March 2021

Wind Energy's Effect on School Finances and Student Outcomes

Working Paper Title: School District Revenue Shocks, Resource Allocations, and Student Achievement
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Overview

Wind energy has grown substantially in the United States over the past decades, contributing ever-greater revenue to states and local jurisdictions, including school districts. However, the impact of school funding from new wind energy installations on school expenditures and student outcomes has not been well understood.

We examine the impact of wind energy installations on school district finances and student outcomes using data on the timing, location, and capacity of U.S. installations from 1995 through 2016. We find that wind energy installations led to large increases in local revenues to school districts, with only minimal offsetting reductions in state aid. Schools dramatically increased capital outlays but only modestly increased current operational spending, such as teacher salaries and supplies or to reduce class size. Accordingly, we find little to no change in class sizes or teacher salaries, nor student test scores. We theorize that state- and county-level tax laws direct most school district funds toward capital projects and away from the current expenditures. If states or counties wish to prioritize student achievement improvements, tax policies will likely need to be reimagined to encourage greater current expenditure proportions. Finally, we find some evidence of tax relief in response to additional wind revenues, which might benefit all district residents.

Background

Wind energy has grown substantially in the United States over the past decades, from less than 2 GW of capacity in 1995 to over 110 GW in 2020 (U.S. EIA, 1995; AWEA, 2020a). By 2020, more than 1,600 commercial U.S. wind installations comprised almost 68,000 turbines (Hoen et al., 2021). Wind projects generated about $1.6 billion in revenues for states and local jurisdictions in 2019 (AWEA, 2020b), a portion of which flowed to school districts.

How wind energy tax revenues flow to school districts depends on a complicated, and often opaque, set of overlapping state and local laws and formulas. They can result in full exemptions or multi-year abatements, no special property tax treatment or a treatment based on the production of the wind project. In other districts, payments in lieu of taxes (PILOTs) might be arranged by the local jurisdiction. In some cases, state aid to local schools can be impacted by new revenues from wind projects. Because of these myriad approaches, a detailed national analysis had not previously been conducted.

To track these impacts, we geocode U.S. wind energy projects installed between 1995 and 2016 (Hoen et al., 2021) to 638 school districts. We combine data on the timing and capacity of wind installations with school district data on revenues, expenditures, staffing, enrollments, teacher salaries, and student achievement. We find the "wind" school districts are smaller, more rural, and have lower household incomes than non-wind districts. They also have lower revenues and expenditures per pupil and have lower pupil-teacher ratios and base teacher salaries.

Results

In terms of school finances, we find that wind energy installation led to large increases in per-pupil revenues (Figure 1) due to increased local revenues, with minimal offsetting reductions in state aid. Large per-pupil expenditures also occurred (Figure 2). Using the mean wind district installed capacity of 243 KW, we estimate a total annual school revenue increase of $872 per pupil, which is an 8% increase over pre-wind (1995) levels.

However, in many cases state aid formulas reduce state funding to school districts when local revenues rise, such as from new revenues from wind projects. This is especially true when districts use the new funds to increase current expenditures. As a result, the districts in our sample tend to spend new revenues from wind generation primarily on capital outlays.

Before getting a wind project, districts spent about $9.50 for current expenses to each dollar of capital investments. But they spent new wind revenues in an opposite pattern, with twice as much for capital as current. Using the 243 kW mean installed capacity, we estimate current expenditures increase by $214 per pupil, while capital spending increased by $515 per pupil. This represents only a 2% current spending boost over 1995 per pupil levels of $8,748, but a 56% increase over 1995 per pupil capital spending levels.

Figure 1: U.S. school district revenue per megawatt of installed wind energy, per pupil, 1995–2016

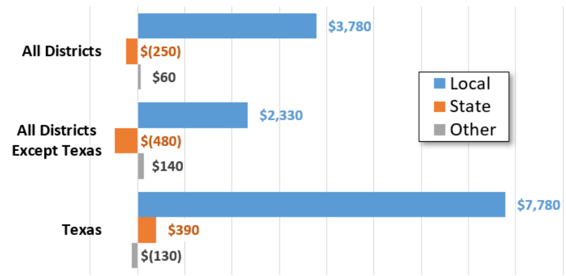
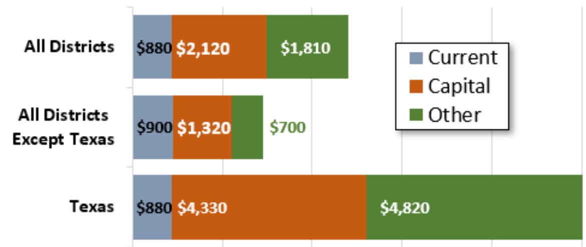


Figure 2: U.S. school district expenditures per megawatt of installed wind energy, per pupil, 1995–2016



Note: "Other" expenditures are predominantly debt service and payments to state

Because of these allocation decisions, we find little to no reductions in class sizes or increases in teacher salaries overall, which tend to have a larger impact on student achievement. Accordingly, we find no change in student test scores. If state and county goals were to improve test scores and other student outcomes at the expense of capital improvements, tax policy would need to direct a greater proportion of new revenues toward current spending, such as to hire additional staff to reduce class size (Dynarski et al., 2013; Hyman, 2017). As it stands, new revenues are directed more toward capital expenditures, resulting in new or improved school infrastructure and equipment.

Finally, we explore an additional way school districts may benefit from wind energy installation: property tax relief. The large increases in local revenues from wind energy installation suggest that districts did not take all these windfalls as tax relief, but did they take any? We looked at two states, finding property tax rates fell by 13% in Illinois school districts after the installation of wind projects, but they rose slightly in Texas. In Texas, state laws provide an incentive for school districts with wind energy installations to pass new capital spending bonds to leverage the new wind monies, paying for the bonds, in part, by slightly increasing property tax rates.

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