paltry $85—out of the more than $400 million in severance taxes collected—raising questions about the long-term viability of the fund.[45] And then there is the Alaska Permanent Fund—deemed one of the more successful state trust funds due to its strong governance and management standards.[46] Unfortunately, while the fund may enjoy good governance, it has failed to serve as a long-term investment vehicle or a driver of economic diversification in Alaska. Most notably, the state's Permanent Fund Dividend program has essentially converted the trust fund from a savings fund to an income distribution fund focused on distributing an annual dividend payout. Saving a small fraction of its oil

45. Dennis Domrzalski, "Why a Key State Investment Fund Only Got $85 Last Year?" Albuquerque Business First, January 3, 2014. See also Carla Sonntaq, "Protect Our Permanent Trust Fund," Albuquerque Journal, September 18, 2014.

46. For more information on Alaska Permanent Fund, see its profile available at http://ccsi.columbia.edu/files/2014/04/nrf_Alaska_August2013_RWI_VCC.pdf

revenues—the percent of total oil money deposited into the fund is very small, with production and income taxes on the crude oil and natural gas industry providing as much as 90 percent of Alaska's general fund revenues—and distributing a dividend payout is a dangerous model for the future finance of a state whose economy is completely dependent on a non-renewable commodity.

In short, severance taxes and well-managed permanent funds hold out the potential for states to leverage near-term fracking windfalls for long-term prosperity.

Five elements of good fund governance and management

How can states best structure and manage an oil and gas trust fund? A review of the structures, governance, and investment strategies of numerous trust funds in the United States and worldwide suggests a number of preferred strategies for designing and implementing them.[47]

Specifically, states with existing funds as well as those creating new ones should consider five best practices in fund design and operation:

Establish an effective governance framework. A robust governance framework is important for the effective management of permanent trust funds. The governance framework should among other things explicitly organize the fund's legal form and structure; identify who has ultimate authority over the fund and who manages it; and spell out the fund's day-to-day operations, office location, and how it should interact with relevant entities including the legislature, executive, advisory bodies, and regulatory agencies.[48] While state governments have ample scope for tailoring fund governance structure to suit local requirements, management structures that set out clear and unambiguous responsibilities paired with strong internal and external oversight promote prudent investment and effectiveness.

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47. For a good discussion of fund governance and management, see Andrew Bauer (ed.), Managing the Public Trust: How to Make Natural Resource Funds Work for Citizens (New York: Natural Resource Governance Institute and Columbia Center on Sustainable Investment, 2014); and Andrew Ang, "Four Benchmarks of Sovereign Wealth Funds." In Sovereign Wealth Funds and Long-Term Investing, by Patrick Bolton, Frederic Samama, and Joseph Stiglitz, eds. (New York: Columbia University Press, 2012).

48. Andrew Bauer and Mafar Rietveld, "Institutional Structure of Natural Resource Funds." In Managing the Public Trust.

To that end states should:

- Clearly define the roles and responsibilities of governing bodies—the legislature, executive, the fund manager, the operational manager, and formal advisory bodies—in law or regulation
- Insulate the management of the fund, whether by an existing agency within the state government or a newly created entity, from political tampering
- Entrust the operational or day-to-day management of funds—especially those with complicated, higher-risk investments—to external fund or portfolio managers with extensive experience in managing complex financial instruments
- Establish independent oversight of trust funds, such as annual audits by external auditors and oversight by external entities comprising representatives from civil society and industry, over and above strong internal controls

Define the fund's revenue source, deposit, and withdrawal rule. Trust funds can only be effective in meeting their stated objectives when the fiscal rules defining their source of funding, deposit, and withdrawals are clear and properly enforced. These should be established in legislation and the exceptions to the rules, if any, should also be codified. The importance of clearly stated fiscal rules and their proper enforcement cannot be overstated especially because oil and gas revenues are finite and prone to volatility. These rules can restrain political interference and discourage overspending by limiting the government's ability to raid the funds for short-term political gain.

To that end states should:

- Specify the portion of severance taxes collected to be allocated to the fund
- Incorporate a minimum deposit requirement into the fund as the growth of the fund's principal is dependent on regular government contributions
- Protect the fund principal so that it is invested permanently and cannot be spent without amending the state constitution
- Define the fund withdrawal rules, clearly specifying how often withdrawals can be made, the amount of withdrawal, and whether they need to be approved by the legislature.

- Specify the conditions under which exceptions to the fund's fiscal rules guiding funding, deposit, and withdrawal can be made

Design the investment strategy. Money deposited into a fund is invested in financial or other assets that may include stocks, bonds, derivatives, real estate, and infrastructure. A clear investment strategy can enhance fund performance by limiting excessive risk taking and preventing mismanagement of public resources. State-controlled funds should be governed by a set of detailed investment rules that cover the types of financial assets the fund can invest in, put restrictions on risky asset purchases and domestic investments, and specify the fund's investment horizon.[49]

To that end states should:

- Incorporate clear guidelines stating the investment horizon, which asset classes the fund can invest in, and which trading strategies the fund can engage in
- Prohibit investments, especially in the early years of the fund, in certain high-risk financial instruments to minimize losses
- Ensure that the fund, if engaging in complex investment practices, has the technical capacity to manage risks and enhance returns
- Select a series of benchmarks for each asset class to measure investment performance
- List all assets owned by the fund in a publicly available document to increase transparency and de-incentivize high-risk or obscure investments

Seize the opportunity to invest fund earnings in economic transformation. Too many states either transfer the funds' earnings into their general fund in order to support routine governmental operations or, as in the case of Alaska Permanent Fund, use it as an income distribution mechanism that undercuts the goal of diversifying and buttressing the state economy in preparation for the end of oil production. As a result, a number of state funds are squandering an opportunity to make truly

49. Yago and Chiang, "Structuring Israel's Sovereign Investment Fund;" Abdullah Al-Hassan and others, "Sovereign Wealth Funds: Aspects of Governance Structures and Investment Management" (Washington: World Bank, 2013); and Malan Rietveld and Andrew Bauer, "Rules Based Investment for Natural Resource Funds." In Managing the Public Trust.

Providing funding for public education: The Texas Permanent School Fund

The Permanent School Fund (PSF) exemplifies how severance tax revenues can be managed through a fund to invest in a state's economic future. Since its inception, the fund has served as a perpetual endowment with the goal of helping finance public education in Texas. Created in 1854 with a $2 million appropriation by the Texas legislature, the fund is overseen by the Texas General Land Office (GLO) and the State Board of Education. The fund's major sources of revenues are royalties on oil and gas extraction and money from the sale or lease of lands under GLO management. GLO also deposits fines on unpaid or late royalties, commercial leasing revenues, and Outer Continental Shelf pipeline fees into the PSF.

Since its inception, the fund has grown to become the largest educational endowment in the country. Since 1960, the PSF has distributed nearly $25 billion to schools, with $838.7 million distributed during FY 2015. At the end of fiscal 2015, PSF had an endowment of $33.8 billion, with the interest earned on the PSF investments distributed by the State Board of Education every year to each school district on a per-pupil basis.

In addition to providing direct support to schools, the PSF guarantees bonds issued by local school districts and charter schools allowing them to issue debt at relatively low rates. At the end of 2015, the PSF's assets guaranteed $63.2 billion in school district bonds, providing a cost savings to 833 public school districts, and $757.9 million in charter district bonds providing cost savings to 13 Texas charter districts.

The provision that only the interest income of the fund can be spent ensures that the PSF will continue to grow and its revenues will be available for Texas public schools in perpetuity. In this manner, the PSF is a good example of how an oil and gas boom can be positively leveraged to fund important state priorities.

Source: Texas Permanent School Fund: Comprehensive Annual Financial Report for the Fiscal Year Ending August 31, 2015.

economy-shaping investments that can prepare their states for the increasingly competitive, knowledge-driven economy of the near future. States should seize the opportunity to deploy funds strategically on bold and transformative initiatives that can help the state diversify by expanding the competitiveness of their advanced economy; promote social inclusion; and help accelerate the advent of a lower carbon economy.

To that end states should:

- Invest in innovation for the future that would help increase states' productive potential and create opportunity for all through targeted investments in research, development, and demonstration of technologies and best practices
- Invest in an integrated pre-K through 20 educational pipeline, with emphasis on STEM education and workforce training to address the needs of states' innovation and STEM-worker intensive advanced industries which are the prime movers of regional economic competitiveness
- Invest in strategies to decarbonize state economies that would include support for renewable and alternative energy innovation and commercialization

Formulate explicit disclosure and transparency standards. Finally, strong disclosure and transparency standards are important elements of good governance. In addition to creating legitimacy among the general public, state government, and financial markets, disclosure and transparency mechanisms improve accountability and management of the funds and reduce the risk of corruption and mismanagement.[50] In this regard, transparency involves publicly available information of all fund activities including size of the fund, financial flows in and out of funds, returns on investment, types of assets permitted for investment, and types of assets (e.g., equities, fixed income) invested in. In addition, state governments can enhance the scope of these reports by making them forward looking and clarifying what will be achieved in the future to set benchmarks for performance and set public expectations.[51]

To that end states should:

- Report at least annually on key information including the size of the fund, returns on investments, categories of investments, geographic locations of investments, names of specific investments, and the currency composition of investments
- Require the public release of all regulations, quarterly financial statements, and annual internal and independent external audits

50. See Yago and Chiang, "Structuring Israel's Sovereign Investment Fund," and Bauer, ed., "Managing the Public Trust."

51. Perrine Toledano and Andrew Bauer, "Natural Resource Fund Transparency." In Managing the Public Trust.

Providing funding for infrastructure improvements and economic development: The Montana Coal Severance Tax Trust Fund

Montana's Coal Severance Tax Trust Fund—though not linked to oil and gas extraction—offers a solid example of a state reinvesting fossil fuel severance tax revenue in economic diversification.

The trust fund was created in 1976 through a constitutional amendment providing that 50 percent of total coal severance tax collections every year would be placed in an inviolate permanent trust. Revenues in the trust fund cannot be appropriated without a three-fourths vote of the state legislature. From FY 1976 to FY 2010, the fund has received approximately $827.5 million in coal severance tax revenues. Individual sub-trust funds receive different amounts of the total revenue.

The legislature has partitioned the permanent trust fund into several sub-funds, whose uses vary. The Coal Tax Bond Fund was created to authorize the sale of bonds to finance renewable energy projects and local government infrastructure projects. A maximum of $250 million in bonds is authorized as loans for renewable energy projects. The Treasure State Endowment Fund (TSEF)—established in 1992 by statewide referendum—awards matching grants to local governments for infrastructure projects such as sewer and water pipes. At the end of the 2013 biennium, the TSEF trust balance was $238.9 million with $21.6 million in interest earnings. The Treasure State Endowment Regional Water System Fund funds regional water system projects for communities in the north-central and northeastern regions of the state.

In addition to infrastructure projects, the Big Sky Economic Development Fund—created in 2005 and receiving 25 percent of the trust fund money—has an economic development focus and its interest backs job creation and planning grants across Montana. Approximately 75 percent of the interest income goes toward grants to local governments to assist businesses in creating new jobs that pay at or above the average county wage. The remaining interest income goes to planning grants for Certified Regional Development Corporations and other qualified economic development organizations.

The Coal Severance Tax Trust Fund, now approaching $1 billion, annually provides more interest income for the legislature to spend than the state's direct coal tax revenue. In doing so, Montana's trust fund is doing what it is supposed to do—build a savings account and use the earnings to meet the state's infrastructure and economic development needs.

Source: Montana Board of Investments, Department of Commerce, "Fiscal Year 2014 Annual Report."

- Incorporate independent oversight of the fund to provide assurances of integrity, accountability, and transparency
- Maintain an active website with up-to-date information on fund activities, engage with the media, and organize educational seminars to communicate with the general public and align public expectations with government objectives

Conclusion

Severance taxes linked to well-managed permanent trust funds offer a significant economic development option for states that have just witnessed the huge potential of unconventional oil and gas development to generate significant, albeit cyclical, economic activity and revenue. Having missed the last decade's opportunity to link an oil and gas boom to transformation through targeted investment, states should prepare now to leverage the next windfalls. They should put in place the tools and management to channel oil and gas-related revenue targeted investment to bolster innovation activity, cultivate a skilled workforce, and help accelerate the decarbonization of their economies. ■

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