



**The Effects of “Federal-Aid Swap”
Programs on Highway Construction
Costs, Contractor Diversity, and
Out-of-State Contractors**
Evidence from Iowa

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Executive Summary

“Federal-aid swap” programs allow states and local governments to bypass federal Davis-Bacon prevailing wage standards, Disadvantaged Business Enterprise goals, and Buy America provisions on highway projects. In these programs, federal funds that have been allocated to projects are exchanged with state funds, so federal construction standards no longer apply. The “swapped” federal funds are commingled and consolidated onto state projects that were already receiving federal funds. The result is that fewer highway projects are built with prevailing wage standards, contractor diversity goals, and American-made iron and steel.

The Iowa Department of Transportation approved a federal-aid swap program in February 2018. Since implementation, Iowa has had the most-utilized program of the 15 swap programs in the country, with 18 percent of federal-aid dollars being swapped with state funds. Nevertheless, three counties in Iowa chose to opt out of the program—Johnson County, Scott County, and Muscatine County.

An analysis of about 1,300 Iowa Department of Transportation projects awarded from 2016 through 2020 reveals that, after accounting for project size and complexity, project type, and project location:

- The federal-aid swap program did not reduce costs on highway construction projects, and may have led to a 25 percent increase in total costs.
- Projects built in the counties that opted out of the federal-aid swap program were no more expensive than projects built in Iowa’s other 96 counties.
- Davis-Bacon prevailing wage standards and Disadvantaged Business Enterprise goals have no effect on total construction costs—indicating that the federal-aid swap program did not lower costs because the federal construction standards that the program aims to bypass do not affect costs in the first place.
- Projects that pay Davis-Bacon prevailing wages are 8 percent less likely to be awarded to out-of-state contractors.

The data reveal that the federal-aid swap program has consequences for construction worker earnings, contractor diversity, and local contractors. Due to the federal-aid swap program:

- 10 percent fewer highway projects are built with federal Davis-Bacon prevailing wage standards.
- 4 percent fewer highway projects are built with Disadvantaged Business Enterprise goals.
- The drop in projects covered by the Davis-Bacon Act—which protects local contractors by ensuring that public expenditures maintain and reflect local standards of compensation and craftsmanship—increases the market share of out-of-state contractors on highway projects funded by Iowa taxpayers by 1 percent.
- \$9 million is lost in economic activity from local contractors and local construction workers in Iowa.

In a 2020 report, the nonpartisan Government Accountability Office concluded that “the impact of fund swapping... cannot be definitively determined due to limited data availability.” This report fills that void with actual project data from Iowa. The results find that federal construction standards have no statistical effect on total costs. This corroborates previous peer-reviewed economic studies, 83 percent of which find that prevailing wage laws have no effect on the cost of traditional public works construction projects.

Elected officials in Iowa could counter the negative effects of federal-aid swap programs by enacting state-level prevailing wage, Disadvantaged Business Enterprise, and Buy America laws. On the other hand, elected officials in Iowa could simply consider repealing the federal-aid swap program. The federal government could also consider prohibiting these state-specific programs because they undermine federal construction standards. While the intention may have been to reduce the cost of highway construction projects, the program has not resulted in any cost savings for taxpayers. Instead, it has decreased skilled construction worker earnings, impacted contractor diversity, and reduced profits for Iowa’s manufacturers.

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Introduction

In Fiscal Year 2020, the Federal Highway Administration (FHWA) invested more than \$43 billion to build and maintain road and bridge infrastructure (FHWA, 2020a). This investment is allocated to the 50 states and the District of Columbia using a formula that ensures no state receives less than 95 cents of every dollar it contributes to the Highway Trust Fund (HTF) (FHWA, 2017a). While states primarily administer this “federal-aid” funding through their departments of transportation (DOTs), states may further distribute dollars to cities, towns, counties, and regional planning agencies (Repko, 2020).

Projects are generally considered “federalized” if they include any FHWA authorization for engineering, right-of-way, or construction (Iowa DOT, 2018a). While the federal government typically does not pay for the entire cost of highway construction projects and states and local governments must come up with matching funds, all projects receiving any amount of federal funds must adhere to applicable federal laws and regulations—including prevailing wage standards through the Davis-Bacon Act, Disadvantaged Business Enterprise (DBE) goals, and “Buy America” provisions (Repko, 2020).

The bipartisan Davis-Bacon Act has established local minimum wages for skilled construction workers employed on federally-funded and federally-assisted construction projects since 1931. The Davis-Bacon Act establishes wages and benefits for detailed job classifications and types of work based on local market rates in each county. The main purpose of the Davis-Bacon Act is to protect local construction standards in the competitive low-bid process. In fact, the architects of the Davis-Bacon Act pointed to “itinerant” contractors with low-wage nonresident labor competing unfairly with local companies as a rationale for the policy (Whittaker, 2003). By ensuring that public expenditures maintain and reflect local market-based standards of compensation and craftsmanship, the Davis-Bacon Act creates a level playing field for construction contractors bidding on federal-aid projects (Duncan et al., 2017).

The Disadvantaged Business Enterprise (DBE) Program was enacted by Congress in 1982 to guarantee nondiscrimination in the award of federally-assisted construction projects and to promote the development of firms owned at least 51 percent by “socially and economically disadvantaged individuals” (FHWA, 2018). Currently, women and Black or African American, Latinx or Hispanic, Asian or Pacific Islander, and Native American men are considered disadvantaged, but other groups—such as military veterans—are often included (FTA, 2017). The program ensures that at least 10 percent of the funds authorized for highway projects are expended on DBEs nationwide. DBE goals on specific projects may be higher or lower depending on the demographics of the community or the state. For example, on federal-aid projects in Iowa, DBE goals range from just 1 percent to 5 percent. If DBE goals are not met on a project, the general contractor must provide an explanation, such as a lack of qualified subcontractors in a region (Duncan, 2015a).

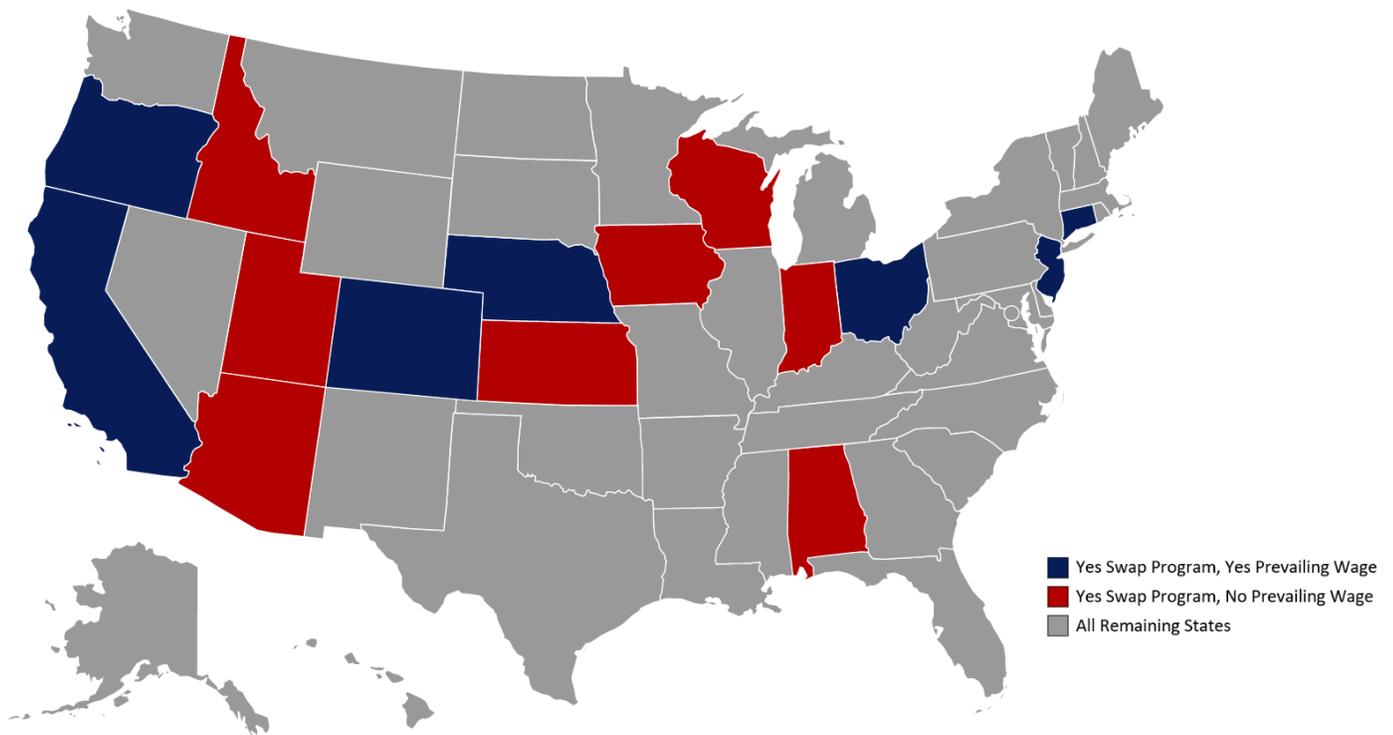
The Buy America Act was also passed by Congress in 1982 to ensure that federal transportation infrastructure projects are built with iron or steel materials manufactured in the United States. While raw materials may be imported, all manufacturing processes to produce iron and steel products must occur domestically (FHWA, 2017b). The goal of the Buy America Act is to protect U.S. manufacturers from foreign competition and boost steel industry employment (Platzer & Mallett, 2019).

“Federal-aid swap” programs bypass these federal construction standards that promote middle-class wages for construction workers, improve diversity among construction business owners, and protect jobs for American steelworkers. Federal-aid swap programs allow local units of government to exchange their allocation of federal-aid highway funds for state transportation funds. By swapping funds, projects are completed with state and local funds only, so federal construction standards no longer apply on these projects. State DOTs assign the swapped federal funds onto projects administered by the state—most of which were already receiving federal funds and

were subject to federal construction standards (Repko, 2020).¹ The result is that, even though the total investment from the federal government remains the same, fewer local projects are built with federal construction standards while federal dollars are “commingled” and concentrated on state projects.

Consider a hypothetical example of a federal-aid swap involving one state highway and one local bridge. The state highway will cost \$10 million and will receive 80 percent of its funding (\$8 million) from the federal government with a 20 percent match from state funds (\$2 million). The local bridge will cost \$2.5 million and will receive 80 percent of its funding (\$2 million) from the federal government with a 20 percent local match (\$500,000). Both projects are set to receive federal dollars and thus must adhere to federal construction standards. Instead, however, the federal funding apportioned to the local bridge is swapped dollar-for-dollar with state funding. This is an exchange of \$2 million in federal funds for \$2 million in state funds. After the swap, all \$10 million used to reconstruct the state highway comes from the federal government and all \$2.5 million used to rebuild the bridge comes from state and local sources. Only the state highway remains “federalized” while the “non-federalized” local bridge is no longer expected to pay Davis-Bacon prevailing wages, meet Disadvantaged Business Enterprise goals, and purchase iron and steel from American manufacturers. With this hypothetical swap, the federal investment remains the same at \$10 million, but the total value of projects subject to these federal construction standards has fallen from \$12.5 million to \$10 million, a 20 percent drop.

FIGURE 1: MAP OF U.S. STATES WITH FEDERAL-AID SWAP PROGRAMS, BY STATE PREVAILING WAGE STATUS



In 2017, the Iowa General Assembly passed legislation that authorized the Iowa Department of Transportation to create a “federal-aid swap” program (Iowa DOT, 2018b). The Iowa DOT approved the policy on February 13, 2018. While 28 states currently have state-level prevailing wage laws (sometimes referred to as “little Davis-

¹ For example, the Government Accountability Office has found that “within the STBG [Surface Transportation Block Grant] program, the federal funds swapped by the local agencies are combined by the state DOT with the other federal funds from that same federal-aid highway program. The suballocated STBG funds swapped by local agencies are combined with the other suballocated STBG funds that the state already has and plans to use on state administered projects” (Repko, 2020).

Bacon Acts”) on the books, Iowa is not one of them (Whittaker, 2003). Under Iowa’s federal-aid swap program, federal dollars that were designated for local construction projects and would have been covered by the Davis-Bacon Act are instead retained by the state, resulting in fewer total projects built with prevailing wage standards.

In Iowa’s program, federal funding is swapped with state funding on a dollar-for-dollar basis and each local Metropolitan Planning Organization (MPO) “is assumed to be a participant in the swap program unless their policy board decides otherwise” (Iowa DOT, 2018c). Two organizations representing three of Iowa’s 99 counties chose to opt out of the Iowa Department of Transportation’s federal-aid swap program. In March 2018, the Metropolitan Planning Organization of Johnson County became the first regional MPO to opt out of the “federal-aid swap” program (MPOJC, 2018). Johnson County contains Iowa City and the University of Iowa. In May 2019, the Bi-State Regional Commission, which is the MPO for the Quad Cities area and covers Scott County and Muscatine County in Iowa, voted to opt out (Lukitsch, 2019).

A nonpartisan Government Accountability Office (GAO) report found that 15 states had federal-aid swap programs (Figure 1). For most states, the amount of highway funds swapped ranged from less than 1 percent of the state’s federal-aid apportionment to 12 percent (Repko, 2020). However, Iowa has the most-utilized program, with 18 percent of federal-aid dollars swapped with state funds in 2019. The GAO reported that some state and local government officials asserted that federal-aid swap programs result in cost savings, but the GAO could not assess the validity of this claim because state DOTs did not track data needed to properly measure these effects.

Utilizing data on 1,302 Iowa Department of Transportation projects awarded from 2016 through 2020, this report puts this claim to the test. The report assesses whether the federal-aid swap program has had an impact on the cost of road and bridge construction projects in Iowa. The effects of federal Davis-Bacon prevailing wages and Disadvantaged Business Enterprise goals, which are skirted when projects are swapped, are also evaluated. In addition, an analysis of whether out-of-state contractors have been more likely to win Iowa DOT project bids since the introduction of the federal-aid swap program is included. Comparative data on the three Iowa counties that opted out of the federal-aid swap program relative to the 96 other counties are also presented. Then, effects that can be attributed the federal-aid swap program are used to estimate economic impacts on workers and contractors in Iowa. A concluding section addresses potential limitations and recaps key findings.

Research on the Effect of Prevailing Wages and Disadvantaged Business Enterprise Goals on Public Construction Costs and Contractor Bid Behavior

There have been 18 studies on the impact of prevailing wage standards on the cost of school construction, highway construction, and municipal building projects that have been published in academic journals since 2000 (Figure 2). Cumulatively, these peer-reviewed studies have analyzed more than 21,000 traditional public works projects. Peer review is the process of establishing credibility by submitting research to a group of anonymous, independent experts who critically evaluate methodologies and conclusions before being accepted for publication. By contrast, studies that have not undergone peer review can suffer from errors, methodological defects, and misleading or suspicious conclusions.

Of the 18 peer-reviewed studies on prevailing wage laws since 2000, 13 pertain to school construction costs, which is a key focus among economic researchers. Additionally, three evaluate highway costs and two investigate public and municipal buildings. In total, 15 of these peer-reviewed studies (83 percent) find that prevailing wage laws have no effect on total construction costs (Figure 2).

FIGURE 2: RESEARCH ON IMPACT OF PREVAILING WAGE LAWS ON THE COST OF TRADITIONAL PUBLIC WORKS PROJECTS SINCE 2000

Study	Authors	Year	Project Focus	Projects	Geography	Effect
1	Lameck Onsarigo; Kevin Duncan; Alan Atalah	2020	School construction	113	Ohio	No effect
2	Kevin Duncan; Jeffrey Waddoups	2020	School construction	77	Nevada	No effect
3	Kevin Duncan	2015	Highways	132	Colorado	No effect
4	Kevin Duncan	2015	Highways	91	Colorado	No effect
5	Kevin Duncan; Peter Philips; Mark Prus	2014	School construction	498	British Columbia (Canada)	No effect
6	Fadhel Kaboub; Michael Kelsay	2014	Public buildings	3,120	12 Midwest states*	No effect
7	Alan Atalah	2013	School construction	1,496	Ohio	No effect
8	Alan Atalah	2013	School construction	1,496	Ohio	No effect
9	Kevin Duncan; Peter Philips; Mark Prus	2012	School construction	723	British Columbia (Canada)	No effect
10	Jaewhan Kim; Chang Kuo-Liang; Peter Philips	2012	Municipal projects	141	California	No effect
11	Jeffrey Vincent; Paavo Monkkonen	2010	School construction	2,645	United States	13%
12	Kevin Duncan; Peter Philips; Mark Prus	2009	School construction	438	British Columbia (Canada)	No effect
13	Kevin Duncan; Peter Philips; Mark Prus	2006	School construction	528	British Columbia (Canada)	No effect
14	Hamid Azari-Rad; Peter Philips; Mark Prus	2003	School construction	4,653	United States	No effect
15	Hamid Azari-Rad; Peter Philips; Mark Prus	2002	School construction	4,974	United States	No effect
16	Donald Vitaliano	2002	Highways (spending)	50**	United States	8%
17	Edward Keller; William Hartman	2001	School construction	25***	Pennsylvania	2%
18	Cihan Bilginsoy; Peter Philips	2000	School construction	54	British Columbia (Canada)	No effect

*Nebraska, South Dakota, North Dakota, Kansas, Missouri, Iowa, Minnesota, Wisconsin, Illinois, Indiana, Michigan, and Ohio.
 **The 50 observations are DOT expenditures for all 50 states, and do not account for the amount of new highway construction ordered, which is an important determinant of project costs.
 ***The analysis did not analyze *actual* projects, but rather conducted hypothetical "wage differentials" for 25 arbitrary projects. Wage differential studies are flawed compared to regression analyses (Duncan & Ormiston, 2018).

Source(s): Individual studies listed in table.

The earliest peer-reviewed studies that used regression analyses to assess the effect of prevailing wage laws on school construction costs were authored by Professors Azari-Rad, Philips, and Prus. These economists examined more than 4,000 schools built across the United States and did not find any statistically significant cost difference between schools built in states with prevailing wage laws and those constructed in states without prevailing wage laws (Azari-Rad et al., 2002; Azari-Rad et al., 2003).

Five studies have taken advantage of the introduction of a prevailing wage policy in British Columbia, Canada to compare school construction costs. After accounting for the business cycle, the number of bidders, and the project type, researchers found that school construction costs under the policy were not statistically different from costs of schools built without prevailing wage (Bilginsoy & Philips, 2000; Duncan et al., 2014). The size differential per project and project efficiency also did not change after the policy was in effect, which is consistent with stable total costs (Duncan et al., 2006; Duncan et al., 2009; Duncan et al., 2012).

Two studies conducted in 2013 compared bids of construction companies that contractually pay prevailing wage to those submitted by contractors paying lower rates in Ohio. Based on an examination of more than 8,000 bids on nearly 1,500 school projects, average bid costs per square foot were not statistically significant different with prevailing wages (Atalah, 2013a). When analyzing bids submitted by different trades, the average bid cost per square foot was not higher for 15 of the 18 trades (83 percent) that paid prevailing wages (Atalah, 2013b).

The two most recent peer-reviewed studies echo the earlier research. One 2020 study analyzing more than 100 school construction projects in Ohio found that prevailing wage standards do not have a statistically significant effect on building costs (Onsarigo et al., 2020). A second analysis of nearly 80 school construction projects in the Las Vegas area found that Nevada’s prevailing wage law has no statistically significant effect on school construction costs (Duncan & Waddoups, 2020).

In addition to these studies that focus on school construction, two peer-reviewed studies have investigated the effect of prevailing wage laws on municipal and public buildings (Kim et al., 2012; Kaboub & Kelsay, 2014). One looks at about 140 local projects in the Palo Alto, California area while the other evaluates more than 3,100 public buildings in 12 states in the Midwest and Great Plains regions, but both conclude that prevailing wage laws have no impact on total construction costs.

Finally, three studies have focused on highway construction projects. The first study used data from 1996 to analyze the effect of prevailing wage on highway expenditures (Vitaliano, 2002). The study indicated that state prevailing wage laws increased overall costs by 8 percent, but the analysis only included 50 observations for the 50 U.S. states and did not account for other important factors. For example, the author did not account for the amount of new highway construction ordered, which is an important determinant of DOT expenditures.

Two studies by Professor Duncan examined the cost impact of federal Davis-Bacon Act prevailing wages and Disadvantaged Business Enterprise goals on highway maintenance projects in Colorado between 2000 and 2011. The first study compares the costs of projects funded by the federal government to projects financed by the State of Colorado (Duncan, 2015a). Federal funding requires that contractors pay Davis-Bacon prevailing wages and meet DBE goals while state-funded projects in Colorado were not covered by either policy during this time. After taking differences in project size and complexity into consideration, there is no difference in average project costs, regardless of prevailing wage and DBE coverage. Additional analysis compares resurfacing costs as contractors switch from federal to state projects (Duncan, 2015b). Winning bids on less-regulated state projects are not different than winning bids on federal projects that include prevailing wage standards and DBE goals.

The economic consensus is that prevailing wage laws have no impact on total construction costs (Duncan & Ormiston, 2018). Prevailing wage laws do not increase project costs for four main reasons. First, labor costs are a low and historically declining share of total costs in the construction industry—approximately 23 percent in the United States (Census, 2017). Second, peer-reviewed research indicates that, when wages rise in construction, contractors respond by utilizing more capital equipment and by hiring skilled workers to replace their less-productive counterparts (Balistreri et al., 2003; Blankenau & Cassou, 2011). Third, contractors have also been found to respond to higher wages by reducing expenditures on materials, fuels, and rental equipment (Duncan & Lantsberg, 2015). Finally, there have been four peer-reviewed studies since 2012 that empirically examine the effect of prevailing wage standards on the overall level of bid competition—an important

determinant of construction costs. All four of these studies, which collectively evaluate data on more than 2,000 bid proposals, find that prevailing wage standards do not reduce the number of bidders on public construction projects (Duncan, 2015a; Kim et al., 2012; Onsarigo et al., 2020; Duncan & Waddoups, 2020). In fact, “the cost-reducing effect of increased bid competition is stronger on projects covered by the prevailing wage policy” (Onsarigo et al., 2020).

The economic research addressing the effect of DBE goals is similar. One study on nearly 2,600 highway construction projects in California examined the effect of Proposition 209, a state-level disadvantaged business enterprise policy, on construction costs. This policy prohibited race and gender from being included in state-funded contracting, isolating the effect of the preferential bid program from other policies that might also have affected project costs. After controlling for other factors, the author finds that the cost of state-funded projects fell by as much as 6 percent compared with federal projects that still included DBE goals (Marion, 2009). Conversely, an examination of more than 3,000 asphalt paving projects in Texas found that the cost of federal projects covered by DBE policies was not statistically different from state-funded projects, which did not include DBE goals. The authors also report that federal projects with higher DBE goals are no more costly than projects with lower goals (De Silva et al., 2012). In addition, Professor Duncan’s aforementioned analyses of 132 highway resurfacing projects in Colorado found that federally-funded projects were no more costly than state-funded projects and that the level of bid competition did not change (Duncan, 2015a; Duncan, 2015b). Each of these studies accounted for detailed information on project characteristics, including the engineer’s estimate.

Iowa DOT Highway Bid Data and Methodology

This analysis uses publicly available bid data on Iowa Department of Transportation projects. Winning bid data on 1,302 awarded highway projects were obtained from the Iowa Department of Transportation’s “Bid Tabulations” and “Plans and Estimating Proposals” website pages as well as from Bid Express (Iowa DOT, 2020a; Iowa DOT, 2021a; Bid Express, 2021). The data exclude bridge deck overlay projects and traffic light projects.²

A total of 15 months of data was collected from the first quarters (i.e., January, February, and March) of 2016, 2017, 2018, 2019, and 2020. There are two reasons why the sample size is limited to the first quarter of data. First, data was only collected through March of 2020 due to the novel coronavirus disease (COVID-19) pandemic. Without a full understanding of economic and policy research on the impacts of the COVID-19 pandemic on state highway expenditures and gasoline tax, license fees, and other forms of transportation revenue, the sample size was limited to the months before Iowa issued its advisory stay-at-home order on April 6, 2020 to remove any effect of the pandemic (Moreland et al., 2020).³ Second, to reduce the effects of seasonality, data for the months of April through December were excluded for earlier years.⁴ With an implementation date of February 13, 2018, the sample size includes 573 projects before the federal-aid swap program was in effect and 729 projects after the policy was in place.

² The author wishes to thank the Indiana, Illinois, Iowa Foundation for Fair Contracting (IIIFFC) for assistance in collecting the Iowa DOT bid data on hot mix asphalt (HMA), plain cement concrete (PCC), and reinforced concrete box (RCB) projects and contractor business addresses.

³ For example, initial research found that individual choices—motivated by fears of infection—were responsible for about 88 percent of the drop in consumer traffic, while legal restrictions were responsible for the remaining 12 percent (Goolsbee & Syverson, 2020). Accordingly, even though Iowa did not have a mandatory stay-at-home order in place, it is likely that the COVID-19 pandemic did have an effect on Iowa’s transportation infrastructure.

⁴ In general, the first quarter of the year is when the highest amount of Iowa DOT contracts is let. Projects are awarded earlier in the year so they can be built during the spring, summer, and fall months that are ideal for the prime construction season. For example, in 2018, fully 270 projects, excluding bridge deck overlay and traffic signal projects, totaling \$350 million were awarded from January through March. Over the full calendar year, 566 of these projects were awarded at a total cost of \$818 million. The first quarter thus accounted for 48 percent of all projects awarded and 43 percent of total project value awarded.

The full dataset includes information on the letting date, the road system, the county where the construction is to occur, and the awarded contractor’s business name. The road systems represented in the sample include 389 farm-to-market road projects, 338 interstate and National Highway System (NHS) primary road projects, 83 urban road projects, 32 local secondary road projects, and 322 maintenance projects. The counties with the most projects awarded are Linn County (65 projects), which is home to the City of Cedar Rapids, and Polk County (64 projects), which includes the City of Des Moines. Addresses for the construction firms that are awarded projects are provided by the Iowa DOT, which were then matched with Iowa Secretary of State business registrations to determine the home state of winning contractors ([Iowa SOS, 2020](#)).⁵

The full dataset also includes information on whether the project received federal-aid funding and paid Davis-Bacon prevailing wages, whether the project was “swapped” through the federal-aid swap program, and whether the project included Disadvantaged Business Enterprise goals. In total, there were 389 highway projects that received federal-aid funding, 111 projects that were swapped, and 802 other projects that were not subject to Davis-Bacon prevailing wage rates. None of the projects in the federal-aid swap program paid Davis-Bacon prevailing wages or had DBE goals attached.

While the Iowa DOT establishes a cost estimate for each project before it is advertised, the department does not release the engineer’s estimate to the public. According to the Iowa DOT, “the intent of this confidentiality is so that the estimate does not influence the bidders’ unit prices” to encourage competitive pricing ([Iowa DOT, 2020b](#)). However, the dataset includes information on each project’s “proposal guaranty,” which is also sometimes called the bid bond. The required amount of the proposal guaranty is provided by the Iowa DOT on the first page of each estimating proposal and is based off the internal engineer’s estimate ([Iowa DOT, 2021b](#)). A contractor’s proposal guaranty must not be less than the amount set by Iowa DOT. Given that minimum proposal guarantees are determined by the Iowa DOT and are based on unreleased engineer’s estimates, the proposal guaranty for each project can be used a proxy for the size and complexity of the project ([Duncan, 2015a](#)).

To parse out the independent effects of the federal aid-swap program, Davis-Bacon prevailing wage coverage, and DBE goals on total construction costs and the probability that a project is awarded to an out-of-state contractor, advanced but common statistical techniques called “regressions” are utilized. By adopting an intuitive technique utilized in both the social sciences and the medical field, the regressions isolate the impact of a change in one group (the “treatment group”) from a similar group (the “control group”). For example, projects that have been swapped would be considered the treatment group and projects that have not would be considered the control group. The analyses also exploit the “natural experiment” posed by variation within Iowa after the federal-aid swap program was introduced, with local MPOs representing Johnson County, Scott County, and Muscatine County voting to opt out of the program. Regressions also describe “how much” a variable is responsible for a particular outcome. For example, a robust ordinary least squares (OLS) regression can evaluate how much the federal-aid swap program increases or decreases the average cost of a highway project in Iowa. Similarly, a robust probit regression, with average marginal effects, can be used to understand how much Davis-Bacon prevailing wage standards increase or decrease the probability of an out-of-state contractor winning a bid on a highway project. The most advanced regressions control for the location of the project, the type of system, and—through the proposal guaranty—the size and complexity of the project.

⁵ There were 42 different contractors in the dataset from states other than Iowa. Many were awarded multiple projects. The most frequent home states of the non-resident contractors were Minnesota, Nebraska, Ohio, and Wisconsin. Contractors from Arizona, Florida, Indiana, Michigan, Missouri, Pennsylvania, South Dakota, and Virginia were also awarded Iowa DOT projects.

The Effects of the Federal-Aid Swap Program on Construction Market Outcomes in Iowa

Summary statistics for the 573 highway projects in the pre-swap period and the 729 projects awarded in the post-swap period by the Iowa Department of Transportation are reported in Figure 3. The total value of all highway construction work in the sample size is just under \$1.7 billion. The data indicate that swapped projects accounted for 15 percent of all projects and 18 percent of all project value after the policy was introduced. The share of projects with DBE goals fell from about 30 percent in the pre-swap period to 24 percent in the post-swap period, a 6 percent decrease. The share of Iowa DOT contracts awarded to out-of-state contractors marginally increased from 13 percent to 14 percent. Additionally, while the average proposal guaranty was not statistically different between the two periods, suggesting that the average project was not significantly larger or more complex in the post-swap months, the average value-to-guaranty ratio increased. Prior to the program, the average project cost less than 12 times as much as the bid bond but after the program it increased to more than 13 times the bid bond. This could be an indication that more projects exceeded the Iowa DOT’s internal engineer’s estimates in the post-swap period.

Similar summary statistics are shown in Figure 4 for the 389 “federalized” projects that included Davis-Bacon prevailing wage standards and the 913 highway projects that did not include any federal-aid funds. The data indicate that, on average, federalized projects are more expensive, larger, and more complex than non-federalized projects. For example, the average low bid is nearly \$2.5 million on federal-aid projects compared with under \$800,000 for state projects. However, the average proposal guaranty is also higher on federalized projects, a difference that is proportional with the average low bid. In fact, the value-to-guaranty ratio averages about 13 times the bid bond amount for both types of projects. Swapped projects account for 12 percent of all non-federalized contracts and 25 percent of all non-federalized construction value awarded by the Iowa DOT.

FIGURE 3: SUMMARY STATISTICS ON IOWA DOT PROJECTS IN SAMPLE IN THE PRE-SWAP AND POST-SWAP PERIOD, 2016-2020

Highway Construction Metric	Pre-Swap Period	Post-Swap Period	Difference
Number of Projects	573	729	
Number of Swapped Projects	0	111	
Swapped Share of Projects	0.0%	15.2%	+15.2% ***
Projects with Federal-Aid Wages	210	179	
Share with Federal-Aid Wages	36.6%	24.5%	-12.1% ***
Average Project Value	\$1,177,457	\$1,404,972	+19.3% *
Value of Projects	\$674,682,861	\$1,024,224,588	
Average Project Value of Swapped Projects	\$0	\$1,641,755	
Value of Swapped Projects	\$0	\$182,234,805	
Swapped Share of Project Value	0.0%	17.8%	+17.8% ***
Projects with DBE Goals	169	160	
Share with DBE Goals	29.6%	23.6%	-6.0% **
Projects Awarded to Out-of-State Contractors	77	104	
Share Awarded to Out-of-State Contractors	13.4%	14.3%	+0.8%
Average Proposal Guaranty	\$131,897	\$121,071	-8.2%
Value-to-Guaranty Ratio	11.7	13.5	+14.8% ***

Source(s): Analysis of public bid information from Iowa Department of Transportation “Bid Tabulations” and “Plans and Estimating Proposals” and Bid Express (Iowa DOT, 2020a; Iowa DOT, 2021a; Bid Express, 2021). ***p<|0.01|; **p<|0.05|; *p<|0.10| (t-tests).

The data presented in Figure 4 also identify some of the specific differences between federalized and non-federalized projects. About 84 percent of federalized projects include Disadvantaged Business Enterprise goals

compared with less than 1 percent of non-federalized projects. Furthermore, fewer than 10 percent of projects receiving federal-aid funds that include Davis-Bacon prevailing wage standards are awarded to out-of-state contractors compared with nearly 16 percent on state and local highway projects.

FIGURE 4: SUMMARY STATISTICS ON IOWA DOT PROJECTS IN SAMPLE BY FEDERAL-AID FUNDING (FEDERALIZED STATUS), 2016-2020

Highway Construction Metric	Federalized Projects	Non-federalized Projects	Difference
Number of Projects	389	913	
Number of Swapped Projects	0	111	
Swapped Share of Projects	0.0%	12.2%	+12.2% ***
Average Project Value	\$2,516,897	\$788,428	-68.7% ***
Value of Projects	\$979,072,933	\$719,834,399	-26.5%
Average Project Value of Swapped Projects	\$0	\$1,641,755	
Value of Swapped Projects	\$0	\$182,234,805	
Swapped Share of Project Value	0.0%	25.3%	+25.3% ***
Projects with DBE Goals	324	5	
Share with DBE Goals	83.9%	0.6%	-83.4% ***
Projects Awarded to Out-of-State Contractors	38	143	
Share Awarded to Out-of-State Contractors	9.8%	15.7%	+5.9% ***
Average Proposal Guaranty	\$244,333	\$74,906	-69.3% ***
Value-to-Guaranty Ratio	12.9	12.5	-3.3%

Source(s): Analysis of public bid information from Iowa Department of Transportation “Bid Tabulations” and “Plans and Estimating Proposals” and Bid Express (Iowa DOT, 2020a; Iowa DOT, 2021a; Bid Express, 2021). ***p<|0.01|; **p<|0.05|; *p<|0.10| (t-tests).

Statistical analyses of the winning bid data provide an opportunity to examine the effect of federal-aid swap programs on the cost of highway construction projects. The models account for the size and complexity of a project, the project type, the location of the project, whether an out-of-state contractor was awarded the project, and average annual cost inflation. Key findings are presented in Figure 5, but full regression results are reported in Table A the Appendix.

FIGURE 5: THE EFFECT OF FUND SWAPPING, DAVIS-BACON PREVAILING WAGES, AND DBE GOALS ON HIGHWAY COSTS IN IOWA

Effect on the Winning Low Bid: Robust OLS Regressions on Award Amount	Analysis of Swapped Projects	Analysis of Federal Standards	Analysis of Federalized and Swapped Projects Only
Project Swapped through Federal-Aid Swap Program	No Effect		No Effect
Project Covered by Davis-Bacon Prevailing Wages		No Effect	
Projects Has Disadvantaged Business Enterprise Goals		No Effect	

Source(s): Analysis of public bid information from Iowa Department of Transportation “Bid Tabulations” and “Plans and Estimating Proposals” and Bid Express (Iowa DOT, 2020a; Iowa DOT, 2021a; Bid Express, 2021). ***p<|0.01|; **p<|0.05|; *p<|0.10| (two-tailed tests). The sample size is between 467 projects and 1,206 projects for each analysis. The R²s range from 0.60 to 0.74. For full results, see Table A in the Appendix.

The data reveals that the federal-aid swap program did not reduce costs on highway construction projects in Iowa, even after controlling for project size and complexity, project type, project location, and home state of the winning contractor, and annual cost inflation (Figure 5). Because highway projects that are swapped are no longer covered by federal construction standards, understanding why the federal-aid swap program is not resulting in cost savings requires insights into the effects of paying prevailing wages and meeting DBE goals. After accounting for other factors, federal Davis-Bacon prevailing wage coverage is not associated higher costs compared with non-federalized projects. This means that projects covered by Davis-Bacon prevailing wage standards are no more expensive to build than projects that are not. The inclusion of DBE goals also has no statistical effect on the cost of highway construction projects. These results suggest that the federal-aid swap

program does not result in lower costs on highway construction projects because the federal standards that the program aims to bypass do not increase costs in the first place.

A full analysis compares federalized and swapped projects, the “treatment group” of affected projects, and contrasts them to state projects, the “control group” of projects that were not affected by the program (Figure 6).⁶ The results imply that the federal-aid swap program has not saved any money—and may in fact have the opposite effect. After accounting for project size and complexity, project type, location of the project, and home state of the winning contractor, the federal-aid swap program increases project costs by about 25 percent, a difference that is statistically significant at the 90-percent level of statistical confidence. If the analysis is limited to only swapped projects (e.g., federalized projects in the post-swap period are excluded), then there is a 27 percent increase in highway construction costs associated with the federal-aid swap program. This effect is statistically significant at the 95-percent level of statistical confidence.

Importantly, the Iowa DOT federal-aid swap program allows regional Metropolitan Planning Organizations (MPOs) to opt out. Since the policy was implemented, two MPOs—the Metropolitan Planning Organization of Johnson County and the Bi-State Regional Commission—have voted not to participate in the program. These MPOs represent Johnson County, Scott County, and Muscatine County in Iowa, which include Iowa City, Davenport, and Bettendorf. Of the 1,302 Iowa DOT projects awarded, 84 were located in Johnson County, Scott County, and Muscatine County.

There is no evidence that highway construction costs were higher in the counties that retained Davis-Bacon prevailing wage standards and DBE goals by opting out of the federal-aid swap program (Figure 6). After accounting for project size and complexity, project type, and the home state of the winning contractor, opting out of the federal-aid swap program had no effect on total construction costs in the Quad Cities and in Johnson County than the rest of the state. These results again indicate that Davis-Bacon prevailing wages and DBE goals do not affect the cost of highway construction projects.

FIGURE 6: TREATMENT AND CONTROL GROUP ANALYSES ON FEDERAL-AID SWAP PROGRAM AND HIGHWAY PROJECT COSTS IN IOWA

Effect on the Winning Low Bid: Robust OLS Regressions on Award Amount	Affected Projects in Affected Counties	Only Swapped Projects in Post-Swap Period	Johnson County and Quad Cities Opt Outs
Effect of the Federal-Aid Swap Program	+24.6%*	+26.7%**	
Effect of Maintaining Federal Standards			No Effect

Source(s): Analysis of public bid information from Iowa Department of Transportation “Bid Tabulations” and “Plans and Estimating Proposals” and Bid Express (Iowa DOT, 2020a; Iowa DOT, 2021a; Bid Express, 2021). ***p<|0.01|; **p<|0.05|; *p<|0.10| (two-tailed tests). The sample size ranges from 467 projects to 707 projects for each analysis. The R²s range from 0.57 to 0.70. For full results, see Table B in the Appendix.

Some state and local government officials claim that, since the same amount of federal-aid funds are expended statewide with fund swapping as would be expended without fund swapping, the program has no impact on diversity outcomes or worker wages.⁷ While the federal-aid program itself cannot be analyzed because none of the 111 projects that were swapped included DBE goals and federal Davis-Bacon prevailing wages, statistical analyses of the winning bid data can assess whether there has been a discernible change in the overall share of Iowa DOT highway projects that include federal construction standards since the program was enacted (Figure 7). The data reveal that the post-swap period is linked with a 4 percent drop in the share of all highway projects

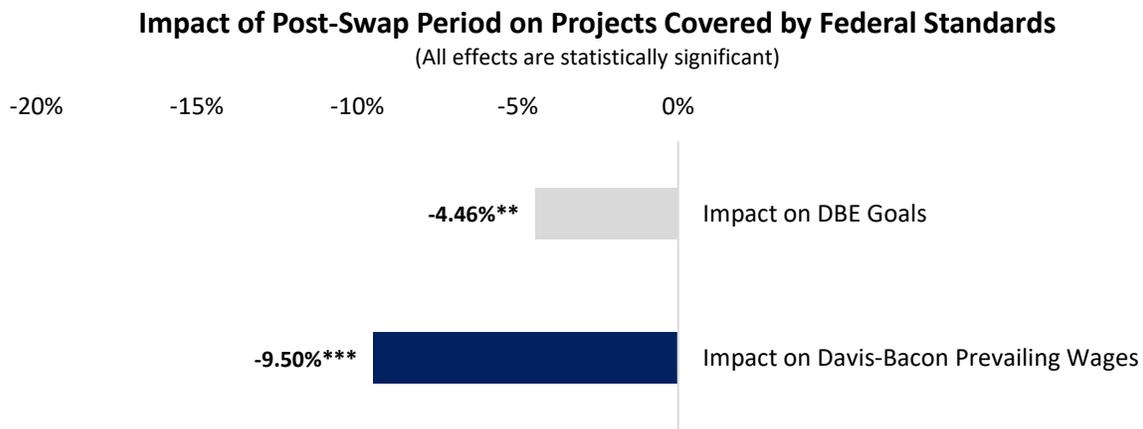
⁶ The sample is limited to counties that had both federalized projects before the program was implemented and swapped projects after. This yields 185 state projects in the pre-swap period, 208 state projects in the post-swap period, 154 federalized projects in the pre-swap period, and 87 federalized projects and 75 swapped projects in the post-swap period.

⁷ Refer to the hypothetical example in the Introduction to see how this is not necessarily true. Officials from the Utah Department of Transportation also informed the Government Accountability Office that they seek to consolidate federal funds on existing “federalized” projects, resulting in fewer projects in Utah with federal construction standards (Repko, 2020).

with DBE goals and a 10 percent drop in the share of all highway projects that pay Davis-Bacon prevailing wages. Since project size is accounted for, about 4 percent more Iowa DOT construction work would have included diversity goals and 10 percent more Iowa DOT construction work would have paid prevailing wages after February 2018 were it not for the federal-aid swap program.

The purpose of prevailing wage is to protect local construction standards in the competitive bid process by creating a level playing field for contractors. The Davis-Bacon Act was enacted in 1931 in response to out-of-state contractors from low-wage and less-skilled areas winning public projects in areas with higher standards of compensation and craftsmanship (Whittaker, 2007). Because the federal-aid swap program allows state DOTs to bypass the payment of Davis-Bacon prevailing wages, one claim made by those who are skeptical of the policy is that it could cause an influx of out-of-state contractors. For example, in a May 2019 article urging local elected officials to opt out of the Iowa DOT federal-aid swap program, the *Quad-City Times* Editorial Board wrote that it was “concerned about local contractors, their employees, and their families” because “their wages and profits support other businesses” in the community (Quad-City Times Editorial Board, 2019).

FIGURE 7: THE EFFECT OF THE FEDERAL-AID SWAP PROGRAM ON THE SHARE OF PROJECTS COVERED BY FEDERAL STANDARDS IN IOWA

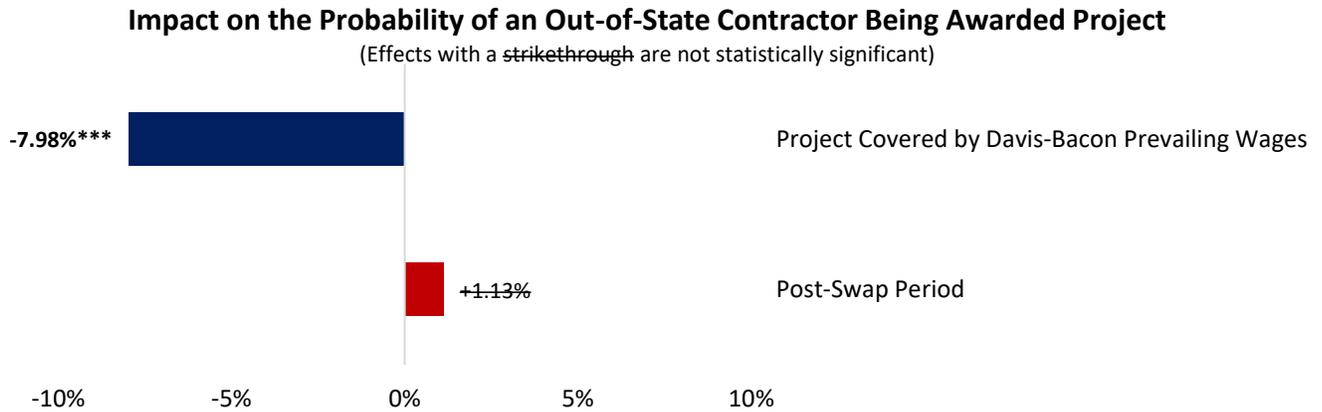


Source(s): Analysis of public bid information from Iowa Department of Transportation “Bid Tabulations” and “Plans and Estimating Proposals” and Bid Express (Iowa DOT, 2020a; Iowa DOT, 2021a; Bid Express, 2021). *** $p < |0.01|$; ** $p < |0.05|$; * $p < |0.10|$ (two-tailed tests). The sample size is between 1,140 projects and 1,206 projects for each analysis. The R^2 s range from 0.33 to 0.39. For full results, see Table C in the Appendix.

This claim can be tested empirically (Figure 8). After accounting for project size and complexity, project type, and location of the project, the post-swap period is associated with a 1 percent increase in the probability that an out-of-state contractor is awarded an Iowa DOT project, but the effect is not statistically significant. However, Davis-Bacon prevailing wage standards reduce the chances that an out-of-state contractor wins a highway project by 8 percent. This effect is significant at the 99-percent level of statistical confidence. Consequently, because the federal-aid swap program reduces the share of projects paying Davis-Bacon prevailing wages by 10 and the Davis-Bacon Act reduces the state contracts awarded to out-of-state firm by 8 percent, the federal-aid swap program increases the market share of out-of-state contractors on highway construction projects by about 1 percent.⁸

⁸ The -9.50 percent effect on the share of projects that include federal-aid wages multiplied by the -7.98 percent effect on the share of projects awarded to out-of-state contractors, which both control for project size and project type, equates to a 0.76 percent increase in the share of all projects awarded to out-of-state contractors. Over the full calendar year in 2018, there were 566 Iowa DOT projects, excluding bridge deck overlay projects and traffic signal projects, costing \$818 million. A 0.76 percent uptick in awards to out-of-state contractors would represent 4.3 additional projects going to out-of-state contractors and about \$6.2 million in lost construction work for local, state-resident contractors.

FIGURE 8: EFFECT OF FUND SWAPPING AND DAVIS-BACON ACT ON THE CHANCES OF AN OUT-OF-STATE CONTRACTOR WIN IN IOWA



Source(s) Analysis of public bid information from Iowa Department of Transportation “Bid Tabulations” and “Plans and Estimating Proposals” and Bid Express (Iowa DOT, 2020a; Iowa DOT, 2021a; Bid Express, 2021). *** $p < 0.01$; ** $p < 0.05$; * $p < 0.10$ (two-tailed tests). The sample size is 1,137 projects. The R^2 is 0.11. For full regression results, see Table C in the Appendix.

The Effects of the Federal-Aid Swap Program on Economic Outcomes in Iowa

Actual data from winning bids on Iowa Department of Transportation projects reveals that the state’s federal-aid swap program has reduced the share of projects covered by Davis-Bacon prevailing wages by nearly 10 percent. In Iowa, projects that are covered by Davis-Bacon prevailing wage are 8 percent more likely to be awarded to in-state contractors. As a result, Iowa’s federal-aid swap program has resulted in both fewer skilled construction workers earning prevailing wages and fewer local contractors winning bids on highway projects.

Iowa invests nearly \$2 billion on road and bridge infrastructure per year (FHWA, 2020b). In the most recent *Economic Census of Construction*, the net value of all highway, street, and bridge construction work totaled \$1.8 billion (Census, 2017). Blue-collar construction worker labor costs accounted for \$341 million, representing about 19 percent of total construction costs. Materials, fuels, and supplies accounted for another \$833 million, or 47 percent of total construction costs (Figure 9).

The average effect of the federal-aid swap program is estimated to reduce the market share of local contractors by about \$13 million per year (Figure 9). However, the costs of materials, fuels, and supplies is likely to remain in the state regardless of whether local contractors or out-of-state contractors perform the work.⁹ As a result, the federal-aid swap program is associated with an estimated loss of \$7.1 million in local construction value. Furthermore, an estimated \$168 million in highway construction work that would have paid Davis-Bacon prevailing wages is swapped per year, affecting more than \$32 million in wages and benefits. Because construction workers earn about 5 percent more when they are covered by prevailing wage standards, the decrease in projects covered by the Davis-Bacon Act produces an estimated \$1.7 million loss in total earnings for Iowa’s skilled construction workers (Manzo et al., 2020; Manzo & Duncan, 2018).¹⁰ The combined effects amount to an \$8.8 million decrease in construction work and construction value (Figure 9). This is nearly \$9 million in economic activity that is no longer spent each year at retail stores, restaurants, and other local businesses in Iowa due to the federal-aid swap program.

⁹ On the other hand, the removal of “Buy America” provisions means that it may be less likely that materials are purchased locally from Iowa’s steel manufacturers.

¹⁰ A recent peer-reviewed academic study found that the repeal of state prevailing wage laws decreased annual average construction blue-collar income by as much as 4.2 percent and voluntary benefits by as much as 16.0 percent (Fenn et al., 2018).

FIGURE 9: THE ESTIMATED ANNUAL ECONOMIC EFFECTS OF THE FEDERAL-AID SWAP PROGRAM ON IOWA

Step	Economic Metric	Math	Value
A	Highway, Street, and Bridge Construction Work in Iowa	--	\$1,767,539,000
B	Construction Worker Wages and Benefits	--	\$341,458,000
C	Cost of Materials, Fuels, and Supplies	--	\$832,860,000
D	Construction Wages and Benefits Share of Total	$B \div A$	19.32%
E	Materials, Fuels, and Supplies Share of Total	$C \div A$	47.12%
F	Impact of Swap Program on Projects with Federal-Aid Wages	--	-9.50%
G	Impact of Federal-Aid Wages on Wins by In-State Contractors	--	+7.98%
H	Total Impact of Swap Program on In-State Contractors	$F \times G$	-0.76%
I	Leakage: Increase in Out-of-State Market Share	$H \times A$	-\$13,399,500
J	Total Impact on Retained Construction Value	$I \times (1-E)$	-\$7,085,700
K	Change in Projects without Federal-Aid Wages	$F \times A$	-\$167,857,700
L	Labor Share of Change in Projects without Federal-Aid Wages	$K \times D$	-\$32,427,200
M	Impact of Prevailing Wage Standards on Construction Wages	--	+5.10%
N	Total Impact on Local Workers	$L \times M$	-\$1,653,800
O	Total Impact on Iowa Construction Market	$J + N$	-\$8,739,500

Source(s): Analysis of public bid information from Iowa Department of Transportation “Bid Tabulations” and “Plans and Estimating Proposals” and Bid Express (Iowa DOT, 2020a; Iowa DOT, 2021a; Bid Express, 2021). Annual estimates of “highway, street, and bridge construction work,” “construction worker wages and benefits,” and “cost of materials, fuels, and supplies” are from the *Economic Census of Construction*, (Census, 2017). The “impact of prevailing wage standards on construction wages” is from a national study on the effects of state prevailing wage laws on construction worker income, homeownership rates, and property taxes (Manzo et al., 2020) and a regional study on the effects of Minnesota’s Prevailing Wage Act, for which Iowa was one of four states in the “control group” (Manzo & Duncan, 2018).

Conclusion

In a 2020 report, the nonpartisan Government Accountability Office concluded that “the impact of fund swapping... cannot be definitively determined due to limited data availability” (Repko, 2020). The intent of this report is to fill that void with data from the federal-aid swap program in Iowa, which was the most-utilized program in the United States. Results from about 1,300 highway construction projects in Iowa built both before and after the implementation of the federal-aid swap program find that Davis-Bacon prevailing wages and Disadvantaged Business Enterprise goals, which are skirted when projects are swapped, have no effect on total costs. Consequently, despite the claims of some state and local government officials, the federal-aid swap program in Iowa has not resulted in any cost savings. In fact, there is some evidence to suggest that the federal-aid swap program is associated with higher costs, although there is no difference in highway costs between the 96 counties where the policy is in effect and the three counties that opted out of participating in the program.

The federal-aid swap program does affect construction worker earnings, contractor diversity, and local contractors. Federal-aid swap programs allow states to remove federal construction standards on some highway projects and commingle and consolidate the federal dollars onto larger state projects that were already receiving federal funds. The result is that 10 percent fewer projects are built with federal Davis-Bacon prevailing wage standards and 4 percent fewer projects are built with Disadvantaged Business Enterprise goals. Because the payment of Davis-Bacon prevailing wages is associated with 8 percent more work for in-state contractors, the federal-aid swap program has also increased the chances that out-of-state contractors are awarded highway construction work funded by Iowa taxpayers. The combined impact is an estimated \$9 million in lost economic activity from local contractors and local construction workers in Iowa.

This study only focuses on two construction policies on federalized projects—Davis-Bacon prevailing wages and Disadvantaged Business Enterprise goals. It does not directly address the impacts that the Buy America Act and any other federal requirements, such as environmental regulations, have on construction costs. Yet, because the federal-aid swap program bypasses all of these federal construction standards and has had no effect on total construction costs, the indirect implication is that the Buy America Act and federal environmental regulations also do not significantly alter total costs on highway construction projects. Additionally, this analysis cannot assess whether federal-aid swap programs allow agencies to complete highway projects in a shorter amount of time due to the “less stringent” requirements attached to state funds (Repko, 2020). However, Iowa’s federal-aid swap program did not reduce the cost of highway projects. To the extent that state and local agencies only have a fixed amount of money to invest in road and bridge infrastructure in any given year, a faster completion time would not result in more projects being completed over the year.

Future research should explore the impact of the various “exchange rates” within federal-aid swap programs. While the State of Iowa has a dollar-for-dollar exchange rate when swapping federal funds for state funds, others have lower rates. For example, Kansas provides local agencies with 90 cents of state funds in exchange for \$1 of federal funds (RSPCB, 2015). Alabama and Indiana have an exchange rate of 75 cents in state funds for \$1 in federal funds (Repko, 2020; Indiana LSA, 2017). The data suggests that a lower exchange rate is correlated with less utilization of federal-aid swap programs. Iowa has a dollar-for-dollar exchange rate and 18 percent of its federal-aid funds were swapped for state funds, Kansas’ has a 90-cents-on-the-dollar exchange rate and 7 percent of its federal-aid funds were swapped, Alabama and Indiana have 75-cents-on-the-dollar exchange rates and, respectively, less than 5 percent and less than 1 percent of funds were swapped. If federal-aid swap programs do not result in cost savings on highway projects, an exchange rate of less than one-for-one causes inefficiencies on swapped projects.

This analysis of real-world project data leads to important policy considerations. Elected officials in Iowa could counter the negative consequences of federal-aid swap programs by enacting state-level prevailing wage, Disadvantaged Business Enterprise, and Buy America laws. California, Connecticut, New Jersey, Ohio, and Oregon all have federal-aid swap programs but also have state prevailing wage laws. Ohio has a law similar to the Buy America Act and Connecticut has small business enterprise rules that are similar to the Disadvantaged Business Enterprise Program (Repko, 2020). On the other hand, in the absence of strong construction standards, elected officials in Iowa could simply consider repealing the federal-aid swap program. Congress could also consider prohibiting these state-level programs which undermine federal construction standards. While the intention may have been to reduce the cost of highway construction projects, the program has not resulted in any cost savings for taxpayers. Instead, it has decreased skilled construction worker earnings, impacted contractor diversity, and likely reduced profits for Iowa manufacturers as fewer projects include federal construction standards.

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Appendix

TABLE A: ROBUST OLS REGRESSION RESULTS ON THE NATURAL LOG OF THE WINNING BID AMOUNT FOR IOWA DOT PROJECTS

Variables for Ln(Winning Bid)	Federal-Aid Swap Analysis	Federal Standards Analysis	Only Federalized and Swapped Projects
Federal-Aid Swap Program	0.1004 (0.071)		-0.1319 (0.113)
Davis-Bacon Prevailing Wage		0.1074 (0.092)	
DBE Goals		0.0438 (0.099)	
Ln Proposal Guaranty	0.8150*** (0.020)	0.7885*** (0.022)	0.7689*** (0.035)
Out-of-State Contractor	-0.3189*** (0.088)	-0.3114*** (0.093)	-0.2825 (0.224)
Year Ordinal	0.0906*** (0.018)	0.0946*** (0.018)	0.1227*** (0.038)
Type: Urban Road	0.4037*** (0.075)	0.4289*** (0.072)	0.3747*** (0.098)
Type: Farm-to-Market Road	0.0423 (0.073)	0.0762 (0.076)	0.0835 (0.108)
Type: Interstate Plus NHS Road	-0.1592** (0.080)	-0.1325 (0.086)	-0.1343 (0.121)
Type: Local Secondary Road	-0.2171 (0.174)	-0.1438 (0.177)	0.0518 (0.132)
Type: Maintenance Project	-0.5093*** (0.018)	-0.4701*** (0.018)	-0.7684 (0.506)
Constant	4.2714*** (0.222)	4.4855*** (0.228)	4.8461*** (0.374)
County Variables Included?	Yes	Yes	Yes
Sample Size (N=)	1,206	1,115	467
R ²	0.736	0.728	0.596

Source(s): Public bid information from Iowa Department of Transportation "Bid Tabulations" and "Plans and Estimating Proposals" and Bid Express (Iowa DOT, 2020a; Iowa DOT, 2021a; Bid Express, 2021). ***p<|0.01|; **p<|0.05|; *p<|0.10| (two-tailed tests). The dependent variable is the natural log of low (winning) bid amount. Standard errors are in parentheses.

TABLE B: ROBUST OLS REGRESSION RESULTS ON THE NATURAL LOG OF THE WINNING BID AMOUNT FOR IOWA DOT PROJECTS WITH INTERACTIONS FOR AFFECTED PROJECTS IN AFFECTED COUNTIES AND FOR OPT-OUT STATUS

Variables for Ln(Winning Bid)	(a) DID Model: Affected Projects in Affected Counties	(b) DID Model: No Federalized in Post-Swap Period in Affected Counties	(c) Opt-Out Analysis: Effect of Opting Out on Affected Projects
Affected Projects x Post-Swap	0.2201* (0.120)	0.2370** (0.114)	
Affected Projects	0.0890 (0.110)	0.0979 (0.110)	
Quad Cities and Johnson County x Post-Swap			-0.2881 (0.178)
Post-Swap Period	0.0896 (0.084)	0.0943 (0.084)	0.3070*** (0.078)
Quad Cities and Johnson County MPOs (Opt Out)			0.2803** (0.123)
Ln Proposal Guaranty	0.7795*** (0.028)	0.7628*** (0.032)	0.7668*** (0.034)
Out-of-State Contractor	-0.3225*** (0.108)	-0.3253*** (0.111)	-0.1975 (0.195)
Type: Urban Road	0.3274*** (0.107)	0.1704 (0.143)	0.4116*** (0.086)
Type: Farm-to-Market Road	0.0231 (0.113)	-0.1630 (0.142)	0.1403 (0.092)
Type: Interstate Plus NHS Road	-0.1617 (0.127)	-0.4428*** (0.153)	-0.0731 (0.129)
Type: Local Secondary Road	-0.2494 (0.221)	-0.4710* (0.254)	0.0436 (0.112)
Type: Maintenance Project	-0.4461*** (0.135)	-0.6694*** (0.155)	-0.7971 (0.497)
Constant	4.6747*** (0.286)	5.0608*** (0.338)	4.8407*** (0.365)
County Variables Included?	No	No	No
Sample Size (N=)	707	620	467
R ²	0.704	0.681	0.569

Source(s): Public bid information from Iowa Department of Transportation “Bid Tabulations” and “Plans and Estimating Proposals Analysis and Bid Express (Iowa DOT, 2020a; Iowa DOT, 2021a; Bid Express, 2021). ***p<|0.01|; **p<|0.05|; *p<|0.10| (two-tailed tests). The dependent variable is the natural log of low (winning) bid amount. Standard errors are in parentheses. The models are (a) a difference-in-differences of affected projects (federalized and swapped projects in the post-swap period and federalized projects in the pre-swap period), relative to state projects for only the counties with at least one swapped project in the post-swap period and at least one federalized project in the pre-swap period; (b) modified difference-in-differences of affected projects (only swapped projects in the post-swap period and federalized projects in the pre-swap period), relative to state projects for only the counties with at least one swapped project in the post-swap period and at least one federalized project in the pre-swap period; and (c) federalized and swapped projects in the pre-swap and post-swap period, with an interaction term for opt-out counties.

TABLE C: ROBUST PROBIT REGRESSION RESULTS ON THE PROBABILITY OF INCLUDING FEDERAL STANDARDS AND OF A PROJECT BEING AWARDED TO AN OUT-OF-STATE CONTRACTOR FOR IOWA DOT PROJECTS

Variables for P(Outcome)	Probability of Project Having DBE Goals	Probability of Project Having Davis-Bacon Prevailing Wages	Probability of a Project Being Awarded to an Out-of-State Contractor
Post-Swap Period	-0.0446** (0.020)	-0.0950*** (0.021)	0.0113 (0.020)
Davis-Bacon Prevailing Wage			-0.0798*** (0.028)
Ln Proposal Guaranty	0.1241*** (0.008)	0.0944*** (0.008)	0.0339*** (0.009)
Type: Urban Road	0.0667 (0.043)	0.0859* (0.047)	-0.0016 (0.068)
Type: Farm-to-Market Road	-0.1596*** (0.030)	-0.1504*** (0.033)	0.1044** (0.042)
Type: Interstate Plus NHS Road	-0.1075*** (0.032)	-0.1359*** (0.034)	0.1049** (0.044)
Type: Local Secondary Road	-0.3431*** (0.096)	-0.4549*** (0.103)	0.0750 (0.077)
Type: Maintenance Project	-0.3662*** (0.050)	-0.5598*** (0.070)	0.1891*** (0.044)
Constant	0.2670*** (0.010)	0.3043*** (0.011)	0.1479*** (0.010)
County Variables Included?	Yes	Yes	Yes
Sample Size (N=)	1,140	1,206	1,206
Pseudo R ²	0.391	0.331	0.331

Source(s): Public bid information from Iowa Department of Transportation "Bid Tabulations" and "Plans and Estimating Proposals" and Bid Express (Iowa DOT, 2020a; Iowa DOT, 2021a; Bid Express, 2021). ***p<|0.01|; **p<|0.05|; *p<|0.10| (two-tailed tests). All coefficients are average marginal effects (AMEs). Standard errors are in parentheses.