

**An Empirical Methodology to Estimate the Incidence and
Costs of Payroll Fraud in the Construction Industry**

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Executive Summary

For decades, the American construction industry has represented a viable pathway for non-college educated workers to develop employable skills and secure the types of blue-collar, middle-class jobs that have been the backbone of families and communities around the country. Many corners of the construction industry feature some of the best labor practices in the American economy, including family-supporting wages and benefits, fully funded worker education and training programs, and joint labor-management cooperation. But these progressive workplace practices are hardly uniform. In stark contrast, other corners of the construction sector feature some of the worst labor practices in the United States: meager wages, no benefits, unsafe working conditions, wage theft, and payroll fraud.

These unethical and illegal labor practices are largely the result of construction employers' single-minded pursuit of reducing labor costs. This has a cascade of effects. Most directly, these actions degrade the standard of living for workers in those jobs. But they also make it difficult, if not impossible, for honest and law-abiding contractors to remain in operation in a market where they must compete against firms with significantly lower costs. The exit of honest employers further degrades industry working conditions, leading to a "race to the bottom" that represents an existential threat to fair-minded employers and workers whose best practices have helped build the American economy and its blue-collar middle class.

One of the most pervasive and caustic of these illegal practices is payroll fraud. This encapsulates two types of employer actions: (a) misclassifying employees as independent contractors and (b) paying workers "off-the-books" in cash-only arrangements. Employers exploit these practices to evade their legal responsibilities of paying workers overtime rates and contributing to social insurance programs. These actions inflict substantial harm on workers, who fail to receive overtime pay and are denied their legal rights to earned unemployment insurance, workers compensation, Social Security and Medicare benefits. These practices also harm taxpayers more generally. Payroll fraud defunds these social programs, leading to higher UI and workers compensation tax rates on law-abiding businesses and increased stress on other income-supporting social programs.

Despite the incredible harm to workers and taxpayers, only a handful of states have engaged in aggressive legislative action to combat payroll fraud. There are many reasons for this relative inaction. But one likely factor is that estimating the scope of payroll fraud in construction—and across the economy—is notoriously difficult. Payroll fraud is effectively a part of the *underground economy*, with these illegal actions specifically kept hidden from the purview of government regulators and data collectors. The lack of *direct* evidence of payroll fraud thereby inhibits studies from developing accurate estimates of its incidence and costs. This is a substantial barrier to legislative action: without sufficient accounting of payroll fraud, it is more difficult for engaged parties to rally political support for public policy that seeks to curb illegal behavior in the construction industry.

This study has been commissioned to address this issue, as the authors have been tasked with developing an accessible empirical methodology that researchers can use to estimate the incidence and cost of payroll fraud in their respective region, state, and city using

publicly-available data. This report develops such an approach, relying on economic tools to estimate the scope of payroll fraud in the industry using *indirect* measures. As outlined in considerable detail in the body of this report, the foundation of this approach is a comparison of household surveys and employer payroll records. Household surveys such as the American Community Survey (ACS) and the Current Population Survey (CPS) provide worker-provided answers to job and employment questions; from these large-scale, nationally-representative surveys, researchers are able to deduce *total* construction employment. These estimates are then compared to aggregate payroll records submitted to state unemployment insurance programs that are published via the Quarterly Census of Employment and Wages (QCEW) and the Bureau of Economic Analysis (BEA); these offer projections of *legal wage-and-salary* construction employment.

The starting point of this report is to focus on the difference between estimates of *total* employment and *legal wage-and-salary* employment in the construction industry. The differential includes law-abiding self-employed construction workers, workers misclassified as independent contractors, and those who are working off-the-books in cash-only arrangements. None of these workers would appear on official employer payrolls. Given that there is no direct way to separate this group into legal and fraudulent categories in publicly-available data, this study applies a series of empirical tools to estimate the proportion of illegality in this group. This includes, but is not limited to, aggregate income underreporting rates by self-employed construction workers as reported by the Internal Revenue Service (IRS), which this study advances as the best publicly-available measure of illegal activity in the industry.

This report was written in the hope that it may serve as a cornerstone for future research efforts on payroll fraud in the construction industry. First, this report includes a comprehensive literature review of prior research on this topic. This includes an analysis of the many ways that researchers have empirically attempted to gain insight into payroll fraud in the U.S. construction industry over the last two decades. This study also provides step-by-step detail in outlining the development and application of its preferred methodology to estimate the incidence of payroll fraud in construction; this includes a supplemental table that facilitates state-level analyses.

Finally, this report applies this statistical approach to 2017 data to produce national estimates of the incidence and cost of payroll fraud in the construction industry. As outlined in more detail in the body of the report, the use of indirect measures leads to a wider range of potential outcomes than the authors would find ideal, but the lack of direct evidence compel the authors not to unnecessarily narrow down their results. The highlights of these estimates include:

Incidence

- In an average month of 2017, between 12.4% and 20.5% of the construction industry workforce were either misclassified as independent contractors or working “off-the-books.” These represent national rates and do not rule out substantial differences across states and regions. Overall, these results suggest that between 1.30 and 2.16 million

workers were misclassified or working in cash-only arrangements in an average month of 2017.

- The hiring of seasonal workers increases these rates during times of peak industry employment. In August 2017, between 13.0% and 21.6% of construction workers were either misclassified as independent contractors or working “off-the-books.” This amounts to 1.45 to 2.41 million workers.
- The estimated ranges offered above are corroborated by the results of a number of state-specific studies, including direct evidence offered by unemployment insurance audit reports. Some of the methodologies explored in this report produced lower estimates, however these rates were contradicted by a preponderance of these prior studies and were thus not included in the most feasible ranges offered above. Further, as outlined in the report, there are methodological reasons that do not preclude the possibility that payroll fraud is even more extensive than the maximum rates highlighted above.

Costs

The aggregate costs effects of payroll fraud are estimated by multiplying a conservative projection of the number of workers directly affected (1.30 million) by the average income of these workers. Unfortunately, empirical data on annual earnings for misclassified and off-the-books workers do not exist. As a result, this study examines the aggregate cost effects through the lens of three possibilities: that these workers would earn, on average, (a) \$30,000, (b) \$35,000, or (c) \$40,000 on an annual basis if employed legally. These income assumptions were examined as they approximate the 30th through 50th percentiles of income among private-sector wage-and-salary workers in the 2017 ACS.

To develop the costs attributable to payroll fraud, this study relies on a variant of the methodology advanced in a 2019 report commissioned by the Attorney General for the District of Columbia and authored by economists Dale Belman (Michigan State University) and Aaron Sojourner (University of Minnesota). The full results are presented in Table A. The authors prefer the most conservative assumptions in the first column due to uncertainty about the true value of workers’ income, however anecdotal reports and conversations with industry stakeholders suggest that the higher income assumptions are also realistic possibilities. In projecting the social costs of payroll fraud for these 1.30 million workers, the results suggest:

- Under the most conservative income assumptions, these 1.30 million workers should have cost their employers \$49.93 billion in wages, benefits, and contributions to social insurance programs. By engaging in payroll fraud, employers are estimated to have only paid between \$38.19 billion and \$43.70 billion, savings of \$11.74 billion and \$6.23 billion, respectively. Under the most aggressive income assumptions, fraudulent employers may accrue savings over \$17 billion in labor costs.

Table A. Estimated Costs of Payroll Fraud in U.S. Construction Industry (in \$ millions)

Worker Earnings if Employed Legally	\$30,000/yr	\$35,000/yr	\$40,000/yr
<i>Total Labor Costs</i>			
If Workers Hired Legally	\$49,928.9	\$59,092.6	\$68,247.0
If Workers Hired Fraudulently	Min \$38,185.9 Max \$43,695.1	Min \$44,550.2 Max \$51,920.8	Min \$50,914.5 Max \$60,145.4
<i>Direct Effects of Payroll Fraud (Based on Top-Line Earnings)</i>			
Overtime and Premium Pay Not Received	\$811.1	\$946.3	\$1,081.5
Workers Compensation Fund Shortfall	\$1,738.1	\$2,027.7	\$2,317.4
Unemployment Insurance Fund Shortfall	\$701.4	\$717.3	\$725.1
Employer Share of FICA Offloaded onto Workers	\$2,983.3	\$3,480.5	\$3,977.7
<i>Effect of Worker Income Underreporting</i>			
Social Security & Medicare Shortfall	Min \$1,361.3 Max \$4,278.6	Min \$1,588.2 Max \$5,084.1	Min \$1,815.1 Max \$5,889.4
Federal Income Tax Shortfall (using 2020 rate schedule)	Min \$319.3 Max \$1,260.1	Min \$480.4 Max \$1,832.0	Min \$641.5 Max \$2,420.1
State Income Tax Shortfall (aggregate) (using 2019 rate schedules)	Min \$160.1 Max \$552.4	Min \$207.5 Max \$729.8	Min \$257.5 Max \$917.2
Number of Workers Involved	1,299,900	1,299,900	1,299,900

- Payroll fraud in the construction industry led to an estimated \$1.74 billion shortfall in state workers compensation programs in 2017 using conservative income assumptions. Less conservative assumptions about worker incomes suggest the shortfall could exceed \$2 billion.
- State unemployment insurance programs experienced revenue shortfalls ranging from \$701.4 million to \$725.1 million in 2017 due to payroll fraud in the construction industry.
- Under the most conservative income assumptions, workers were denied \$811.1 million in overtime (the “half” in time-and-a-half) and premium (e.g., holiday) pay in 2017. Under more aggressive income assumptions, that number could exceed \$1 billion.
- The most substantial savings to employers engaging in payroll fraud is the offloading of the “employer share” of Social Security and Medicare onto workers. Using the authors’ conservative assumptions, this amounts to a \$2.98 billion illegal transfer of tax obligations from employers to workers. If incomes among these workers are higher, the projections suggest that this transfer of tax obligations could approach \$4 billion.
- While workers bear the brunt of this substantial increase in tax obligations, the failure of employers to properly report employment income and withhold income tax leads to shortfalls in state and federal tax revenues. The lack of documentation from employers incentivizes some workers to evade their tax requirements by either not reporting or underreporting their income to the Internal Revenue Service and state tax agencies. This

study estimates the corresponding shortfalls to Social Security, Medicare, and state and federal income tax as a result of non-reporting and underreporting. The ranges of potential outcomes are knowingly wide, attributable to (a) diverse estimates of income underreporting rates and (b) different assumptions about the wage premium that workers may receive for agreeing to forego their legally-earned benefits.

- Misclassified and off-the-books workers are considered to be “self-employed” and thus legally responsible for both the employee and employer shares of Social Security and Medicare. Because of non-reporting and underreporting by employers and workers, this study projects that between \$1.36 billion and \$4.28 billion of this is never collected depending on the underreporting rate using the study’s conservative income assumptions. Under the most aggressive assumptions, this shortfall may approach up to \$6 billion.
- Losses to federal income tax revenues were calculated using 2020 tax schedules to account for tax reform passed in December 2017. Under conservative income assumptions, federal tax losses range from \$319.3 million to \$1.26 billion due to payroll fraud in construction. Larger income assumptions suggest that federal income tax revenue losses could far surpass \$2 billion. As described in the text, the assumptions underlying income tax calculations are exceedingly conservative, suggesting that these are *lower-bound* estimates of the effects of payroll fraud.
- State income tax revenues also suffer considerably due to payroll fraud in construction. Using 2019 state income tax rates and conservative income assumptions, aggregate state tax revenues exhibit a \$160.1 million to \$552.4 million shortfall. Higher income assumptions suggest that losses could be up to \$917.2 million. These are also presented as *lower-bound* projections of the effects of payroll fraud.

In developing the cost estimates outlined above, the authors have used conservative assumptions whenever possible. This includes, but is not limited to, considering only the most conservative number of workers directly affected (1.30 million) in the ranges presented above. However, the authors suspect—even if they cannot verify—that the social costs of payroll fraud may be substantially larger than the projections in Table A suggest. Most directly, the estimated social costs would be much larger if the study applied the upper projections for the number of workers directly affected by payroll fraud (2.16 million). Further, off-the-books employment is notoriously linked to rampant wage theft in the construction sector. Given that there are no known credible estimates of its magnitude on a national scale, the cost models in this report conservatively assume it to be zero. But if wage theft amounted to 5% of worker earnings, offending employers are projected to siphon off an additional \$1.91 billion to \$2.18 billion in worker earnings under the most conservative assumptions.

To summarize, this study has developed an accessible empirical methodology to estimate the incidence and costs of payroll fraud in the construction industry while also providing a

set of baseline estimates for the sector on a national basis. While it is hoped that this report advances understanding and awareness of payroll fraud as an important public policy issue, the authors of this study acknowledge that the estimated incidence of illegal employment in the construction industry features a large range of possibilities. While this is unfortunate, it is not unexpected: this study estimates the incidence of payroll fraud through indirect means using only publicly-available data. While this may be akin to the development of “blunt instruments,” this report does represent a step forward in the literature and it is hoped that it serves as the cornerstone of future research. In particular, scholars are strongly encouraged to refine the projections in this study through examination of government-restricted matched administrative data and other potential resources.

While this report largely focuses on the direct actions of *employers*, it is acknowledged that cost differentials accruing from illegal actions benefits parties up and down the contracting chain. The cost savings to employers allow them to submit lower bid prices, thereby benefiting general contractors and, by extension, construction owners and developers. Prior research studies have offered evidence that some developers build their business model on the continued exploitation of workers in this way. In essence, offending contractors and construction owners are deepening their own pockets at the expense of workers, law-abiding employers, and taxpayers. Those engaged in policy debates are therefore warned that there exists an entrenched set of industry stakeholders whose self-interest may run contrary to effective public policy. If lawmakers are committed to the best interests of broader society, then policies geared towards combating payroll fraud—such as providing more resources for enforcement agencies, establishing more severe penalties for offending contractors (including criminal charges), or instilling greater liability along the contracting chain—represent win-win opportunities that benefit workers, law-abiding employers, and taxpayers.

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Supporting Organizations

UNITED BROTHERHOOD OF CARPENTERS AND JOINERS OF AMERICA (UBC)

<http://carpenters.org/>

The United Brotherhood of Carpenters and Joiners of America (UBC) is one of North America's largest building trades unions, with over a half-million members. With pride in our more than 135-year history, we strive for job fairness and family-sustaining wages and benefits. We lead the way in training, educating, and representing the next generation of skilled construction professionals. The United Brotherhood of Carpenters (UBC) places a top priority on developing the total professional: tradespeople who are not only technical experts in their craft, but who also demonstrate effective communication and leadership qualities. The UBC mission is to stand strong with our members and business partners to help them achieve success. UBC education and training advances leadership, skill, quality, productivity, safety, and attitude with the goal of creating a constructive culture within the construction industry and providing a competitive workforce for our contractors and owners.

INSTITUTE FOR CONSTRUCTION ECONOMIC RESEARCH (ICERES)

<http://iceres.org/>

The construction industry and its stakeholders face pressing long term issues regarding workforce sustainability, safety, productivity and integration of technology. The Institute for Construction Economic Research (ICERES) supports high quality research with the goal of finding and disseminating pragmatic solutions to these and other construction issues. The Institute for Construction Economic Research undertakes non-partisan research on issues facing the industry, collaborating with existing construction researchers and attracting new investigators into the field of construction research. The Institute also works to develop a network of researchers with ongoing programs on construction issues. In addition to its work in supporting research, the Institute disseminates this research with a working paper series, a web presence, and conferences.

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Dale Belman, Michigan State University

Dr. Belman represents one of the nation's leading academic economists on labor issues in the construction industry. A professor in the School of Labor Relations and Human Resources at Michigan State University, Dr. Belman is the founder and former president of ICERES. During his esteemed academic career, Dr. Belman has written scores of journal articles and book chapters on labor and employment issues, and has frequently testified on these concerns in federal and state legislative proceedings.

Mark Erlich, Harvard University

Mr. Erlich spent 42 years working with the Carpenters, rising from a member of Carpenters Local 40 in 1975 to become the Executive Secretary-Treasurer of the New England Regional Council of Carpenters until his retirement in 2017. The author of two books, Mr. Erlich is now an active researcher and writer on misclassification and the underground economy as a Wertheim Fellow at Harvard University's Labor and Worklife Program.

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An Empirical Methodology to Estimate the Incidence and Costs of Payroll Fraud in the Construction Industry

Introduction

The authors of this study have been tasked with developing an accessible methodology to estimate the incidence and costs associated with worker misclassification and off-the-books employment in the construction industry. This is a considerable challenge. In general, the estimation of the size of the “underground economy” in the United States—and around the world—has long represented one of economists’ most vexing statistical dilemmas.

The reason that estimates of illegal activity in our economy represent such a challenge is related to the tools that economists typically use to estimate anything in our society. For most estimates—such as the unemployment rate, trade deficits or gross domestic product—economists are able to *directly* measure these values by analyzing worker surveys, payroll and tax records, bank transactions, and other reliable sources of information. Economists’ reliance on data generally works well when studying the “legitimate” economy. Researchers and analysts can extract data from numerous state and federal agencies that collect volumes of information from businesses, while also leaning on several large, nationally representative surveys of individuals about their workplace and consumer behaviors.

But while economists have access to mountains of data on the legitimate economy, the same cannot be said for the underground economy. This should be unsurprising given that, by its very definition, these activities occur in the shadows of our society. Illegal actions of all kinds typically occur without any corresponding paper trail. Cash-only payments and off-the-books arrangements are often not reported to the appropriate taxation bureaus. In sum, actors who purposely conceal evidence of illegal activity from the purview of government regulators for fear of civil or criminal charges are, at the same time, also hiding evidence of their activities from government agencies responsible for data collection.

Data limitations certainly represent a source of frustration to economists attempting to study the underground economy. But black markets and off-the-books arrangements are common in any society, and their magnitude and influence make them of critical importance to economists attempting to understand criminal behavior, tax revenue shortfalls, and distortions of legitimate markets. As a result, the underground economy has been a significant area of research to economists and other social scientists, even if the data and statistical tools available to them offer limited, and often less accurate, perspectives when compared to similar analyses of the legitimate economy.

What has emerged over decades of research is that economists and social scientists have developed two categories of approaches to analyze the underground economy that are relevant to the current study. First, economists have attempted to *directly* estimate the amount of illegal activity by applying their standard analytical tools to the limited data available to researchers. But given the inadequacy of information from the usual sources—

since most illegal activity operates beyond the reach of government data collectors—economists have also developed means of *indirectly* measuring the scope of the underground economy by looking for discrepancies between two data streams that offer reasons to believe may reflect the influence of illegal behavior.¹

Prior Studies: Methodologies

Direct Methods

Direct measurement of economic activity in the legitimate economy is typically estimated by analyzing two data sources: (1) publicly-available microdata sets derived from nationally representative surveys of workers and consumers and (2) aggregated data published by government agencies. As an example, economists estimate the national unemployment rate from the results of a monthly survey of 60,000 American households; analysts estimate unemployment by essentially dividing the number of people who claim to be out of work by the total number of people identifying as a part of the labor force. However, such a straight-forward approach is not available to researchers studying worker misclassification and off-the-books employment in the United States. There are no nationally-representative survey of workers that explicitly ask these questions and government-provided information offers little help since illegal activities, by design, are concealed from regulators and data collectors.

Given these limitations, a small number of studies have developed and administered their own surveys to gauge the level of illegal employment. For example, a 1994 study in the *American Economic Review* featured the authors giving a survey to over 2,000 people in Quebec City, Quebec, to assess the incidence of off-the-books employment in the city and how it was influenced by tax policy.² Within the United States, the most cited study on illegal labor practices is a 2009 report that presents the results of a survey of over 4,000 workers in New York, Chicago, and Los Angeles across 12 low-wage industries (including residential construction).³ A 2004 survey—the National Day Labor Survey—interviewed 2,660 day laborers, gathering information on a sample of whom 43% primarily worked in construction.⁴ More recent surveys conducted by the Workers Defense Project investigated

¹ There is a third method of analyzing the underground economy: Dynamic Multiple Indicators-Multiple Causes (DYMIMIC). This involves a two-stage estimation process featuring structural equation models, however problematic endogeneity and causation concerns have compelled researchers to largely adhere to the more commonly-used direct and indirect approaches. For more, see: Alm, James. 2012. "Measuring, Explaining, and Controlling Tax Evasion: Lessons from Theory, Experiments and Field Studies," *International Tax and Public Finance*, 19(1), 54-77.

² Lemieux, Thomas, Bernard Fortin, and Pierre Frechette. 1994. "The Effect of Taxes on Labor Supply in the Underground Economy," *The American Economic Review*, 84(1), 231-254.

³ Bernhardt, Annette, Ruth Milkman, Nik Theodore, Douglas Heckathorn, Mirabei Auer, James DeFillipis, Ana Luz Gonzalez, Victor Narro, Jason Perelshteyn, Diana Polson, and Michael Spiller. 2009. *Broken Laws, Unprotected Workers: Violations of Employment and Labor Laws in America's Cities*, Chicago: Center for Urban Economic Development, University of Illinois; New York: National Law Employment Law Project; Los Angeles: UCLA Institute for Research on Labor and Employment.

⁴ For detailed perspective on the survey, see: Gonzalez, Arturo. 2007. "California Economic Policy Day Labor in the Golden State: Web Appendix B." For a review of the results see, among others: Valenzuela, Abel Jr., et al. 2006. "On the Corner: Day Labor in the United States."

workplace conditions in the construction industry, surveying over 1,100 people in Texas for one study and over 1,400 in six major cities in the American South in a second report.⁵ Finally, Local 525 of the Michigan Regional Council of Carpenters conducted a multi-year census of mid-Michigan’s drywall industry to estimate the incidence of illegal workplace practices in the region.⁶ A review of each study’s findings will be presented later in this report.

The development and administration of worker surveys to fill in the gaps that exist in publicly-available data are laudable on the part of researchers, and a well-done, representative survey represents the gold standard of how to investigate the incidence of certain illegal labor practices. But survey administration comes with a practical caveat that renders it as inaccessible for most researchers: cost. Creating a *representative* survey—even at the local level—requires substantial time and financial resources; expand this to a state and national level and it simply becomes too cost prohibitive for most interested researchers and organizations. Even ignoring other concerns about the use of surveys to gauge illegal activities, the studies identified above, while commendable, are not large enough in scope to offer a complete, representative perspective about activities across an entire state much less across the entire country.⁷

There is a second approach to directly measure illegal workplace practices in the construction industry: a review of audits made by the Internal Revenue Service or each state’s respective agency in charge of unemployment insurance or workers compensation. Given that the IRS does not generally offer access to the results of tax audits, numerous researchers have collaborated with state workplace agencies to review and publish the findings of audits; these have mostly consisted of UI audits, but a recent study has broken new ground in publishing the findings of workers compensation audits.⁸ While nearly all reports on state audits attempt to estimate the incidence of worker misclassification as independent contractors within a given state, a number of these reports have filtered the

⁵ Workers Defense Project. 2013. “Building a Better Texas: Construction Conditions in the Lone Star State”; Theodore, Nik, Bethany Boggess, Jackie Cornejo, and Emily Timm. 2017. “Build a Better South: Construction Working Conditions in the Southern U.S.”

⁶ The results of Local 525’s investigation are presented in Ormiston, Russell, Dale Belman, Julie Brockman and Matt Hinkel. *Forthcoming*. “Rebuilding Residential Construction,” In P. Osterman (Ed.), *Shifting to the High Road: Job Quality in Low-Wage Industries*. MIT Press.

⁷ When using surveys to examine worker misclassification and illegal employment, there are concerns about respondents’ truthfulness and that they may misreport self-employment earnings as wages; for the latter issue, see: Roemer, Marc. 2002. “Using Administrative Earnings Records to Assess Wage Data Quality in the March Current Population Survey and the Survey of Income and Program Participation,” U.S. Census Bureau Staff Paper, Washington, D.C. For more on the strengths and weaknesses of surveys and other direct measures of the underground economy see, among others: Alm, James. 2012. “Measuring, Explaining, and Controlling Tax Evasion: Lessons from Theory, Experiments and Field Studies,” *International Tax and Public Finance*, 19(1), 54-77; Putnins, Talis J., and Arnis Sauka. 2015. “Measuring the Shadow Economy Using Company Managers,” *Journal of Comparative Economics*, 43, 471-490.

⁸ For a review of misclassification studies, see National Employment Law Project, “Independent Contractor Misclassification Imposes Huge Costs on Workers and Federal and State Treasuries,” Fact Sheet, September 2017. The most recent study reviewing workers compensation audits is: Xu, Lisa, and Mark Erlich. 2019. “Economic Consequences of Misclassification in the State of Washington.”

results of these audits by industry or presented findings specific to the construction industry. The results of these studies will also be presented later in this report.

State UI audits represent a long-accepted, and well-travelled methodological approach for researchers interested in directly measuring the incidence and cost of worker misclassification in the construction industry. But this approach also comes with two caveats. First, engaging in this type of study requires the cooperation of the state department of labor. This is not always a given. Second, a review of companies' UI records will fail to recognize off-the-books employment and will completely ignore contractors who are operating illegally and do not file payroll records with the state. So while UI audits play an important role in documenting the incidence and costs of worker misclassification by state, they represent an incomplete picture of all illegal labor practices.

Indirect Methods

Given the inadequacy of direct measures to completely outline the incidence and costs of underground economic activity, many researchers have turned to *indirect* approaches. The overarching theme of these methodologies is to make use of the *absence* of data in key areas or, rather, to exploit discrepancies between two measures of economic activity to identify what is likely black market behavior. This is best reflected in one of the long-standing ways in which economists have attempted to measure the underground economy in developing countries: through an analysis of electricity consumption. By comparing the growth rate of electrical usage to a country's measured growth rate in the legitimate economy, researchers point to the difference as a sign of increased or decreased activity in the country's underground economy.⁹

A compelling indirect approach to study worker misclassification and off-the-books employment is motivated by the aggregated differences between what workers self-report on national, large-scale surveys and what workers and contractors submit to state and federal tax and labor regulators. These national surveys—the most prominent of which are conducted by the U.S. Bureau of the Census and the U.S. Bureau of Labor Statistics—annually ask hundreds of thousands of Americans about their employment status, industry, occupation, income, and dozens of other areas of interest. Respondents' identities are kept confidential, and the resulting data is considered to be the gold standard among economists studying labor market outcomes in the United States. But, for the purposes of the current study, these surveys feature a particularly glaring hole: they do not directly query workers about the legality of their employment situation.

While these surveys do not offer a direct measure of illegal labor practices, they nevertheless provide researchers with something quite important: an estimate of the *total* number of construction workers by state and across the country. Some of these workers are in legal

⁹ For more on electric consumption models (ECM) of the underground economy see, among others: Feige, Edgar L., and Ivica Urban. 2003. "Estimating the size and growth on unrecorded economic activity in transition countries: A re-evaluation of electric consumption method estimates and their implications." Working paper No. 636, William Davidson Institute. <https://core.ac.uk/download/pdf/3102894.pdf>.

employment relationships. Others are misclassified or are working off-the-books. To estimate the incidence of illegality, a few recent studies have compared the *total* number of construction workers (from national surveys) to government data sources that provide an estimate of the level of *legal wage-and-salary* employment within the industry (e.g., payroll records submitted to state unemployment insurance agencies). Excluding the legally self-employed, the difference between *total* employment and *legal* employment must be, by definition, *illegal* employment. This approach represents a durable and easily accessible methodology that has begun to take root in the literature, as academic articles in the journals *Industrial Relations* and *Journal of Labor Economics* applied this approach to examine issues separate from those discussed in this paper; later sections will outline the details, limitations, and suggested modifications of this approach.¹⁰

A 2016 study in the academic journal *Public Budgeting and Finance* offers a second method of assessing illegal employment via indirect means.¹¹ The authors started by calculating the aggregate income of self-employed construction workers as provided in responses to one of the national surveys highlighted above. They then compared this number to the amount of self-employment income as reported to the Internal Revenue Service; the resulting gap—which was considerable—represents the amount of underreporting of income that occurs as a result of informal labor relationships. This approach is potentially powerful in estimating the amount of illegal activity in the construction industry, but it also comes with caveats: timing and accessibility. The 2016 study featured summary statistics from the 2001 tax year that, while a bit dated, will be valuable to the current report. Accessing more recent data, however, is not without obstacles. The two authors of the study highlighted above were funded by an IRS grant and had access to data from its National Research Program. In developing the current report, we were told by the IRS that the soonest we could obtain access to the NRP—if our proposal were even to be approved—would be in one year’s time.

Finally, the most promising—and underutilized—indirect approach to estimate illegal activity in construction is to explicitly link individuals’ responses from large, national household surveys to their respective data at the Internal Revenue Service, Social Security Administration, and the Department of Labor. The presupposition here is that workers will

¹⁰ Within academic journals, see: Bohn, Sarah, and Emily Greene Owens. 2012. “Immigration and Informal Labor,” *Industrial Relations*, 51(4), 845-873; Abraham, Katharine G., John Haltiwanger, Kristin Sandusky, and James R. Speltzer. 2013. “Exploring Differences in Employment Between Household and Establishment Data,” *Journal of Labor Economics*, 31(S1), S129-S172. The former study used this approach to estimate the rate of informal employment in the entire labor market by state (not just construction), while the latter represented a larger analysis of differences between worker surveys and establishment data. But there are additional studies that used this approach to explicitly measure illegal employment in the construction industry in a specific state. A study out of Stockton University used this approach to estimate misclassification and off-the-books employment in New Jersey (Cooke, Oliver, Deborah Figart, and John Froomjian. 2016. “The Underground Construction Economy in New Jersey”), another from Tennessee followed the same approach (Canak, William, and Randall Adams. 2010. “Misclassified Construction Employees in Tennessee”). A report by the Economic Roundtable was not as explicit about their methodology, but seemed to have applied a variant of the same approach to estimate illegal employment in California (Liu, Yvonne Yen, Daniel Flaming, and Patrick Burns. 2014. “Sinking Underground: The Growing Informal Economy in California Construction”).

¹¹ Alm, James, and Brian Erard. 2016. “Using Public Information to Estimate Self-Employment Earnings of Informal Suppliers,” *Public Budgeting & Finance*, 36(1), 22-46.

be more honest with survey takers about illegal behavior than they will be with their respective income and tax agencies. Interpreting these answers as more reflective of actual labor market activity, researchers can then compare survey responses to employer payrolls and tax filings for individual workers, with discrepancies representing evidence of illegal employment structures and income underreporting.

While “matched administrative data” perhaps holds the most promise to address the questions offered in this study, this also faces considerable issues with accessibility. Matched administrative data is tightly restricted by the IRS, SSA, and all other government agencies. While there is a pathway to accessibility, it requires a considerable application-and-approval process and vigilant government oversight.¹² This may explain why, to date, there is only one known, publicly available study using matched administrative data to address construction related issues (albeit in a tangential way). A 2002 report by an analyst at the U.S. Census Bureau—who would presumably have greater accessibility—matched individuals’ responses from two worker surveys to IRS tax filings. Estimating illegal activity was not the primary goal of the paper, however the Appendix features estimates of illegal employment for a limited number of construction occupations for worker data from the mid-1990s.

Prior Studies: Results

The previous section outlined that prior studies have applied numerous and highly dissimilar approaches to estimate the incidence of payroll fraud in the construction industry. Before this study advances its preferred methodology, it is necessary to synthesize the projections from these previous studies in order to establish reasonable expectations about the true incidence of wage and tax fraud in the sector. To those ends, Table 1 provides an overview of relevant studies from the last 15 years, featuring the author(s), geography analyzed, and a basic overview of their findings.

<<<SEE TABLE 1 ON PAGE 62>>>

A review of audit studies would seem to point to a general consensus that, within the last 15 years, between 14% and 26% of construction employers misclassify employees as independent contractors; the most recent study in the state of Washington puts that number at 19%. Among the studies presented in Table 1, the outlier rate in Virginia (33%), however, offers some insight into why there may be large discrepancies across states. For that state’s report, the Virginia Employment Commission relied on an investigative structure that feature relatively more targeted (rather than random) audits than studies of other states. While this approach may have maximized the state’s investigative resources, random audits allow for more representative statewide estimates of misclassification.

¹² As a first step to exploring the use of matched administrative data to study the construction industry, researchers are encouraged to explore the underlying microdata from the Longitudinal Employer-Household Dynamics database. Data can be accessed—after an approval process—at one of the many Federal Statistical Research Center sites across the country. This data links worker surveys to employer payroll files. If a worker claims to be an employee of a particular company, but the firm’s payroll records do not list the worker, this would offer clear evidence of worker misclassification. For more, see: <https://lehd.ces.census.gov/data/>.

In addition to the structure of state audits, it is also possible that differences in Virginia's construction industry played a role in the state's divergence from the remainder of studies. Perhaps not coincidentally, most of the audit reports featured in Table 1 were commissioned in states with high union densities in the construction industry. Virginia is a clear outlier, as its construction industry features one of the lowest union densities in the United States (2.2% in 2018).¹³ If state construction union densities are correlated with employer misclassification rates, then the higher percentages in Virginia could offer some evidence that the consensus of 14% to 26% may be on the low end in terms of estimating national employer misclassification percentages given the dearth of studies in other low-density states.

Moving from employers to workers, the consensus of UI audit studies suggest that 5.4% to 16% of a state's construction employees were misclassified as independent contractors (most studies do not include the self-employed in these proportions). While these rates are sizeable, they pale in comparison to the three workplace surveys of construction workers in Texas and six major Southern cities; these studies found that 32% to 41% of workers were either misclassified or working off-the-books. The discrepancy between these two approaches is enormous. While there are many reasons for the disparity of estimates, one undoubtedly leaps to the forefront: the incidence of off-the-books employment.¹⁴ Audits of unemployment insurance and workers compensation programs only address the records of firms that file their payroll records with their respective state labor agency. This approach therefore ignores cash-only payments to workers and the presence of construction contractors who operate entirely off-the-books and out of the purview of government regulators and data collectors.

While worker surveys may be able to identify off-the-books employment in ways that audit studies cannot, there are reasons why the results from the worker surveys listed in Table 1 may overestimate the amount of payroll fraud in the American construction workforce. The three studies on Texas and Southern cities focus on regions with lower union density and increased employer access to undocumented labor pools than many parts of the country, while the survey design offers concerns about the engagement of a representative sample.¹⁵ The census of mid-Michigan drywall installers—which suggested that 73% of workers in the region were misclassified or working off-the-books—is also limited by sampling questions; the goal was to investigate payroll fraud in one of the most affected trades in the industry.

Given the prohibitive costs and sampling concerns of worker surveys, interested researchers and organizations have increasingly exploited discrepancies between government data

¹³ Union density rates calculated from data from the 2018 Current Population Survey and presented at <http://www.unionstats.com>.

¹⁴ Other potential factors to explain the differences between the UI audit studies and the worker surveys include, but are not limited to: (a) geography, (b) non-random samples in both categories of reports, and (c) the time difference between when most of the UI studies were published (mid-to-late 2000s) and when the worker surveys were conducted (late 2000s through the 2010s).

¹⁵ Thirty-two percent of respondents in the study of Texas construction workers revealed that they lacked legal documentation to work in the United States (Workers Defense Project. 2013. "Building a Better Texas: Construction Conditions in the Lone Star State.")

streams on construction employment to identify the incidence of payroll fraud. Statewide estimates in Tennessee, New Jersey and California suggested that 11% to 21% of their state's construction workforce was either misclassified or working off the books. Studies on New York City and Los Angeles County suggest that these rates may be higher in metropolitan areas, with rates between 25% and 30% in the two jurisdictions. The only known, publicly available study to rely on the most promising empirical approach—the 2002 report by the U.S. Census that used matched administrative data—estimated rates of illegality that exceeded 16% in seven construction occupations in the 1990s; unfortunately, the report did not list the results for occupations with lower rates of illegality, making the overall industry average unclear. Nevertheless, while there may be some reasons to suspect that all of these rates may undercount the incidence of payroll fraud, these values nevertheless offer a key set of benchmarks for the rest of this study.

Before moving onto the development of this study's preferred empirical methodology, there are two important notes to consider. First, conversations with industry stakeholders offer anecdotal evidence that off-the-books employment is more prevalent than worker misclassification in the current construction industry. Studies of New Jersey and California seem to offer evidence of this, with both indicating that there are more than twice the number of off-the-books workers than there are workers misclassified as independent contractors. As will be discussed later in the paper, however, accurately isolating these two groups of workers within the data used in this study is wrought with empirical concerns that undermine any confidence we would have in producing such estimates. Nevertheless, it seems unequivocal that there are substantial numbers of off-the-books workers in the construction industry; as a result, any estimate of illegal employment should be higher than the results reported in state UI audits alone.

A second consideration in comparing studies listed in Table 1 is to be mindful of *when* they were conducted. While the studies included in this report are restricted to only those published in the last 15 years, there is emerging evidence that these practices have increased over time. In a 2019 employer audit study in Washington State, Mark Erlich and Lisa Xu demonstrated that the prevalence of employee misclassification in the state has increased. In 2008, it was estimated that 5.0% of all employers engaged in misclassification; by 2017, that number was 14.4%.¹⁶ Further, the 2014 study on California identified in Table 1 does provide some confirmatory evidence to stakeholders' hypotheses, suggesting that informal employment in the state's construction industry grew 400% between 1972 and 2012.¹⁷ These results largely corroborate our conversations with dozens of industry stakeholders who suggest that payroll fraud has been increasing over time.¹⁸ While there are no

¹⁶ Xu, Lisa, and Mark Erlich. 2019. "Economic Consequences of Misclassification in the State of Washington." Labor and Worklife Program: Harvard Law School.

¹⁷ Liu, Yvonne Yen, Daniel Flaming, and Patrick Burns. 2014. "Sinking Underground: The Growing Informal Economy in California Construction."

¹⁸ The most relevant study to this question—a 2016 article by Lawrence Katz and the late Alan Krueger—suggested that alternative work arrangements in the construction industry *declined* from 1995 (30.5% of workers) to 2015 (29.8%), but these conclusions are not entirely applicable for the current study: anyone who reported themselves as an employee—which would include substantial numbers of off-the-books and misclassified workers—were not counted.

confirmatory academic articles on the subject, the most relevant academic study—a 2016 article by Lawrence Katz and the late Alan Krueger—suggested that alternative work arrangements in the construction industry *declined* from 1995 (30.5% of workers) to 2015 (29.8%). While these results run counter to prevailing wisdom in the industry, the authors' conclusions are not entirely applicable to the current study: their work ignored anyone who reported themselves to be an employee which, as will be outlined in this study, would include a substantial number of off-the-books and misclassified workers in the construction industry.¹⁹

Current Study: Methodology and Results

Introduction

The authors of this report have been tasked with identifying and developing an accessible empirical methodology with which to estimate the incidence of illegal employment in the construction industry. As has been presented earlier in this study, the approach that offers the most comprehensive analysis of payroll fraud—capturing *both* worker misclassification and off-the-books employment—is to compare government data sources that estimate *total* employment and *legal* employment. The resulting difference between these two totals, by definition, represents the incidence of illegal employment in the construction industry. As presented in Table 1, this general approach has been applied in five region-specific studies of payroll fraud in the construction industry and used in a broader examination of construction employment in an academic article in the journal *Industrial Relations*.

Data Sources

Adding in the academic paper, there are six known studies that have attempted to estimate the incidence of illegal employment in the construction industry by comparing government data on legal employment to household surveys that capture total employment. But while the underlying approach may be the same, the specific empirical methodology applied has differed across studies. Most fundamentally, there has not been consensus on which data sources to feature, with at least three different pairings of data offered in the literature. Since the selection of data sources will influence estimates of illegal employment, a brief overview of each data stream is required before advancing this study's preferred methodologies.

Legal Employment. The basis for measuring legal employment in the United States comes from the analysis of employers' monthly payroll records submitted to their respective state unemployment insurance agencies every quarter. Given that state UI programs feature federal government oversight, these records are aggregated by the US Department of Labor and published as the Quarterly Census of Employment and Wages (QCEW). As will be

¹⁹ The authors used the 1995 and 2005 Contingent Worker Supplement of the Current Population Survey and a similar survey conducted by RAND in 2015. They found that while independent contracting was on the decline between 1995 (23.0%) to 2015 (17.6%), however was offset by increased use of temp agencies (0.4% to 2.4%) and contract labor firms (4.0% to 5.8%) (Katz, Lawrence F., and Alan B. Krueger. 2016. "The Rise and Nature of Alternative Work Arrangements in the United States, 1995-2015," National Bureau of Economic Research Working Paper #22667).

important later, the QCEW represents the number of full- and part-time jobs and is compiled on the basis of the employer's location. Data is aggregated by industry and various geographic jurisdictions (region, state, metropolitan area, county).²⁰

The QCEW captures between 95% and 97% of all wage and salary civilian employment in the United States according to government sources.²¹ To develop a more complete estimate of the number of jobs in the US, the Bureau of Economic Analysis (BEA) augments the QCEW by reviewing additional administrative records, including workers who are not covered by state UI programs, and adjusting for reporting errors.²² These efforts do influence construction industry estimates. For 2018, the QCEW suggests that there were 7,225,870 jobs in the American construction industry whereas the BEA estimates there were 7,428,000, representing an adjustment of 2.80%.

Total Employment. The QCEW and BEA offer two data sources to estimate the number of legal jobs by industry. But these jobs—which feature W-2s and all the regular characteristics of formal employment—only represent a portion of overall employment in a given sector. In construction, as in any industry, there are also legitimate independent contractors, misclassified workers who receive a 1099-MISC instead of a W-2, and those working entirely off-the-books. In order to estimate the amount of illegal employment that exists in a sector, it is necessary to compare the amount of legal employment (via the QCEW and BEA) to measures of total employment that exclude legitimate independent contractors.

To estimate total employment in any industry, researchers regularly turn to two large-scale, nationally-representative household surveys that represent bedrock data sources for labor economists and other social scientists: the Current Population Survey (CPS) and the American Community Survey (ACS). The CPS is a monthly survey of 60,000 households and is sponsored jointly by the Census Bureau and the Bureau of Labor Statistics (BLS); this survey serves as the basis for the calculation of the nation's monthly unemployment rate and other important labor benchmarks.²³ The ACS is a more extensive survey modeled after the long-form decennial census. The Census Bureau contacts over 3.5 million Americans annually to participate in the American Community Survey, with the resulting data used regularly by researchers, state and federal agencies, and journalists.²⁴

The ACS and CPS are similar in many ways. Each asks respondents about their employment situation during the week before the survey, including labor force status, industry,

²⁰ All data discussed in this paper are aggregated by the North American Industry Classification System (NAICS) unless otherwise noted.

²¹ Background and data on the QCEW can be found at: <https://www.bls.gov/cew/>.

²² For a full review of the differences between the BEA and QCEW, see Bureau of Economic Analysis. 2019. "State Personal Income and Employment: Concepts, Data Sources, and Statistical Methods."

²³ For more information on the Current Population Survey, see: <https://www.bls.gov/cps/> and <https://www.census.gov/programs-surveys/cps.html>.

²⁴ For more about the American Community Survey, see: <https://www.census.gov/programs-surveys/acs/>.

occupation and other basic work-related questions.²⁵ The primary advantage of the American Community Survey is sample size. The ACS is the largest survey of American workers besides the decennial census with data compiled and reported on an annual basis; the volume of respondents allows for substantially better estimates of industry employment at state and sub-state levels than the Current Population Survey.

While the ACS is substantially larger, the CPS has its own advantages. First, as a monthly survey, CPS data is published on a timelier basis. For instance, as of November 1, 2019, CPS data was available for August 2019 while ACS data was only available through 2017. From a more methodological perspective, the CPS is also advantaged by the fact that it is the largest regular survey of Americans that provides detailed information about workers' second jobs.²⁶ The ACS does not ask about this area, an important detail in the study of construction employment given the transient nature of most jobs and the amount of moonlighting that occurs in the industry. Finally, as will be discussed later, measuring employment via monthly data during times of peak employment is more effective in identifying part-year workers than the use of annual data like the ACS.

Methodology #1: QCEW-CPS

The five region-specific studies of payroll fraud in the construction industries followed the same general approach in comparing legal employment to total employment. However, there was considerable variation in how these studies paired up respective data sources. For instance, the 2007 study on New York State connected the QCEW (legal employment) with the CPS (total employment). The 2010 report on Tennessee paired the QCEW with the ACS. The 2016 study on New Jersey linked BEA data to the ACS. In reviewing the particulars of the relevant data sources, each pairing has particular strengths and weaknesses. To those ends, this study advances two frameworks to estimate illegal employment: monthly data will be explored using a QCEW-CPS framework, while annual data will be investigated using the BEA-ACS pairing.

The pairing of monthly data sources—the QCEW and CPS—offers a number of advantages. Two of those were identified earlier: greater timeliness and insight drawn from the CPS into workers' second jobs. But perhaps the biggest advantage of the monthly data inherent in the QCEW-CPS approach is that it substantially attenuates concerns about temporal mismatches between data on workers and jobs that occur when analyzing annual data such as the BEA and ACS. In these annual data sources, employment estimates are formed by—implicitly or explicitly—taking the average across 12 months of information.²⁷ This is a problem when

²⁵ Be aware that the ACS has an option to view industry using NAICS codes whereas the CPS only uses Census's industry codes. This may not matter at the level of the construction industry as a whole, but may be important when conducting sub-industry analyses.

²⁶ The CPS has other advantages, such as a larger battery of questions of respondents' employment situation. For a broader comparison of the ACS and CPS see, among others: Vroman, Wayne. 2003. "Comparing Labor Market Indicators from the CPS and ACS."

²⁷ BEA data on the number of payroll jobs in a given year is based on the explicit average number of jobs in the QCEW across each of its 12 months of filings in a given year. The ACS issues an approximately equal number of surveys each month and calculates annual estimates by implicitly taking the average of those 12 months' worth

dealing with part-year workers. For instance, there is only a 25% probability that a seasonal worker who operates in the construction industry for three months will be counted compared to a 100% probability for full-year employees. Given that the goal of this methodology is to identify the *total* number of workers operating under an illegal employment arrangement, it is preferable to feature an estimation method that counts all workers in the industry. The monthly data offered by the QCEW and CPS resolves this issue.

To demonstrate the QCEW-CPS methodology, this study will use this approach to estimate the national incidence of illegal employment in the construction industry for August 2017. This represents the peak employment month for the most recent year in which all needed data sources are available.²⁸ Given that many workers' attachment to the industry waxes and wanes with the seasons, the analysis of construction at its peak should reflect industry conditions at "full employment" to account for as many part-year workers as possible.

First looking at total employment using the Current Population Survey, Table 2 presents the number of workers who report to being employed in the construction industry in their first or second job during the second week of August. The first two columns in Table 2 are not mutually exclusive; for example, a government employee who moonlights on the weekend would be counted in both columns. The CPS estimates that, in August 2017, 10.92 million people had their primary employment in the construction industry, representing approximately seven percent of American employment during the month.²⁹ In estimating total employment, the results of Table 2 demonstrate that limiting the analysis to one's first job would be a mistake: there were an estimated 226,346 workers who had a second job in the construction industry during this timeframe, representing an additional 2.03% in sector employment. While some workers may have additionally had *third* jobs in the construction industry during the reference week, the magnitude is likely minimal and, given the lack of data, is ignored moving forward.

of surveys. For seasonal industries like construction, one would expect fewer workers identifying themselves as attached to the industry during low periods of employment and more workers during peak periods, with the net effect averaging out. For more on ACS methodology, see: <https://www.census.gov/programs-surveys/acs/methodology/design-and-methodology.html>.

²⁸ Current Population Survey data extracted from public-use microdata files found at the National Bureau of Economic Research web site at: <https://data.nber.org/cps/>. Quarterly Census of Employment and Wages data found at: https://data.bls.gov/cew/apps/data_views/data_views.htm.

²⁹ Weights are chosen consistent with the CPS guide as published by the Federal Reserve Bank of Kansas City: first jobs are weighted using the composite final weight, while second jobs are weighted using the outgoing rotation weight: <https://www.kansascityfed.org/research/kcdc/cps/coreinfo/keyconcepts/weights>.

Table 2. Total Employment in the Construction Industry, United States, August 2017 (Worker Data)

	First Job	Second Job	Total Jobs
Private, For Profit	8,223,766	92,623	8,316,389
Private, Not-for-Profit	23,386		23,386
Government, Federal	52,730		52,730
Government, State	109,895	3,360	113,255
Government, Local	240,061		240,061
Total Legal Jobs	8,649,838	95,983	8,745,821
Self-Employed, Incorporated	867,938	39,570	907,508
Self-Employed, Unincorporated	1,401,251	90,793	1,492,044
Without Pay	2,497		2,497
Total Self-Employed	2,271,686	130,363	2,402,049
Total Employment	10,921,524	226,346	11,147,870

Source: Current Population Survey

The results of the August 2017 CPS reflect workers reporting a total of 11.15 million jobs. Of those, workers self-report a total of 8.75 million jobs where they are employees. While most of these workers are legitimate payroll employees, later analysis will reveal that some of these workers are not. The underlying issue is that household surveys such as the CPS only gauge what workers *believe* themselves to be. While this distinction will be addressed later, the remaining jobs in the construction industry identified in Table 2 are among the self-employed and a small number of people who work without pay; this latter group is typically comprised of those who work at family businesses. Among the 2.40 million workers who report being self-employed, a little more than one-third identify as being incorporated. This will typically include incorporated business owners, sole proprietors and partners in construction businesses. The remainder is comprised of unincorporated self-employed workers. This would include business owners and legally-operating sole proprietors who simply never incorporate their business. But it also likely includes many people who are working off-the-books and those who are misclassified as independent contractors.

Looking more deeply at Table 2, the CPS is unique in offering details on workers' second jobs. However, the blank cells in the second column of Table 2 reflect sample size concerns. Economy-wide estimates like those presented in Table 2 are generated by extrapolating from the results of the monthly survey. This works well for the column on first jobs, as there were 4,328 survey respondents whose primary job was in the construction industry during the reference week (out of 60,747 employed workers). But there were only 24 respondents who reported a second job in construction, and none of them worked for non-profits or local governments.³⁰ While the CPS is the largest monthly survey in the United States, there are concerns in using it to estimate small-probability outcomes of the larger population.

³⁰ As outlined in a 2013 study in the *Journal of Labor Economics*, surveys like the CPS may undercount the number of people with second jobs for a variety of reasons. Unfortunately, there is no clear way to adjust these numbers to account for worker misreporting. For more, see: Abraham, Katharine G., John Haltiwanger, Kristin Sandusky, and James R. Speltzer. 2013. "Exploring Differences in Employment Between Household and Establishment Data," *Journal of Labor Economics*, 31(S1), S129-S172.

While the CPS offers monthly estimates of *total* employment based on workers' self-reporting, the QCEW provides monthly data on the number of jobs among employers who file with their respective state's unemployment insurance agency (i.e., *legal* employment). Analyzing data from August 2017, Table 3 reveals that the Quarterly Census of Employment and Wages indicates that there were 7.35 million jobs on construction employers' payrolls that month.³¹ As discussed in an earlier section, the QCEW represents most—but not all—of legal employment in the United States. The number of jobs is subsequently inflated by the construction industry adjustment factor (+0.0407%) found in comparing annual figures from the QCEW and the Bureau of Economic Analysis for 2017. As a result, the August 2017 data on employer payrolls suggests that there were an estimated 7.38 million legal jobs during the month.

Table 3. Legal Employment in the Construction Industry, United States, August 2017 (Employer Data)

QCEW	7,350,667
BEA Adjustment (2017)	+0.407%
Legal Jobs	7,380,566

Sources: Quarterly Census of Employment and Wages, Bureau of Economic Analysis

A simple comparison of Tables 2 and 3 to estimate illegal employment is misleading: this analysis has yet to factor in legal self-employment. But a comparison of the two tables does offer critical insight that will be needed before doing so. As presented in Table 4, data from the CPS reveals that workers reported an estimated 8.75 million jobs in which they were construction industry employees during August 2017. Meanwhile, the adjusted figures from the QCEW—drawn from employers' payroll records—reflect only 7.38 million legal jobs during the month. Comparing these two data streams, the differential identifies an estimated 1.37 million jobs in which incumbents self-reported as "employed" but construction employers did not report to their respective state UI agencies.

Table 4. A Comparison of Legal Construction Jobs in the CPS and the QCEW/BEA, August 2017

	Legal Jobs
CPS (Worker Data)	8,745,821
QCEW/BEA (Employer Data)	7,380,566
"Misclassified" Workers	1,365,255
Percentage	15.6%

Taken at face value, the differential expressed in Table 4 would seemingly represent a proxy for the industry's worker misclassification rate: people who believe they are employees but who are, in fact, not reported as such by their employers. This is buttressed by the fact that the proportion of jobs affected (15.6%) is generally consistent with rates of worker

³¹ This represents the sum of the private sector, local government, state government and federal government.

misclassifications found in state UI studies.³² But there are a number of caveats that limit this as a true measure of worker misclassification. First, the number of jobs via the CPS is estimated on the basis of workers' self-reporting and not on whether the worker actually qualifies as an employee under their respective state statute. Second, a 2002 report by an analyst at the U.S. Census Bureau revealed that, among workers who mistakenly reported being employees on the CPS, a substantial proportion were in fact working off-the-books.³³ This likely reflects workers' perceptions of themselves as employees even when operating within cash-only arrangements. Regardless of their specific situation, these 1.37 million workers are not legally employed and are obligated to individually report their earnings to their respective tax agencies; from a legal standpoint, these workers should have been classified as self-employed.

To recap, the Current Population Survey suggests that there were a *total* of 11.15 million construction jobs in the United States as of August 2017. This study has been tasked with estimating the proportion of these jobs that are *illegal*, namely misclassified workers and off-the-books employment. To those ends, the adjusted numbers from the Quarterly Census of Employment and Wages reflect that 7.38 million of these jobs are *legal*, as they represent jobs for which construction employers report worker wages to their respective state UI agency.³⁴ This puts the workers in the remaining 3.77 million jobs in the crosshairs of this study: the 2.40 million who report to being self-employed on the CPS (Table 2) and the additional 1.37 million who mistakenly classified themselves as employed (Table 4).

Identifying Illegal Self-Employment. Distinguishing legal from illegal employment structures among these 3.77 million jobs is where things get empirically murky. Some of the workers in these jobs are legitimately self-employed, operate in the legal economy, and comply with all relevant tax and employment laws. Other self-employed workers may operate entirely in the underground economy and fail to report any of their earnings. And still other workers

³² There is one potential methodological difference between the QCEW and CPS that may suggest that the differential in legal jobs between the two data sources *undercounts* the number of misclassified workers. While the CPS asks workers about their labor force status during a week in the middle of each respective month, the QCEW captures the number of payroll jobs in a given month. It is expected that, with a given month, employers may make create new jobs after the reference week and/or terminate jobs before the week in question. When that happens, the number of jobs presented in the QCEW would overstate the number of jobs explicitly available during the CPS reference week. The scope of this problem is unclear and, for the sake of maintaining conservative estimates of illegal employment, is ignored in this study.

³³ Matching workers' data from the 1996 CPS to their respective Detailed Earnings Record at the Social Security Administration, Roemer (2002) estimated that 7.7% of workers across all industries reported to be employees on the worker survey but for whom legitimate wages were never reported to the SSA. Most alarmingly, the SSA files reflected neither wages nor self-employment earnings for five-seventh of that total (5.5% of self-reported wage earners on the CPS). For more, see: Roemer, Marc. 2002. "Using Administrative Earnings Records to Assess Wage Data Quality in the March Current Population Survey and the Survey of Income and Program Participation," U.S. Census Bureau Staff Paper, Washington, D.C.

³⁴ While jobs reported to state agencies are considered "legal" for the sake of this report, this does not make them immune from payroll fraud. It is relatively common for employers—both union and non-union—to pay overtime to workers in cash and designate it as per diem so as to not pay taxes on the additional wages. While the authors are aware that fraudulent actions such as these are frequent in the construction industry, there is no feasible way to estimate the incidence or magnitude of these illegal payments.

may be legitimately self-employed, but may operate in both legal and underground markets and/or fail to report all of their earnings.

Unfortunately, the accurate measurement of illegality among self-employed workers requires data that is either not collected or not publicly available. While matched administrative data sets offer some degree of untapped potential to address this issue, these are not perfect measures and access to the underlying microdata is restricted.³⁵ What is left in the public domain are the equivalent of “blunt instruments.” Given that the very goal is to estimate the incidence of activities occurring in the shadows of the economy, this yields a disparate set of projection methods each with its own distinct flaws. As such, this study does not rely entirely on a single set of results but rather seeks to triangulate the findings from multiple approaches to form its best estimates of payroll fraud in the industry.

The first approach follows in the path of previous state studies by estimating legal self-employment by the number of business tax returns in the industry. To be clear, the underlying assumption here is that any self-employed person who files with the IRS is operating *legally*. But anecdotal evidence—and basic common sense—reflects that not every person who files a tax return is operating entirely above board. Since underreporting of earnings also falls within the scope of payroll fraud addressed in this study, this definition will necessarily overstate the incidence of legal self-employment (and thus understate illegal self-employment). As will be discussed later, there are also methodological reasons to suspect that this approach may not be a fully accurate gauge of legal self-employment.³⁶

Being mindful that these two approaches likely overstate legal self-employment, Table 5 offers the first estimates of illegal employment using this approach. Column A represents the total number of self-employment (3.77 million) as discovered by comparing the CPS to the QCEW in the steps above for August 2017. Column B advances two different estimates of legal self-employment for 2017.³⁷ First, the IRS publishes statistics on the number of tax returns received by industry for sole proprietorships; these estimates are only available to

³⁵ As an example of a matched data set, the Longitudinal Employer-Household Dynamics (LEHD) data set links responses from individual workers from surveys from the U.S. Census Bureau to employer payroll files as collected through the QCEW program. Due to potential confidentiality issues, the viewing of the underlying microdata sets are limited to those with approved projects at a Federal Statistical Research Data Center. For more on the LEHD, see: <https://lehd.ces.census.gov/>.

³⁶ In addition to what is later discussed in the text, the Census Nonemployer Statistics series ignores workers who operate firms with paid employees but counts partners and corporations even with no assurance that the individuals involved are actively working in construction.

³⁷ Researchers should be mindful that the national self-employment estimates offered by the Bureau of Economic Analysis through its National Accounts Data are, per conversations with an analyst at the BEA, derived directly from an analysis of the CPS. As a result, these data offer no assistance in the goal of separating CPS self-employment into legal and illegal categories. The BEA data in question are located here: <https://apps.bea.gov/iTable/iTable.cfm?reqid=19&step=2&isuri=1&1921=survey>. Note that an investigation of BEA data does provide a measure of state self-employment by industry by an examining of tax records, but the aggregated state estimate for 2017 yielded 3.43 million. This national number would yield estimates of illegal employment that would clearly defy the direct evidence from audit studies and further investigation revealed that many individual state estimates of illegal employment would be *negative*. Given concerns with tax data—double-counting of individuals, partners as business entities and not people, partners not actually working in construction—it is obvious that using BEA state data is not feasible.

the public on a national basis.³⁸ The Census adjusts IRS data to only include businesses with no paid employees who are subject to federal income tax; their Nonemployer Statistics (NES) series is available on a state-by-state basis.³⁹

Table 5. Estimates of Illegal Employment in the Construction Industry, Defining Legal Self-Employment by Tax Filing Status, August 2017

	Total Self-Employment (A)	Legal Self-Employment (B)	Illegal Self-Employment (A-B)
IRS: Sole Proprietors	3,767,304	2,832,288	964,915
Census: Nonemployer Statistics	3,767,304	2,494,089	1,303,114

Sources: Internal Revenue Service, U.S. Bureau of the Census.

Before latching onto any particular value in Table 5, it is reminded that there are reasons to believe that these estimates are likely to represent conservative, lower-bound projections of illegal employment in the construction industry. As identified earlier, this approach treats all tax filers as operating in full accordance with the law. But there is also a methodological concern that leads this study to emphasize that the results in Table 5 are lower-bound estimates: a temporal mismatch between the monthly data used in the QCEW and CPS (Column A) and the annual data published by government agencies (Column B). In particular, government agencies identify legal self-employment based on tax filings for anyone who worked at any point during 2017. Given the volatile and transient nature of construction work, this will likely include a substantial number of people who were not engaged in self-employment activities in the month of August of that year. This results in an overstatement of legal self-employment in the month and, as a result, an underestimate of illegal employment.⁴⁰ Unfortunately, there is no feasible way to correct for this issue: tax filings do not provide month-to-month information.

Given the deficiencies in using the *number* of tax filings, this study advances a new approach to using IRS-sponsored data and research to estimate the incidence of illegality in the construction industry: using income underreporting rates by self-employed construction workers on tax filings. While imperfect, these rates offer a better proxy for *illegal activity*. After all, worker misclassification and off-the-books arrangements are, for the most part, efforts on the part of employers to conceal payments to workers and evade taxes due to the

³⁸ To access IRS tax statistics and relevant documentation, go to: <https://www.irs.gov/statistics/soi-tax-stats-business-tax-statistics>. The IRS also presents data on the number of partners in construction industry businesses. These were not incorporated into the analysis for two reasons. First, there was no assurance that all partners were individuals (as opposed to other business entities) and, even if they were, there is no certainty that they are actively working in the construction field. Second, their inclusion led to estimates of illegal employment (406,260 workers, or 3.6% of the entire industry labor force) that were contradicted by a decade of UI audit studies that estimated that misclassified workers only—not including off-the-books workers—accounted for 5.4% to 14.6% of the industry workforce.

³⁹ In addition to sole proprietorships, the NES series also includes any partnerships or corporations that feature no paid employees. To access Census' Nonemployer Statistics (NES) series, go to: <https://data.census.gov/>. For documentation on the NES, see: <https://www.census.gov/programs-surveys/nonemployer-statistics.html>.

⁴⁰ One additional concern with the IRS and Census NES data is that legal self-employment is based on the number of returns received. If an individual files a return for multiple businesses, they are double-counted; this inflates legal self-employment and, thus, allows for the underestimate of illegal self-employment.

government. To be clear, the decision to report—or not report—income on tax returns is the responsibility of the worker. But employers who rely on cash-only payments—without tax documentation—effectively open the door for income underreporting.

The proposed relationship between income underreporting and illegal employment arrangements is consistent with research by the Internal Revenue Service. According to a 2016 IRS report, only 1% of wages and salaries across all industries were misreported on income tax forms.⁴¹ In other words, for those in legal jobs—featuring detailed documentation in the form of W-2s—feature scant levels of income underreporting. Meanwhile, the IRS report suggested that 64% of nonfarm proprietor income—which is subject to “little to no information reporting”—is underreported on tax forms. Given this outcome, one should expect off-the-books arrangements to be strongly correlated with higher degrees of income underreporting in the industry.

From a methodological perspective, the use of income underreporting rates is also preferable to the number of tax filings. First, this approach relaxes the assumption that every tax filer is operating entirely within the bounds of the law. As such, this method incorporates workers who may operate legally in some transactions—reporting those to the IRS—but may also do business on the side in other transactions. This would theoretically include wage-and-salary employees who do work on the side, as well as sole proprietors who report income documented on 1099-MISC forms but fail to report cash-only payments. Further, while not an explicit count of workers themselves, the use of income underreporting rates weights flagrant abuses far greater than workers who do an occasional side job for a friend.

The application of income underreporting rates is primarily motivated by the findings of the 2016 study in the journal *Public Budgeting and Finance*. In an attempt to explore income underreporting by informal workers in 12 industries, the authors—James Alm and Brian Erard—used the 2001 Current Population Survey to estimate that self-employed construction workers earned an aggregate of \$53.3 billion in income that year. Meanwhile, the authors—who had access to IRS tax data—explored tax returns to conclude that only \$23.2 billion was actually reported as self-employment income. A review of tax audits, however, revealed that an additional \$17.7 billion was mistakenly reported as wages on workers’ tax filings, meaning that a total of \$40.9 billion ($\$23.2 + \17.7) of that \$53.3 billion was reported *somewhere* on individuals’ tax returns.

There are a number of ways to estimate income underreporting rates in the context of the current study. The most straight-forward approach would be to consider that \$40.9 of an estimated \$53.3 billion in self-employment construction earnings were reported the IRS, representing an underreporting rate of 23.3%.⁴² But the 23.3% rate is only the starting point: there are multiple reasons to believe that the *true* income underreporting rate is much higher. First, a 2014 study in the journal *The Review of Economics and Statistics* concluded

⁴¹ For more, see: Internal Revenue Service. 2016. “Federal Tax Compliance Research: Tax Gap Estimates for Tax Years 2008-2010.” IRS Publication 1415.

⁴² For more, see: Alm, James, and Brian Erard. 2016. “Using Public Information to Estimate Self-Employment Earnings of Informal Suppliers,” *Public Budgeting & Finance*, 36(1), 22-46.

that self-employed workers underreported their income by 25% on household surveys like the CPS.⁴³ The general premise behind this phenomenon was that workers were still hesitant to reveal the true scope of their illegal activity even when there were no consequences for truthfulness. If that holds for the sample used in the 2016 study by Alm and Erard, then the adjusted aggregate income for self-employed construction workers should be \$66.6 billion (i.e., \$53.3 billion times 1.25). That would move the income underreporting rate of self-employed construction workers to 38.6%.

The review of tax audits in the 2016 study by Alm and Erard also reveal another concern: the \$17.7 billion in self-employment earnings in construction that was mistakenly reported as wages on tax returns. Certainly, some of that is simple misreporting and does not reflect nefarious or illegal activity. But some of it likely does. The 2002 report from the U.S. Census Bureau highlighted that many workers who viewed themselves as employees on the CPS were, in fact, misclassified or underground workers.⁴⁴ This would conceivably extend to how such workers filled out their taxes: they (falsely) presumed themselves to be employees. This would incorporate both misclassified workers and those in cash-only employment relationships. How much of this \$17.7 billion represents evidence of illegal employment structures is unclear: the authors of this study could not find research that apportioned such misreporting into nefarious and non-nefarious reasons. But if this report took a conservative approach and assumed that one-quarter of this \$17.7 billion reflected illegal employment structures, this would move the underreporting rate to 45.2%.⁴⁵

While these two adjustments may seem like a stark increase, consider that the Bureau of Economic Analysis applies a 44% misreporting adjustment in their analysis of sole proprietors and partnerships to account for net income not reported on tax returns across the entire economy.⁴⁶ Meanwhile, a 2010 article in the *National Tax Journal* by Andrew Johns and Joel Slemrod used tax data from 2001 to highlight misreporting among the self-employed across all industries, estimating that 57% of nonfarm proprietor income was not reported to the Internal Revenue Service.⁴⁷ Using more recent data from 2008-10, a 2016 study by the IRS estimated the net misreporting percentage on nonfarm proprietor's income to be 64%.⁴⁸

⁴³ For more, see: Hurst, Erik, Geng Li, and Benjamin Pugsley. 2014. "Are Household Surveys Like Tax Forms? Evidence from Income Underreporting of the Self-Employed," *The Review of Economics and Statistics*, 96(1), 19-33. Further, an updated report reveals more issues with misreporting and nonresponse errors when using the CPS; see: Bee, Adam, and Jonathan Rothbaum. 2019. "The Administrative Income Statistics (AIS) Project: Research on the Use of Administrative Records to Improve Income and Resource Estimates."

⁴⁴ For more, see: Roemer, Marc. 2002. "Using Administrative Earnings Records to Assess Wage Data Quality in the March Current Population Survey and the Survey of Income and Program Participation," U.S. Census Bureau Staff Paper, Washington, D.C.

⁴⁵ This number is produced by the following equation: $[(66.6 - (40.9 - 17.7 * 0.25)) / 66.6]$.

⁴⁶ See page IV-2 of the "State Personal Income and Employment: Concepts, Data Sources, and Statistical Methods" at <https://www.bea.gov/system/files/2019-10/SPI2018.pdf>.

⁴⁷ For more, see: Johns, Andrew, and Joel Slemrod. 2010. "The Distribution of Income Tax Noncompliance," *National Tax Journal*, 63(3), 397-418.

⁴⁸ For more, see: Internal Revenue Service. 2016. "Federal Tax Compliance Research: Tax Gap Estimates for Tax Years 2008-2010." IRS Publication 1415.

The 64% rate published by the IRS based on 2008-10 data is eye-opening. But there are reasons to consider that this high number may be applicable as an upper-bound estimate in the current report. If one considers all self-employment earnings misreported as wages from the Alm and Erard (2016) to reflect illegal activity, then the relevant construction-industry underreporting rate from 2001 would be 56.5%; adding in the presumed income underreporting rate on worker surveys and that number jumps to 65.2%.⁴⁹ Further, in the most recent report the authors could find that discusses the issue, a 1996 IRS publication stated that “informal suppliers” across all industries—such as people working in cash-only relationships—failed to report 81.4% of their income to the IRS in 1992.⁵⁰ Meanwhile, sole proprietors were estimated to underreport 32.3% of their income.⁵¹ Given the prevalence of both types of workers in construction, some back-of-the-envelope calculations using the CPS offers additional credence that the more recent IRS estimate (64%) that spans all self-employment may be applicable.⁵² Given all of this supporting evidence, this estimate is applied to our data and represents the upper-bound of income underreporting rates in this study.

Table 6 presents the application of the income underreporting rates to estimate the incidence of illegal employment in the construction industry in August 2017. The projections vary widely. The unadjusted rate using the 2016 study from Alm and Erard offers the lowest rates. However, given its methodological defects, the fact that its rates are lower than those offered by the also-flawed approach of using the number of tax returns, and the contradictions offered by the scope of illegality offered in previous studies, this study does not find this unadjusted rate to be as compelling. Removing this from consideration, the results of Table 6 suggest that illegal activity in construction labor markets affect between 1.45 and 2.41 million workers. Regardless of the preferred rate, the results of Table 6 demonstrate that the use of income underreporting rates will generally lead to larger

⁴⁹ The 56.5% is calculated by the following: $(53.3-23.2)/53.3=0.565$. Adding in the 25% income underreporting rate and the formula becomes: $(53.3*1.25-23.2)/(53.3*1.25)=0.652$.

⁵⁰ For more, see: Internal Revenue Service. 1996. “Federal Tax Compliance Research: Individual Income Tax Gap Estimates for 1985, 1988 and 1992.” IRS Publication 1415. These estimates were later also published at: United States General Accounting Office. 1997. “Taxpayer Compliance: Analyzing the Nature of the Income Tax Gap.” Publication GAO/T-GGD-97-35.

⁵¹ The IRS also reported that partnerships and small business corporations had an income underreporting rate of 7.5%. Within construction, however, there were 16 times more sole proprietors than there were partnerships in 2017 according to IRS tax data (and 5 times more sole proprietors than partners); in other words, the incorporated underreporting rate in construction is likely still quite high and, combined with the underreporting rate of informal suppliers, would theoretically justify the use of 64%.

⁵² Examining the CPS employment data (Table 2), there were an estimated 907,508 self-employed workers who were incorporated. Since incorporated self-employed workers are not identified as sole proprietors or partners in the CPS, the application of 2017 annual rates from IRS tax filings—5.0698 sole proprietors for every 1 partner—would yield 149,511 partners and 757,997 sole proprietors. Assuming that all remaining self-employed workers (1,365,255) were unincorporated, it could be argued that these most closely resemble the “informal suppliers.” Using the income underreporting rates in the 1996 IRS publication, a weighted average of construction workers—ignoring differences in their respective earnings—would result in an industry-wide underreporting rate of 60.2%; this incorporates informal suppliers (81.4%), sole proprietors (32.3%) and partners (7.5%). This is knowingly crude and relies on data from 1992, but it lends some support to the idea that 64% may not be entirely off-base as an indicator of illegal activity in the construction industry.

estimates of illegal employment when compared to the use of the number of tax returns to proxy legal self-employment.

Table 6. Estimates of Illegal Employment in the Construction Industry, Using Self-Employment Income Underreporting Rates, August 2017

	Total Self-Employment (A)	Under-reporting % (B)	Illegal Employment (A*B)
Alm and Erard (2016) Unadjusted	3,767,304	23.3%	877,782
Alm and Erard (2016) CPS Income Adjustment	3,767,304	38.6%	1,454,179
Alm and Erard (2016) Income + ¼ Misreporting Adjust.	3,767,304	45.2%	1,702,821
BEA Methodology (2019)	3,767,304	44.0%	1,657,614
Alm and Erard (2016) Full Misreporting Adjustment	3,767,304	56.5%	2,128,527
Internal Revenue Service (2016)	3,767,304	64.0%	2,411,075

Sources: Alm and Erard (2016), Bureau of Economic Analysis.

To be clear, the use of income underreporting rates is far from perfect and represents a second “blunt instrument” as described above. Part of this is due to methodological issues.⁵³ Part of this is because the latter two rates used in Table 6 represent economy-wide rates, including industries—such as private child care—that may feature worse income underreporting rates than construction. But another part is the recognition that income underreporting rates likely represent a better proxies for illegal *activity* than they do for illegal *employment*. In truth, this approach cannot rule out that *every* one of the 3.77 million self-employed workers underreports their income—thus working off-the-books, technically—with the industry average accumulating to the rates offered in Table 6. But the use of these rates more appropriately weights the severity of these workers’ actions; otherwise, a worker who operates entirely in cash-only arrangements would be considered just as illegal as a union employee who does one side job for a neighbor over a couple of weekends.

Table 7 offers a summation of the QCEW-CPS methodology used to estimate the proportion of illegal employment in the overall construction industry for August 2017. The results offer a wide range of outcomes, suggesting that 7.9% to 21.6% of construction workers are either misclassified or working off-the-books. Given that the use of the number of tax filings is particularly flawed, our preferred approach of using income underreporting rates still yield

⁵³ Among the many potential methodological concerns, the use of the CPS to analyze income—such as used by Alm and Erard (2016)—is well-known to be fraught with misreporting and nonresponse concerns. Further, Alm and Erard (2016) and Johns and Slemrod (2010) rely on data from 2001; we would certainly prefer to use more recent data.

a substantial range. After excluding the unadjusted rate from the 2016 study by Alm and Erard, the results of Table 7 suggest that between 13.0% and 21.6% of the national construction workforce was either misclassified or working off-the-books in August 2017. It is reassuring that these estimates are broadly within the range offered by previous studies, although a longer discussion in the conclusion section will serve to triangulate sources to hone in on a more narrow range.

Table 7. Summary of Illegal Employment Estimates Using QCEW-CPS Method, August 2017

	Total Employment	Illegal Employment	% Illegal Employment
<i>Number of Tax Filings</i>			
IRS: Sole Proprietors	11,147,870	964,915	8.7%
Census: Nonemployers	11,147,870	1,303,114	11.7%
<i>Income Underreporting Rates</i>			
Alm and Erard (2016) Unadjusted	11,147,870	877,782	7.9%
Alm and Erard (2016) CPS Income Adjustment	11,147,870	1,454,179	13.0%
Alm and Erard (2016) Income + ¼ Misreporting	11,147,870	1,702,821	15.3%
BEA Methodology (2019)	11,147,870	1,657,614	14.9%
Alm and Erard (2016) Full Misreporting Adjust.	11,147,870	2,128,527	19.1%
IRS (2016)	11,147,870	2,411,075	21.6%

Methodology #2: BEA-ACS

While the QCEW-CPS methodology outlined above has its advantages, it contains one substantial drawback when it comes to estimating state-by-state estimates of payroll fraud in construction: sample size. A survey of 60,000 households may be sufficient for large, national inferences like those made in the previous section, but it may not be for smaller probability outcomes such as those for individual states. As an example, using the August 2017 CPS, there were less than 60 construction workers included among survey respondents in 14 states and in the District of Columbia. While this would still allow for state-by-state estimates of total construction employment, it would be preferable to base these projections on larger samples.

The American Community Survey resolves this issue. As the largest annual household survey in the United States, the ACS contacts over 3.5 million household each year; in 2017, this resulted in over 2.3 million responses.⁵⁴ There have been at least 4,000 responses in every state annually since 2011, with larger states featuring well over 100,000. This level of response allows researchers to much more confidently determine total construction employment—and thus estimate illegal employment—for states and even some metropolitan areas.

But the use of the ACS comes with its own drawbacks, each of which stand in contrast to the strengths of the CPS. First, the ACS only asks respondents about their primary job (during the week before the survey); as such, the ACS does not provide information about workers' second jobs. Second, ACS data is presented on an annual basis when, in fact, it is the implicit average of 12 distinct monthly surveys. This is not problematic for many survey characteristics such as demographics or housing characteristics. But its use to study employment in the construction industry offers some concern: employment in the sector is characterized by transient employment relationships and an extreme seasonal pattern. As described earlier, this means that if a worker was operating in the construction industry for three months, there is only a 25% probability that they would receive the survey during this time and thus be counted among the industry's workforce during a given year. Given that the goal of this study is to estimate the extent of illegal employment in the industry, failing to sufficiently count seasonal or part-year workers represents a significant empirical concern.

Even with these shortcomings, the ACS still represents the best possible method of projecting *total* industry employment at sub-national levels. To those ends, the process of estimating the incidence of illegal employment using the ACS and the BEA—also a 12-month average—will largely follow the same pattern as the QCEW-CPS pairing described in the earlier section. To those ends, Table 8 presents the estimated amount of *total* employment based on worker surveys.⁵⁵ The first column of data comes directly from the ACS, indicating that there were 10.29 million people who identified construction as the industry of their primary job during the course of 2017. However, since the ACS does not have information on respondents' second job during the reference week of the survey, Table 8 is supplemented by data from the CPS. Since the ACS represents a 12-month average, the second column of Table 8 calculates the average number of workers who identify construction as their second job across all 12 monthly CPS data sets. This brings the total of average monthly employment in the sector to 10.49 million workers.

⁵⁴ For ACS sample size information, see: <https://www.census.gov/acs/www/methodology/sample-size-and-data-quality/sample-size/index.php>.

⁵⁵ ACS data used in this study was drawn from the 2017 ACS 1-Year Estimates at the following site: <https://data.census.gov/cedsci/table?q=workers%20by%20industry&g=&table=B24070&tid=ACSDT1Y2017.B24070&t=Industry&vintage=2018&lastDisplayedRow=20>

Table 8. Total Employment in the Construction Industry, United States, 2017 Monthly Average (Worker Data)

	First Job (ACS)	Second Job (CPS)	Total Jobs
Private, For Profit	7,370,151	85,210	7,455,361
Private, Not-for-Profit	92,939	1,062	94,001
Government	415,725	4,534	420,259
Total Legal Jobs	7,878,815	90,806	7,969,621
Self-Employed, Incorporated	842,254	34,132	876,386
Self-Employed, Unincorporated and Unpaid Family Workers	1,571,356	77,254	1,648,610
Total Self-Employed	2,413,610	111,385	2,524,995
Total Employment	10,292,425	202,191	10,494,616

Sources: American Community Survey, Current Population Survey.

With the amount of *total* industry employment for 2017 generated from the worker surveys, the methodology for estimating *illegal* employment via the BEA-ACS follows the same steps as developed with the QCEW-CPS approach. To those ends, Table 9 compares the number of individuals who claim to be employed in legal jobs on worker surveys against the estimated number of jobs from employer payrolls as presented by the Bureau of Economic Analysis (i.e., adjusted QCEW data). This analysis suggests that an estimated 842,621 workers (10.6%) misreported their work status on the ACS when matched against payroll records. As described in the previous section, these are comprised of both misclassified independent contractors as well as off-the-books workers who believe themselves to be in a traditional employment relationship.

Table 9. A Comparison of Legal Construction Jobs in the ACS/CPS and the BEA, 2017 Monthly Average

	Legal Jobs
ACS/CPS (Worker Data)	7,969,621
BEA (Employer Data)	7,127,000
“Misclassified” Workers	842,621
Percentage	10.6%

Sources: American Community Survey, Current Population Survey, Bureau of Economic Analysis.

To integrate Tables 8 and 9, the worker surveys suggest that there were a total of 10.49 million jobs in the construction industry, on average, across the 12 months of 2017. In

contrast, the BEA indicates that employers only reported 7.13 million jobs to their respective tax agencies. Assuming that workers in payroll jobs are all operating legally, this puts the workers in the remaining 3.36 million jobs under scrutiny in this study: the 2.52 million (Table 8) who report being self-employed and the remaining 842,621 (Table 9) who mistakenly believe themselves to be employees.

The final step to estimate the incidence of misclassification and off-the-books employment in the construction industry for 2017, Table 10 applies the same approaches as used in the previous section to estimate the number of self-employed workers who are operating illegally. The first two columns represent the total amount of employment (10.49 million) and self-employment (3.36 million) identified above. The third column represents the estimate of illegal self-employment, while the fourth represents this number as the proportion of total industry employment. As a reminder, the first two approaches are derived from the *number* of tax returns in the industry and assume that anyone who submits a tax return is operating legally. In contrast, the bottom six rows apportion the self-employed into legal and illegal categories based on income underreporting rates and offer a more comprehensive approach to estimating the volume of illegal activity in the industry.

Table 10. Summary of Illegal Employment Estimates Using BEA-ACS Method, 2017 Monthly Average

	Total Employment	Total Self-Employment	Illegal Self-Employment (est.)	Illegal as % of Total
<i>Number of Tax Filings</i>				
IRS: Sole Proprietors	10,494,616	3,367,616	535,328	5.1%
Census: Nonemployers	10,494,616	3,367,616	873,527	8.3%
<i>Income Underreporting Rates</i>				
Alm and Erard (2016) Unadjusted	10,494,616	3,367,616	784,655	7.5%
Alm and Erard (2016) CPS Income Adjustment	10,494,616	3,367,616	1,299,900	12.4%
Alm and Erard (2016) Income + ¼ Misreporting Adj.	10,494,616	3,367,616	1,522,162	14.5%
BEA Methodology (2019)	10,494,616	3,367,616	1,481,751	14.1%
Alm and Erard (2016) Full Misreporting Adjustment	10,494,616	3,367,616	1,902,703	18.1%
IRS (2016)	10,494,616	3,367,616	2,155,274	20.5%

While the results in Table 10 offer a considerable range of estimates of illegal activity, it is reminded that the discussion accompanying the QCEW-CPS estimates reflect that the bottom five rows are the most compelling. As such, the results of Table 10 using the BEA-ACS approach suggest that, for an average month in 2017, there were between 1.30 and 2.16 million workers who were misclassified or working off-the-books, representing between 12.4% and 20.5% of the industry's workforce. While this is still a wide range, it is again reassuring that these estimates are generally consistent with prior research. In contrast, the lower-end estimates of Table 10—suggesting single-digit rates of illegality—somewhat contradict the direct evidence presented in UI audit studies about the extent of misclassification, especially if one also considers the voluminous anecdotal evidence of the prevalence of off-the-books employment in the industry.

State-by-State Estimates

To this point, the focus of the methodological section has been to develop two approaches to estimate the incidence of illegal employment in the construction industry on a *national* basis. It is expected that corresponding rates of payroll fraud will vary substantially from state to state. Fortunately, all of the data elements identified above—CPS, ACS, QCEW, and BEA—provide state-specific data on construction employment; the Census also breaks down nonemployer statistics by state. While the income underreporting rates are on a national basis, state-to-state differences in payroll fraud would be derived from relatively larger or smaller gaps between total employment (worker surveys) and legal employment (payroll records) in each respective state. As such, the methodologies developed above are flexible and can be directly applied to generate state-by-state estimates of off-the-books employment and worker misclassification.

Researchers engaged in state-level analyses, however, should be mindful of two methodological issues. First, while this study has implicitly prioritized using monthly data at peak employment, it is reminded that annual data—such as the BEA-ACS approach—offers one substantial advantage: sample size. While nothing in the QCEW-CPS methodology prohibits its application in a one-state sample, the small number of construction workers identified in the CPS in some states in a single month may result in unreliable state-wide estimates (especially in smaller states). This may compel the use of the BEA-ACS methodology in some states, however researchers are cautioned to be mindful of how this approach undercounts part-year workers and, as a result, illegal employment.⁵⁶

Studies of individual states must also account for the fact that worker surveys and employer payroll data implicitly report geography on different bases. Worker surveys like the CPS and ACS categorize workers by their *place of residence*; meanwhile, payroll data classifies jobs by the location of the employer's office, also referred to as their *place of work*.⁵⁷ In order to

⁵⁶ As discussed in this paper, the BEA-ACS approach requires the use of data on second jobs from the CPS. Given that there will not be sufficient data to accurately estimate second-job holding rates in construction at the state level using the CPS, researchers should consider applying national rates.

⁵⁷ When it comes to construction, it is recognized that the location of the employer's office may not be in the same state as the job site on which the worker is employed. While this is an important distinction, there is no feasible way of determining the location of workers' job sites; as such, employer location is the best proxy.

appropriately match workers and jobs, state analyses must incorporate inflows and outflows of workers across state lines.

<<<SEE TABLE 11 PAGES 65-66>>>

To those ends, Table 11 compares employed construction workers' state of residence with the state of their workplace using data from the 2017 American Community Survey.⁵⁸ The results are provided for (a) all construction workers and (b) only those who work for wages (i.e., excluding the self-employed). This split is informative given that only 2.33% of self-employed construction workers live in a different state than their primary work location, whereas 5.35% of employees cross state lines. The results demonstrate the importance of adjusting a state's total employment—based on worker surveys—by the net inflows and outflows of workers from and to other states. This is especially true for states that border large metropolitan cities. Predictably, the results reflect that the most significant inflows of workers are to Washington, D.C., and New York; correspondingly, the largest outflows reported in Table 11 were from Maryland and New Jersey.

Conclusion

At the start of the paper, it was remarked that estimating the size and scope of black-market activity represented one of economists' most vexing statistical dilemmas. Attempting to estimate the amount of underground employment in the construction industry in this paper has been no different. Our charge for this project was to develop an accessible methodology for researchers to use to estimate the extent of illegal employment in state construction industries. From that perspective, this study has done just that. But the many variants of the methodology explored in this study and the wide range of possible outcomes largely reflect the challenge in deriving accurate estimates of black-market activity—which is purposely concealed from government regulators and data collectors—using only publicly-available information.

Nevertheless, as the first known study to estimate the full extent of illegal employment on a national basis for the construction sector, it is hoped that this study will serve as the foundation for additional research on the underground economy in the industry. To those ends, this report has taken great care in developing a comprehensive review of prior literature and a thorough examination of the relevant empirical issues. While this study's empirical methodology is akin to the use of blunt instruments—in the form of studying indirect measures of illegality using publicly-available data—there are reasons to be optimistic for the potential of more refined approaches being developed in the future. First, in the course of developing this study, we had conversations with other researchers who had access to restricted government data and were exploring similar questions even if their results may not be available for some time. Second, greater development and interest in matched administrative data are critical, as those restricted data sets offer considerable

⁵⁸ The Current Population Survey does not query individuals' place of work.

promise.⁵⁹ As an example, researchers are encouraged to explore the Longitudinal Employer-Household Dynamics microdata that explicitly links individuals' responses on worker surveys to their corresponding presence (or absence) on employer payroll files collected by the government. Gaining access to microdata or worker data linked to the IRS—to evaluate off-the-books employment—may be especially revealing.

While future research may offer additional refinement, the present requires us to consider the results of this study. As discussed throughout the section, the preferred approach developed in this section was to compare estimates of construction employment on household surveys to the number of employees shown on employer payroll data submitted to the government. Applying income underreporting rates to the difference allows for the estimation the proportion of off-the-books and misclassified workers in the sector. The use of underreporting rates may have its flaws—it may proxy the proportion of illegal *activity* better than illegal *employment*—but it represents a much better approach than the sheer number of tax filings by the self-employed in the construction industry.⁶⁰

The most compelling estimates from the QCEW-CPS approach suggest that between 13.0% and 21.6% of the construction workforce was misclassified or working off-the-books in August 2017 (i.e., 1.45 to 2.41 million workers). Meanwhile, the use of annual data from the BEA-ACS approach projects that rate to be 12.4% to 20.5% for the average month in 2017 (i.e., 1.30 to 2.16 million workers). On the surface, these numbers seem credible when compared to previous studies. Reports on individual states estimated illegal employment rates between 11% and 21%. State UI audit studies estimated misclassification *alone* to represent between 5% and 16% of wage earners—statewide rates that would be lower once factoring in the self-employed—and the current study offers ranges that would be consistent with anecdotal suggestions of voluminous amounts of off-the-books employment adding to those numbers in the industry. These results are also not inconsistent with the findings of Roemer (2002) who used matched administrative data to suggest double-digit rates of illegal employment in a number of construction occupation in the mid-1990s. The rates presented in this study also predictably fall short of the proportion of construction workers identifying as misclassified and off-the-books in studies of New York City (25%), Los Angeles (30%), six Southern cities (32%) and Texas (41%), all areas in which one would expect substantially higher rates of illegal employment due to a variety of factors.

⁵⁹ Researchers are cautioned against a potential misstep in using matched administrative data, which is reflected in Roemer (2002). While this was not the focus of his study, the author assumed that any worker who reported being self-employed on a survey and also filed self-employment earnings on their taxes was not acting illegally. But this ignores the possibility that workers may be engaged in both on-the-books and off-the-books work, thereby underreporting their true income on IRS tax forms.

⁶⁰ One potential concern of using income underreporting rates is that they are drawn from historical data. For instance, the Alm and Erard (2016) study used data from 2001. However, any increase in illegal employment over time should be detected by larger differences between total employment (worker surveys) and legal employment (payroll records). While it is possible that income underreporting rates have changed over time, the authors suspect that the tax-reporting behavior of an individual engaged in cash-only work has likely not shifted severely enough since 2001 to undermine the general approach developed in this paper.

While the range of estimates offered in this study offer consistency with prior studies, the authors do not have enough evidence to sufficiently narrow things down to a single “best” one-number estimate. On one hand, the fully adjusted rates procured from an analysis of Alm and Erard (2016)—15.3% from the QCEW-CPS and 14.5% from the BEA-ACS—offer some appeal. These rates are based on construction-specific data (albeit dated), generated from the analysis of peer-reviewed academic studies, and seem conservative both in how it was constructed (assuming only one-quarter of misreported wages were representative of illegal activity seems low) and in how it compares to other rates and the findings of prior studies. On the other hand, the maximum rate—21.0% and 20.6%, respectively—also seems to have some legitimacy. While the rates are based on an all-industry average, its source (the IRS) is impeccable and construction has a substantial number of workers who could be categorized as “informal suppliers” whose income underreporting rate is quite large.

As a fundamental reminder about all of these estimated rates, the methodology developed in this paper amounts to “blunt instruments” that attempt to estimate the size of the underground economy using only publicly-available data. This leads a wide range of potential estimates of the incidence of payroll fraud. And while some of the lowest estimates were dropped due it being contradicted by more direct evidence, it is reminded that this study cannot rule out that payroll fraud is even more extensive than the highest rate. The use of income underreporting rate is not a perfect proxy for illegal employment. A misclassified worker who reports all of their income to the IRS will not appear as being in a fraudulent employment relationship using this method. Further, the use of an industry-wide average income underreporting rate does not preclude the possibility—however unlikely—that *every* worker not a company payroll is engaging in *some* level of income underreporting. Finally, the number of jobs in play may even be a question if legal wage-and-salary workers moonlight while off-the-clock never report to survey takers that this side work constitutes a second job. In sum, while the authors of this study have been careful to take a conservative approach in estimating the size of the underground economy, they fully recognize the limits of this methodology and acknowledge that payroll fraud may be much more extensive than the estimates in this work. Unfortunately, without better data to examine this issue, this study has little choice but to cap its projections at the upper end of the range presented above.

Before concluding the section, it must be noted that this study makes no claim about the relative size of off-the-books employment versus worker misclassification in these results. The data simply does not allow for definitive classification of workers into either of these two groups. While it is tempting to consider those who claim to be employed despite not showing up on company payrolls as “misclassified workers,” the 2002 report by an analyst at the U.S. Census Bureau revealed that these individuals also feature a large number of off-the-books workers. While conversations with industry stakeholders have consistently suggested that off-the-books employment dwarfs worker misclassification, the lack of distinction between the two types of workers in the data leaves us without sufficient empirical standing to evaluate these claims.

Costs

Introduction

This report went into considerable depth to estimate the number of workers directly affected by payroll fraud in the construction industry, summarizing all of the relevant research and meticulously detailing our preferred empirical methodology. This was necessary because this study was breaking new ground in an area wrought by considerable uncertainty. But once the number of workers affected has been estimated, calculating *the cost of payroll fraud* is relatively straight forward. Not only is there applicable government data, but a 2019 study by Dale Belman (a co-author on this report) and Aaron Sojourner has already developed an empirical methodology to estimate the costs of payroll fraud in the construction industry; their study was prepared for and distributed by the Attorney General’s Office of the District of Columbia.⁶¹ The current report follows their blueprint and applies a close variant of their approach.

For the most part, worker misclassification and off-the-books work arrangements exist in the construction industry due to employers’ self-interest in evading legally-required tax contributions associated with legal employment. This defunds critical social programs, robs workers of their legal rights to benefits, and shifts some of employers’ tax burden onto the backs of workers. This also severely disadvantages honest, law-abiding contractors in the bidding process for new projects, driving many out of business and further quickening the “race to the bottom” when it comes to employment conditions in many trades.⁶²

The cost differential that employers generate from payroll fraud degrades the structure of the industry and puts undue hardships on workers. As a result, the initial focus of this section will be on estimating the aggregate costs associated with the *direct* actions of these employers. This will specifically focus on the loss of revenue to state workers compensation (WC) and unemployment insurance (UI) funds, as well as the shifting burden of Social Security and Medicare taxes from employers to workers. This study will then extend the Belman and Sojourner analysis to estimate some of the *indirect*, downstream effects of payroll fraud, such as revenue shortfalls in Social Security, Medicare, and state and federal income taxes.

⁶¹ For more, see: Belman, Dale, and Aaron Sojourner. 2019. “Economic Analysis of Incentives to Fraudulently Misclassify Employees in District of Columbia Construction,” Office of the Attorney General for the District of Columbia.

⁶² There are numerous reasons why payroll fraud has persisted—and seemingly intensified—in the construction industry over the last few decades; while this discussion rests outside the scope of the current report, there are other studies that have addressed these concerns. Among others, see: Belman, Dale, and Russell Ormiston. *Forthcoming*. “Best Practices in the United States Construction Industry,” In J. Druker and G. White (Eds.). *Labour in the Construction Industry: An International Perspective*. Routledge; Ormiston, Russell, Dale Belman, Julie Brockman and Matt Hinkel. *Forthcoming*. “Rebuilding Residential Construction,” In P. Osterman (Ed.), *Shifting to the High Road: Job Quality in Low-Wage Industries*. MIT Press.

Estimates

The goal of this section will be to develop estimates of the aggregated costs of payroll fraud in the construction industry on a national basis. To be clear, Belman and Sojourner were looking at a slightly different question: they were tasked with estimating the percentage cost differential between legal and illegal employment for the *average* worker on a per-hour basis in the Washington, D.C., construction industry. Using averages and rates specific to the District of Columbia, the authors' most conservative assumptions led them to project that legal employers' labor costs were 16.7% higher than those operating fraudulently. Using less conservative but realistic assumptions, the authors projected that law-abiding firms' labor costs could also be up to 48.1% higher based on potential circumstances. While a wide range, this is not inconsistent with the widely-held view that payroll fraud reduces employers' labor costs by 30%.⁶³

Given that the authors' aim is to estimate aggregate costs on a national, industry-wide basis, the current study uses workers' annual earnings—not their hourly wage—as the starting point. The end goal of our analysis will be to multiply employers' per-worker cost savings attributable to payroll fraud by the number of workers involved (i.e., the outcome of the previous section of this report). However there is one glaring problem with this approach: empirical data do not exist on the earnings of workers directly affected by payroll fraud. As a result, this study must make assumptions about these workers' average incomes. To those ends, this study offers three potential income assumptions about workers' equivalent annual earnings if employed legally: (a) \$30,000, (b) \$35,000, and (c) \$40,000. These numbers approximate the 30th through 50th percentile of annual earnings for private-sector employees in the construction industry as reported by the 2017 ACS.

This study will highlight the most conservative income assumption (\$30,000) as the starting point for its analysis. This represents the authors' preferred presupposition for two reasons. First, there is evidence suggesting that payroll fraud is a more pervasive problem in trades that require lesser skill or training and among workers whose earning power may be limited by their experience or their legal status.⁶⁴ There are considerable reports of off-the-books

⁶³ This 30 percent estimate was explicitly cited in 2013 Congressional testimony: "Payroll Fraud: Targeting Bad Actors Hurting Workers and Businesses: Testimony of Catherine K. Ruckelshaus, National Employment Law Project," Hearing Before the Senate Committee on Health, Education, Labor, & Pensions, November 12, 2013, <https://www.help.senate.gov/imo/media/doc/Ruckelshaus1.pdf>.

⁶⁴ In addition to anecdotal evidence offered by industry stakeholders, the notion that payroll fraud is more prevalent in trades that require lesser skill or training is supported by a number of articles. First, the census of mid-Michigan drywall installers by Carpenters Local 525 of the Michigan Regional Council of Carpenters found that 73% of were either misclassified or working off-the-books. Further, the 2007 study of misclassification in Minnesota found that misclassification rates were highest in roofing and drywall installation and lowest in road and bridge construction and site preparation. Finally, the 2002 report by an analyst at the U.S. Census Bureau estimated that, in the mid-1990s, the highest rates of illegal employment by occupation were in carpet installation, tile setters, construction helpers, construction laborers, and roofers. In terms of sources, respectively see: Ormiston, Russell, Dale Belman, Julie Brockman and Matt Hinkel. *Forthcoming*. "Rebuilding Residential Construction," In P. Osterman (Ed.), *Shifting to the High Road: Job Quality in Low-Wage Industries*. MIT Press; Office of the Legislative Auditor. 2007. "Misclassification of Employees as Independent Contractors,"

workers earning below the poverty line in some trades, especially those concentrated in residential construction. Second, the use of the 30th percentile is consistent with this study's aims to develop conservative estimates of the aggregate costs of payroll fraud in the construction industry.

While the per-worker cost differential will be built upon an analysis of a legal employee making \$30,000 per year, take-home earnings represent only a portion of labor costs associated with legal employment. As a result, this study must make a series of assumptions to extrapolate this hypothetical worker's total compensation. To those ends, this report relies on similar assumptions, underlying data sources, and empirical approach as used by the Belman and Sojourner analysis. This includes the application of construction-industry data from the Employer Costs for Employee Compensation (ECEC) program administered by the Bureau of Labor Statistics; these reports offer the average per-hour rates for all types of worker compensation for workers in the construction sector.⁶⁵ Following Belman and Sojourner's blueprint, this study decomposes this worker's full labor cost below:

- *Regular vs. Overtime and Premium Pay:* One of the defining characteristics of legal employment is that employees are entitled to overtime wage rates (i.e., time-and-a-half) if they exceed 40 hours of work in a given week; in contrast, higher rates for overtime are not required for workers misclassified as independent contractors. Further, regular employees are often granted a premium for working on holidays. The starting point of \$30,000 in annual income from the American Community Survey, however, does not differentiate between regular, overtime and premium pay.⁶⁶ Fortunately, calculations derived from the ECEC reflect that 2.08% of construction workers' income, on average, is derived from the overtime and premium rates (e.g., the "half" in "time-and-a-half").⁶⁷ Applying this to the worker in question, this means that \$29,376.03 was earned via regular rates with an additional \$623.97 earned from overtime and premium pay.
- *Social Security and Medicare:* To be conservative, this study assumes that workers' \$30,000 in self-reported earnings represents *gross* annual pay. The employee will then have 7.65% deducted for Social Security and Medicare, a contribution otherwise known as the Federal Insurance Contribution Act (FICA) tax; this amounts to \$2,295.00 being taken out of employees' paychecks. The employer will also be required to pay an additional \$2,295.00 to cover its share of Social Security and

State of Minnesota; Roemer, Marc. 2002. "Using Administrative Earnings Records to Assess Wage Data Quality in the March Current Population Survey and the Survey of Income and Program Participation," U.S. Census Bureau Staff Paper, Washington, D.C.

⁶⁵ This study relies on the ECEC rates for the construction industry from September 2017, available at: https://www.bls.gov/news.release/archives/ecec_12152017.htm.

⁶⁶ This study assumes that workers' self-reported total of \$30,000 includes all tax-eligible income payments that find their way on workers' paychecks, including wages and salaries, paid leave, and supplemental pay.

⁶⁷ This number is estimated by adding up all tax-eligible income payments made to workers; from the ECEC, this would include the categories of wages and salaries, paid leave, supplemental pay. That sum for September 2017 was \$30.29 per hour. Of that, \$0.63 per hour was deemed to be from the overtime premium. Dividing \$0.63 by \$30.29 yields 2.08%.

Medicare without it showing up on the employee's pay stub. Removing the employee's share of FICA, this leaves the worker with \$27,705.00 in *net* annual pay (\$27,128.77 from regular wages, \$576.23 in overtime and premium pay).

- *Worker's Compensation:* The ECEC suggests that, on average, construction employers spend \$4.46 for every \$100 paid to the worker to fulfill their respective state workers compensation program requirements. Multiplying this rate by \$30,000, this suggests that the employer will pay \$1,337.07 in workers compensation costs to cover this employee.
- *Unemployment Insurance:* The amount that an employer must pay to fulfill its legal obligation to fund their respective UI obligation for each worker varies greatly by the taxable rate (%) and taxable wage base (\$) of their respective state programs. To estimate the appropriate national average, this study calculates the weighted average of UI costs for workers making \$30,000 based on the number of legal jobs in each of the 50 states and the District of Columbia.⁶⁸ This process led to the projection that, on a national basis, construction employers contributed an average of \$539.59 to state UI funds for workers who were paid \$30,000.
- *Tax-Exempt Benefit Costs:* Workers' responses on the American Community Survey do not offer insight into the dollar value associated with employer-provided, tax-exempt fringe benefit costs, which include things like health insurance and pension funding. However, calculations from the ECEC suggest that, on average, construction employers spend \$17.47 on these fringe benefits for every \$100 paid to the worker. While this may be true for the average worker, benefit packages are likely to be much smaller for those workers paid at the 30th percentile of the industry. As such, this study analyzes differences in the incidence of employer-sponsored health insurance in the ACS to suggest that a more appropriate fringe benefit rate for these workers should be \$14.13 for every \$100 paid to the worker.⁶⁹ Multiplying this rate by

⁶⁸ The weighted average of UI costs required a number of empirical steps. First, data from the 2017 ACS as presented in Table 11 were used to calculate the number of jobs in each state (columns D+E-F). From there, this study incorporated state-by-state UI taxable wage base (\$) and taxable rates (%) to estimate the UI cost for a worker making \$30,000 in each state; since taxable rates are typically higher for construction employers than the state average, this study followed the lead of Belman and Sojourner (2019) to presume that use twice the state-average taxable rate. This study then took a weighted average of UI costs by the proportion of national jobs located within each state. State-by-state DOL UI rates are located here: <https://oui.doleta.gov/unemploy/docs/aetr-2017.pdf>.

⁶⁹ The rate of \$17.47 is deflated by comparing the average rate of employer-sponsored health insurance across the entire industry (61.75%) against the rate for those who earn between \$25,000 and \$35,000 (49.95%); empirically, the calculation is $17.465 \times 0.4995 / 0.6175 = 14.13$. To be fair, using the industry-average ratio of \$17.47 to calculate the fringe benefit packages of lower-income workers would also have offered validity: the smaller benefit packages would be a product of working with a smaller base income. But this study was compelled to deflate the rate of fringe benefits at the lower-income range to account for the lack of union employers in this income range and for the sake of generating conservative empirical estimates.

\$30,000, this implies that employers would spend \$4,238.15 in insurance and pension benefits for this worker.⁷⁰

Aggregating all wages, benefits, taxes and required social contributions, this employee would cost a legally-operating employer a total of \$38,409.82. Of those funds, workers would receive \$31,943.15 in after-tax earnings and fringe benefits. The remaining \$6,466.67 would be diverted to Social Security, Medicare, workers compensation and unemployment insurance programs.

The fundamental question from here is: how much would this worker cost an employer if they were classified as an independent contractor or hired in a cash-only arrangement? This question is a bit more complicated than meets the eye. If the labor market adhered to the simplest economic theory of perfect arbitrage, contractors engaging in payroll fraud would have to pay the same total amount to compensate workers for their lost access to workers compensation and UI benefits, foregone overtime and fringe benefits, and the shifting burden of both FICA payments that would now be borne by the worker. In other words, employers operating under this assumption would have to pay workers a substantial wage premium in order for them to agree to forego regular employment and instead work as a misclassified or off-the-books worker. But it is well-established that *perfect* arbitrage does not happen in labor markets; in economists' terms, these markets are "sticky." As a result, workers may not necessarily receive a wage premium—substantial or otherwise—for doing the same work as legal employees.

What happens instead is that construction employers leverage their monopsony power to exploit workers. As a result, workers are misclassified as independent contractors or hired in cash-only arrangements in order for firms to reduce their financial obligations and workers—who need these jobs—have little choice but to comply. Workers in these arrangements typically do not get overtime pay. They are not often compensated for their lost access to workers compensation and UI programs. They may or may not get the same fringe benefits as legal employees. They are typically not compensated for their increased FICA tax burden. In sum, the construction employers engaging in payroll fraud are able to reap considerable savings on a per-worker basis by not paying workers most, if not all, of the legally-required or fringe benefits that accrue to a legal employee.

The wage premium paid to workers agreeing to operate in an illegal employment relationship likely differs from employer to employer and from worker to worker. For many workers, there may be no such wage premium at all. Others may see a reasonable sum added to their earnings to incentive them to work off-the-books. Unfortunately, there is no known data on this presumed value. So for the sake of offering an initial, conservative estimate of the costs of payroll fraud in the construction industry, this study follows the lead of Belman and Sojourner's approach in their 2019 study in first assuming that workers who are employed fraudulently do earn a sizeable premium: the cash value of legal employees' fringe

⁷⁰ This study ignores potential mandatory health insurance costs such as the opt-out of the Affordable Care Act. A vast majority of construction firms do not employ the 50+ employees that would make it legally obligated to comply with the law.

benefits. This would leave the employer to save on labor costs via the (a) denial of overtime and premium pay, (b) avoiding required workers compensation and unemployment insurance contributions, and (c) shifting its FICA burden to employees.

Given these starting conservative assumptions, the first two columns of Table 12 compare the amount and distribution of employers' per-worker labor costs when the firm is operating legally versus when they acting fraudulently but offering workers this premium. The results suggest that an employer that is operating legally must spend \$4,795.64 more on a per-worker basis than one that is operating fraudulently; put another way, per-worker labor costs for the law-abiding firm are 14.27% higher than the one acting illegally.⁷¹ Much of this differential in labor costs is attributable to the elimination of firms' required contributions to social insurance programs, including a shifting of the "employer share" of the Social Security and Medicare tax burden from employers to workers.⁷² But it is notable that workers also lose a substantial amount even with the assumed wage premium; including lost overtime and the employer's share of the tax burden, workers' net compensation declines by \$3,471.94 when working for an employer engaging in payroll fraud.

The assumption that these workers receive a substantial wage premium for operating outside a legal employment structure does offer a conservative estimate of per-worker cost savings attributable to payroll fraud. But it is unclear whether this is realistic. Volumes of anecdotal evidence and conversations with industry stakeholders imply that most workers receive little to no such wage premium. To those ends, the third column in Table 12 offers a less conservative assumption that workers receive no wage premium for engaging in an illegal employment structure, instead receiving only cash in the form of regular pay. Under this set of circumstances, an employer that is operating legally must spend \$9,033.78 more on a per-worker basis than a contractor operating fraudulently. This equates to 30.75% higher per-worker labor costs for the law-abiding firms, which roughly matches the industry's long-held 30% rule of thumb when it comes to estimating the cost savings attributable to payroll fraud.⁷³ Given the lack of wage premium, workers bear the brunt of

⁷¹ This estimated percentage differs slightly from the findings of Belman and Sojourner in 2019 study, as they were (a) using local (higher) rates for unemployment insurance and workers compensation and (b) did not cap UI contributions based on income level since they were looking only at hourly wage (and not annual earnings).

⁷² With a \$30,000 assumption, this study estimates that the per-worker labor costs for legal employers is 14.27% higher than firms who operate fraudulently and pay a wage premium to workers who operate as misclassified independent contractors or who work in a cash-only relationship. This is calculated using the earnings of workers in these illegal employment relationships as the denominator. This is not the same as the percent of cash savings using the legal employers' labor costs as the basis of analysis; using that as the denominator, the estimated differential is 12.84%.

⁷³ This report estimates that legal employers pay 29.43% higher labor costs than fraudulent employers who do not pay a wage premium to workers for their willingness to engage in an illegal employment arrangement. This is substantially lower than estimates from Belman and Sojourner's 2019 study, where they estimated this gap to be 48.1%. There are many reasons for this. As described in a previous footnote, Belman and Sojourner were using higher local contribution rates for unemployment insurance and workers compensation. Further, Belman and Sojourner attached a much higher fringe benefit value than the current study. Part of this was attributable to them examining the industry average whereas this study considers smaller benefit packages on account of focusing on workers at the 25th percentile of the industry. Another part appears to be the fact that Belman and Sojourner may have been including benefits that are tax eligible (e.g., paid leave) in their calculation of non-

this arrangement, with their net compensation being \$7,061.65 less than that of a legal employee.

Table 12. A Comparison of Per-Worker Labor Costs for Legal Employers and Those Engaging in Payroll Fraud (Assuming Legal Earnings = \$30,000)

	Legal Employer	Fraudulent Employer w/Premium	Fraudulent Employer w/o Premium
<i>Value to Worker</i>			
Regular Pay	\$29,376.03	\$29,376.03	\$29,376.03
Overtime and Premium Pay	\$623.97	\$0.00	\$0.00
Fringe Benefits / Wage Premium	\$4,238.15	\$4,238.15	\$0.00
<i>Subtotal (1)</i>	\$34,238.15	\$33,614.18	\$29,376.03
<i>LESS: Social Security & Medicare (EE share) (2)</i>	\$2,295.00	\$5,142.97	\$4,494.53
Total – Net Value to Worker	\$31,943.15	\$28,471.21	\$24,881.50
<i>Employer Contributions to Social Insurance</i>			
Social Security & Medicare (ER share)	\$2,295.00	\$0.00	\$0.00
Unemployment Insurance	\$539.59	\$0.00	\$0.00
Workers Compensation	\$1,337.07	\$0.00	\$0.00
Total – ER Contributions to Social Insurance (3)	\$4,171.67	\$0.00	\$0.00
<i>Totals</i>			
Total Net Value to Worker (1-2)	\$31,943.15	\$28,471.21	\$24,881.50
Total Value to Social Insurance (2+3)	\$6,466.67	\$5,142.97	\$4,494.53
Total Labor Costs (1+3)	\$38,409.82	\$33,614.18	\$29,376.03
<i>Differences from Legal Employer</i>			
Total Labor Cost Differential from Legal		\$4,795.64	\$9,033.78
% More that Legal Employers Must Pay		14.27%	30.75%

Notes: The worker is responsible for both the employee and employer's share of Social Security and Medicare when working off the books or as an independent contractor. Workers who receive a wage premium—such as the cash value of fringe benefits in the second column—must pay the tax on the premium; in contrast, the fringe benefits (e.g., health insurance) provided by the legal employer in the first column are not subject to tax.

Table 12 highlights the respective sources of these cost savings for fraudulent employers and how this leads to reduced net compensation for workers and funding for social programs. For employers, avoiding legally required contributions to social insurance programs makes up a considerable portion (\$4,171.67) of the cost differential. Denial of overtime and premium pay also saves these employers an estimated \$623.97 on a per-worker basis. The shifting of the employer share of Social Security and Medicare taxes onto workers also substantially reduces workers' net compensation. While the current discussion focuses only on the costs associated with the *direct* actions of employers, future discussions will focus on the fact that much of this shifting tax burden is never collected by the IRS due to worker nonreporting and underreporting on their tax forms, further deepening the losses to Social Security and Medicare funding.

The results of Table 12 offer the authors' best estimates of the minimum and maximum per-worker labor cost differential between legal employers and those who misclassify equivalent

taxable fringes. Since this study is focused on workers' self-reported annual pay, we presume that value to include all paid leave and thus remove it from our calculation of fringe benefits.

workers as independent contractors or hire workers using cash-only payments. Given this framework, estimating the aggregate cost of payroll fraud in the construction industry becomes a matter of multiplying the per-worker cost differential (current section) by the number of workers operating in illegal employment arrangements (previous section). The level of uncertainty surrounding the number of workers involved, and the authors' interest in being conservative, compel this study to apply the lower-bound of the realistic range of estimates of the illegal employment from the previous section. Given that the authors' goal will be to produce aggregate cost estimates on an annual basis, this study uses the employment numbers from the BEA-ACS method; using annual data, this approach suggested that there were an estimated 1,299,900 workers who were misclassified or working off-the-books in the construction industry.

Multiplying the estimated number of workers by the per-worker cost differentials, Table 13 presents the projected aggregate annual costs of payroll fraud for the construction industry based on 2017 data. With the authors' aims of generating the most conservative estimates, this study will again first rely on the precedent set by Belman and Sojourner in assuming that misclassified and off-the-books workers receive a wage premium equal to the cash value of legal employees' fringe benefits; those projections are in the second column. The projections suggest that, all else equal, the legal employment of these nearly 1.30 million workers would have equated to aggregate labor costs totaling \$49.93 billion. By misclassifying workers as independent contractors or paying them off the books, employers paid just \$43.70 billion. Some of this reflects a direct transfer from workers to employers, as the latter save an estimated \$811.1 million by not having to pay workers overtime and premium pay. The presumed wage premium paid to workers, however, means that most of employers' cost savings were derived via their evasion of legally-required contributions to social insurance programs. This analysis suggests that unemployment insurance programs lost an estimated total of \$701.4 million in funding across the country due to payroll fraud in the construction industry in 2017. Workers compensation programs lost even more, with the analysis projecting a loss of an estimated \$1.74 billion nationwide.

Under this conservative set of assumptions, illegal employment practices allowed firms to offload their estimated \$2.98 billion in required contributions to Social Security and Medicare onto the backs of workers, who are responsible for both the employer and employee share when operating as a self-employed worker. In this scenario, however, total funding obligations to these two programs would actually *increase* given that workers would have to pay taxes on the cash value of fringe benefits (whereas they do not when those are delivered in the form of health insurance and pension funding).

Table 13. Estimated Aggregate Labor Costs for Legal Employers and Those Engaging in Payroll Fraud, 2017 (in \$ millions) (Assuming Legal Worker Earnings = \$30,000)

	Legal Employer	Fraudulent Employer w/Premium	Fraudulent Employer w/o Premium
<i>Illegal Employment</i>			
Number of Workers	1,299,900	1,299,900	1,299,900
<i>Value to Worker</i>			
Regular Pay	\$38,185.9	\$38,185.9	\$38,185.9
Overtime and Premium Pay	\$811.1	\$0.0	\$0.0
Fringe Benefits / Wage Premium	\$5,509.2	\$5,509.2	\$0.0
<i>Subtotal (1)</i>	\$44,506.2	\$43,695.1	\$38,185.9
LESS: Social Security & Medicare (EE share) (2)	\$2,983.3	\$6,685.3	\$5,842.4
Total – Net Value to Worker	\$41,522.9	\$37,009.7	\$32,343.5
<i>Employer Contributions to Social Insurance</i>			
Social Security & Medicare (ER share)	\$2,983.3	\$0.0	\$0.0
Unemployment Insurance	\$701.4	\$0.0	\$0.0
Workers Compensation	\$1,738.1	\$0.0	\$0.0
Total – ER Contributions to Social Insurance (3)	\$5,422.8	\$0.0	\$0.0
<i>Totals</i>			
Total Net Value to Worker (1-2)	\$41,522.9	\$37,009.7	\$32,343.5
Total Value to Social Insurance (2+3)	\$8,406.0	\$6,685.3	\$5,842.4
Total Labor Costs (1+3)	\$49,928.9	\$43,695.1	\$38,185.9
<i>Differences from Legal Employer</i>			
Total Labor Cost Differential from Legal		\$6,233.8	\$11,743.0
% More that Legal Employers Must Pay		14.27%	30.75%

Notes: The worker is responsible for both the employee and employer's share of Social Security and Medicare when working off the books or as an independent contractor. Workers who receive a wage premium—such as the cash value of fringe benefits in the second column—must pay the tax on the premium; in contrast, the fringe benefits (e.g., health insurance) provided by the legal employer in the first column are not subject to tax.

The third column of Table 13 offers an additional set of aggregate cost estimates by assuming that employers do not provide a wage premium to workers who are misclassified as independent contractors or agree to work off the books. To be clear, the assumption that no wage premium exists leads this to represent an *upper-bound* set of cost projections for the nearly 1.30 million misclassified and off-the-books workers identified in this study. The results suggest that employers engaging in payroll fraud paid \$38.19 billion for labor that should have cost \$49.93 billion if workers had been hired and compensated legally. When compared to the second column, the higher cost savings in this scenario is entirely attributable to the lack of wage premium paid to employees; there is no change in lost overtime premiums or funding to UI and workers compensation programs between the second and third columns. The absence of a wage premium predictably leads to a substantial downgrade in the net value paid to workers, offset only fractionally by reduced Social Security and Medicare obligations.

Outcomes Assuming Higher Worker Earnings

To this point, the cost estimates of payroll fraud have relied on the authors' conservative assumption that affected workers would earn, on average, \$30,000 per year if employed legally. This assumption was made in order to develop conservative estimates in the absence

of confirmatory empirical data on the incomes of workers directly affected by payroll fraud. This decision was further supported by the volumes of anecdotal reports suggesting payroll fraud was particularly rampant among lesser-skilled trades and workers without much leverage in the labor market (e.g., undocumented laborers). But industry stakeholders have reported that payroll fraud is prevalent in *all* parts of the construction sector, including among workers who earn middle-class incomes and above. The volume of these reports compel the authors to therefore consider more aggressive income assumptions.

To those ends, Tables 14 and 15 develop aggregate cost estimates of payroll fraud in the construction industry if workers are assumed to make \$35,000 and \$40,000, respectively, in legal employment relationships. Table 14 predictably demonstrates that the social costs of payroll fraud increase as workers' earnings levels increase. For example, the projected shortfall to state workers compensation programs increases from \$1.74 billion in Table 13 (\$30,000 income assumption) to \$2.03 billion in Table 14 (\$35,000). In the most aggressive scenario in which workers receive no wage premium, employers are estimated to reduce their total labor costs by \$14.54 billion by engaging in payroll fraud.

Table 14. Estimated Aggregate Labor Costs for Legal Employers and Those Engaging in Payroll Fraud, 2017 (in \$ millions) (Assuming Legal Worker Earnings = \$35,000)

	Legal Employer	Fraudulent Employer w/Premium	Fraudulent Employer w/o Premium
<i>Illegal Employment</i>			
Number of Workers	1,299,900	1,299,900	1,299,900
<i>Value to Worker</i>			
Regular Pay	\$44,550.2	\$44,550.2	\$44,550.2
Overtime and Premium Pay	\$946.3	\$0.0	\$0.0
Fringe Benefits / Wage Premium	\$7,370.6	\$7,370.6	\$0.0
<i>Subtotal (1)</i>	\$52,867.1	\$51,920.8	\$44,550.2
<i>LESS: Social Security & Medicare (EE share) (2)</i>	\$3,480.5	\$7,943.9	\$6,816.2
Total - Net Value to Worker	\$49,386.6	\$43,976.9	\$37,734.0
<i>Employer Contributions to Social Insurance</i>			
Social Security & Medicare (ER share)	\$3,480.5	\$0.0	\$0.0
Unemployment Insurance	\$717.3	\$0.0	\$0.0
Workers Compensation	\$2,027.7	\$0.0	\$0.0
Total - ER Contributions to Social Insurance (3)	\$6,225.5	\$0.0	\$0.0
<i>Totals</i>			
Total Net Value to Worker (1-2)	\$49,386.6	\$43,976.9	\$37,734.0
Total Value to Social Insurance (2+3)	\$9,706.0	\$7,943.9	\$6,816.2
Total Labor Costs (1+3)	\$59,092.6	\$51,920.8	\$44,550.2
<i>Differences from Legal Employer</i>			
Total Labor Cost Differential from Legal		\$7,171.8	\$14,542.4
% More that Legal Employers Must Pay		13.81%	32.64%

Notes: The worker is responsible for both the employee and employer's share of Social Security and Medicare when working off the books or as an independent contractor. Workers who receive a wage premium—such as the cash value of fringe benefits in the second column—must pay the tax on the premium; in contrast, the fringe benefits (e.g., health insurance) provided by the legal employer in the first column are not subject to tax.

Table 15 extends the analysis by projecting the social costs of payroll fraud if workers directly affected were able to earn an average of \$40,000 through legal construction employment. This represents the most aggressive income assumption in this paper and, predictably, leads to the largest projections of the costs of payroll fraud. For instance, the results of Table 15 suggest that, under this assumption, workers compensation programs experience a shortfall of approximately \$2.32 billion due to payroll fraud in the construction industry. Meanwhile, in the most aggressive scenario where workers do not receive a wage premium to engage in fraudulent employment relationships, the projections of Table 15 suggest that employers are able to reduce their total labor costs by \$17.33 billion due to fraudulent activities.

Table 15. Estimated Aggregate Labor Costs for Legal Employers and Those Engaging in Payroll Fraud, 2017 (in \$ millions) (Assuming Legal Worker Earnings = \$40,000)

	Legal Employer	Fraudulent Employer w/Premium	Fraudulent Employer w/o Premium
<i>Illegal Employment</i>			
Number of Workers	1,299,900	1,299,900	1,299,900
<i>Value to Worker</i>			
Regular Pay	\$50,914.5	\$50,914.5	\$50,914.5
Overtime and Premium Pay	\$1,081.5	\$0.00	\$0.00
Fringe Benefits / Wage Premium	\$9,230.8	\$9,230.8	\$0.00
<i>Subtotal (1)</i>	\$61,226.8	\$60,145.4	\$50,914.5
<i>LESS: Social Security & Medicare (EE share) (2)</i>	\$3,977.7	\$9,202.2	\$7,789.9
Total – Net Value to Worker	\$57,249.2	\$50,943.1	\$43,124.6
<i>Employer Contributions to Social Insurance</i>			
Social Security & Medicare (ER share)	\$3,977.7	\$0.00	\$0.00
Unemployment Insurance	\$725.1	\$0.00	\$0.00
Workers Compensation	\$2,317.4	\$0.00	\$0.00
Total – ER Contributions to Social Insurance (3)	\$7,020.2	\$0.00	\$0.00
<i>Totals</i>			
Total Net Value to Worker (1-2)	\$57,249.2	\$50,943.1	\$43,124.6
Total Value to Social Insurance (2+3)	\$10,997.9	\$9,202.2	\$7,789.9
Total Labor Costs (1+3)	\$68,247.0	\$60,145.4	\$50,914.5
<i>Differences from Legal Employer</i>			
Total Labor Cost Differential from Legal		\$8,101.7	\$17,332.5
% More that Legal Employers Must Pay		13.47%	34.04%

Notes: The worker is responsible for both the employee and employer's share of Social Security and Medicare when working off the books or as an independent contractor. Workers who receive a wage premium—such as the cash value of fringe benefits in the second column—must pay the tax on the premium; in contrast, the fringe benefits (e.g., health insurance) provided by the legal employer in the first column are not subject to tax.

Effects of Income Underreporting

To this point, the cost analysis has focused on the direct actions of employers. But state and federal governments and critical social insurance programs incur substantial revenue shortfalls because of workers' actions to not report or underreport income gained through these illegal employment structures. This is not to absolve employers of blame: worker nonreporting and underreporting are made possible by firms' failure to submit employment

documentation to the IRS and other tax agencies. Further, the failure of employers to withhold taxes from workers' paychecks also contributes to income tax revenue shortfalls.

Worker underreporting has the largest impact on Social Security and Medicare programs. Workers in fraudulent employment relationships are considered for tax purposes to be self-employed. As a result, they are responsible for both the employer and employee share of Social Security and Medicare; for all but the very highest-paid construction workers, this amounts to 15.3% of workers' earnings. Given the assumptions built into the cost estimates to this point, Table 13—assuming \$30,000 worker incomes—reflects that the aggregate Social Security and Medicare tax obligation for these 1.30 million workers in 2017 was \$6.69 billion under the most conservative assumptions and \$5.84 billion under less conservative assumptions; the former set of estimates feature a larger tax obligation due to the presence of the wage premium. As a reminder, the first part of this paper thoroughly explored income underreporting rates of self-employed workers, offering a wide range that extended from 23.3% to 64.0%. Applying these percentages to workers' Social Security and Medicare obligations, the results suggest that these programs experienced an estimated shortfall between \$1.56 billion and \$4.28 billion with the wage premium assumption and between \$1.36 billion and \$3.74 billion if no wage premiums are paid.

As would be predicted, applying higher income assumptions leads to larger estimates of shortfalls for Social Security and Medicare. For instance, Table 14—which assumes worker incomes at \$35,000—would reflect these programs to have a revenue shortfall between \$1.85 billion and \$5.08 billion with the wage premium assumption and between \$1.59 billion and \$4.36 billion if no wage premiums are paid. Applying the most aggressive income assumption (\$40,000) from Table 15 pushes these estimates even higher. With a wage premium attached, shortfalls are projected to be between \$2.14 billion and \$5.89 billion; without it, projections fall between \$1.82 billion and \$4.99 billion.

The effect of payroll fraud and worker underreporting on state and federal income tax revenues is substantial. However, the exact estimation of federal income tax losses is complicated by the fact that each worker will have different levels of tax obligations based on their spouse's income, itemized deductions, and all other tax-relevant characteristics; this is in contrast to things like Social Security and Medicare, where obligations are a flat percentage of a worker's income. Given that worker surveys do not identify which *specific* workers are misclassified or working off-the-books, researchers cannot glean each worker's tax responsibilities.

While generating exact losses to federal tax revenues is impossible with existing publicly-available data, researchers are able to project likely ranges using a number of assumptions about the 1.30 million workers in question. First, since marital status dictates workers' standard deduction and tax rates, this study assumes that workers engaged in payroll fraud are married at the same proportion (56.83%) as all construction workers. In the absence of clear data on spousal income, this study assumes that all workers take the standard deduction and have no other income. This latter assumption is extremely conservative, and suggests that the estimated resulting federal income tax revenue losses approximate *lower-bound* projections.

Using 2020 tax rates—to estimate revenue losses after tax reform was passed—it is projected that a non-married worker operating in a fraudulent employment relationship and earning \$33,614.18 (see middle column of Table 12; includes wage premium) would owe \$2,348.20 in federal income tax.⁷⁴ Meanwhile, a married worker earning the same amount is projected to owe \$881.42 in federal income tax; the lower rate is the result of the differences in the size of the standard deduction (\$12,400 for single, \$24,800 for married). Assuming that 56.83% of the 1.30 million workers in question are married and the rest unmarried, this would put the aggregate federal income tax obligation of these workers at \$1.97 billion. Applying the income underreporting rates used in this study (23.3% to 64.0%) and assuming that the IRS recovers no money in subsequent audits, this suggests that between \$458.7 million and \$1.26 billion of federal tax revenue goes uncollected because of income underreporting made possible by employers' lack of appropriate employment documentation.

Income tax obligations are reduced substantially if workers do not receive any wage premium for working off-the-books or for being misclassified as an independent column. For workers earning \$29,376.03 (see last column of Table 12), unmarried workers are estimated to owe \$1,839.62 in federal taxes while married workers are assumed to owe \$457.60. Assuming 56.83% of the 1.30 million workers are married, this would equate to an aggregate federal income tax obligation of \$1.37 billion. Again applying the income underreporting rates used in this study and assuming no IRS audits, this suggests that a federal income tax shortfall between \$319.3 million and \$877.0 million. While the income tax estimates in this section are considered to be very conservative based on the assumption that workers (and their spouses) have no other earnings, it should be noted that this analysis also ignored other potential deductions—especially the Earned Income Tax Credit—that would offset workers' tax obligations.

While the income tax estimates were established assuming workers would make \$30,000 if operating in a legal employment relationship, estimates featuring higher assumed incomes predictably lead to higher federal income tax losses. Assuming the two scenarios in Table 14 with workers assumed to make \$35,000, the predicted shortfalls extend from \$480.4 million to \$1.83 billion. Increasing the income assumption to \$40,000, projected shortfalls in federal income tax range from \$641.5 million to \$2.42 billion. It is recognized that these are wide ranges of projected income tax shortfalls, but this is the result of the divergent rates of income underreporting rates and the use of multiple scenarios (i.e., the wage premium).

Finally, projecting shortfalls in state income tax revenues attributable to payroll fraud in construction follows the same structure as the estimates above using 2019 state-by-state tax rates.⁷⁵ Assuming that married workers typically have one child (since many states allow personal exemptions), this study first calculates the respective tax obligations a worker

⁷⁴ Per-worker tax estimates derived from looking at breakdowns from the Tax Foundation: <https://taxfoundation.org/2020-tax-brackets/>.

⁷⁵ For more, see state income tax rates at: <https://taxfoundation.org/state-individual-income-tax-rates-brackets-2019/>.

would endure in each state at the three income levels described above. This study then takes the weighted average of state tax responsibilities based on the number of workers residing in the state before multiplying that by the number of workers (1.30 million) affected and the range of income underreporting rates. The results suggest that the most conservative income assumption (\$30,000) yields state tax revenue shortfalls ranging from \$160.1 million to \$552.4 million. Increasing the income assumption to \$35,000 predictably leads to higher state income tax shortfalls, with estimates between \$207.5 million and \$729.8 million. Finally, the highest income assumption (\$40,000) nets the largest projected shortfalls, ranging from \$257.5 million to \$917.2 million. Just as with the federal income tax calculations, however, it is reminded that this represents *lower-bound* estimates due to assumptions that other family income equals zero.

Discussion

While this section has attempted to project the cost disadvantages faced by legal employers compared to contractors engaging in payroll fraud, there are a number of reasons why these estimates may *understate* the magnitude of the disadvantage. First, legal employers must adhere to regulations imposed by the Occupational Safety and Health Administration. While this may be in the best interest of workers, it nevertheless imposes a substantial cost on legal employers that is often evaded by contractors operating fraudulently. Since there is no known credible estimate for the cost that this imposes on legally-operating employers, it is not included in this analysis.

The second means by which fraudulent employers reduce labor cost is via wage theft. There are anecdotal reports of rampant wage theft among off-the-books workers in the construction industry, especially among the most vulnerable workers (e.g., undocumented laborers); as an example, see the 2015 report by Tom Juravich, Essie Ablavsky and Jake Williams.⁷⁶ However, while anecdotal reports are plentiful, there are no known estimates for its incidence in the national construction industry. For the sake of generating conservative estimates, the results in Tables 12 and 13 assumed there was no wage theft among fraudulent workers. But if this report instead assumed that 5% of wages from fraudulent employers were not paid to workers, the cost differentials would jump from 14.27% to 20.28% in the conservative estimates (Column 2) and from 30.75% to 37.63% in the upper-bound estimates (Column 3). In terms of aggregate costs, a move from 0% to 5% wage theft would allow employers to reduce labor costs by an additional \$1.91 to \$2.19 billion.

The estimates presented in this section may also understate the aggregate costs of payroll fraud because it is assuming a relatively conservative estimate of the number of workers who are misclassified or are working off-the-books. As outlined earlier in this report, it is a considerable challenge to estimate the number of workers engaged in the underground construction economy. This study has offered a rather wide range of possible estimates in that regard. The authors believe that the estimate used in this section (1,299,900 workers) represents the most conservative projection among the preferred empirical approaches

⁷⁶ For more, see; Juravich, Tom, Essie Ablavsky, and Jake Williams. 2015. "The Epidemic of Wage Theft in Residential Construction in Massachusetts," UMass-Amherst Working Paper Series.

presented in this study. While the estimated range of workers directly affected may well exceed two million, the authors' inability to verify this outcome compels this study to remain steadfast with its application of 1.30 million workers as the baseline estimate. However, the authors suspect that payroll fraud does exceed this conservative estimate—perhaps by a sizeable amount—suggesting that the true the true level of aggregate costs may be much larger than is projected in Tables 13 through 15. That said, given that some worker projections—however flawed—led to estimates of fewer workers engaged in the underground economy, the authors also cannot definitively rule out aggregate cost estimates that are smaller than what is shown in those latter three tables.

Finally, the cost section of this report is built following the blueprint established by Belman and Sojourner in their 2019 report. To be clear, the extension of this approach to analyze per-worker annual labor costs implicitly assumes an apples-to-apples comparison of misclassified and off-the-books workers to legal employees earning at the industry's 30th percentile. This presumption is partially supported by evidence suggesting that, on average, employees and the self-employed work roughly the same amount in a given year.⁷⁷ Making apples-to-apples comparisons between workers in an economic fashion requires some consideration of potential wage premiums paid to non-payroll workers given potential arbitrage in labor markets for equally-skilled workers.

This presumed equality between these two sets of workers may deviate, however, for a number of reasons. On one hand, legal employees are likely to be better trained, more educated, and have greater firm-specific and job-specific knowledge and skills that make them more productive. This can implicitly lower legal employers' costs since these workers can presumably finish jobs faster and with fewer mistakes. On the other hand, some off-the-books workers may be unable to secure legal employment (e.g., undocumented laborers) and may not be able to approach the 30th percentile of industry earnings. Further, unencumbered by a permanent legal employment relationship (and experience-rated UI contributions), fraudulent employers may be more likely to jettison workers when there is a lack of work when compared to legal employers, thereby lowering their labor costs. While the factors highlighted in this paragraph work in opposing directions, the absence of data on things like worker productivity and turnover differentials among the two types of employers renders it impossible to sort out their net effect on the results.

Conclusion

The goals of this study were to develop accessible empirical methodologies that could be used to estimate the size of the underground construction economy and the aggregate cost savings attributable to payroll fraud. Given that these activities occur in the shadows of the economy—outside the purview of government regulators and data collectors—creating accurate projections represents a considerable challenge. To those ends, this study has used publicly-available data to develop accessible projection methods for estimating the

⁷⁷ Using the 2017 American Community Survey, self-employed construction-industry workers who report being employed at the time of the survey report working an average of 47.03 weeks per year and 41.27 hours per week. Legal employees report working an average of 47.99 weeks per year and 42.00 hours per week.

incidence and cost of payroll fraud in the construction industry. In addition to a thorough review of prior literature on the topic, it is hoped that the advancement of these empirical approaches will help promote future research on payroll fraud, both in the construction industry and across the entire economy.

The authors of this study acknowledge that the estimated incidence of illegal employment in the construction industry features a rather large range of possibilities; further, because of methodological factors, the authors cannot rule out that payroll fraud is even more extensive than this study's top-line estimate. While this uncertainty and the wide range of projections are unfortunate, it is not unexpected. To be clear, without any direct evidence of payroll fraud, the tools developed in this study are, in combination with only publicly-available data, akin to "blunt instruments." It is hoped that future research—such as the exploration of matched administrative data developed by government agencies—may lead to far more precise means to estimate the incidence and costs of payroll fraud among construction employers.

Regardless of specific values, this study has revealed that payroll fraud in the construction industry affects millions of workers and represents billions of dollars of lost income for both workers and social insurance programs. The most conservative cost estimates of this study suggest that the estimated 1.30 million workers directly affected by payroll fraud should have cost their employers \$49.93 billion in labor costs. But illegal labor practices allowed fraudulent employers to pay these workers between \$38.19 billion and \$43.70 billion, a gigantic savings that make it difficult for honest and law-abiding employers to compete in the most affected trades. In terms of fraudulent labor costs alone, these values represented 4.8% to 5.5% of total value added by the U.S. construction industry in 2017.

Given the caustic effects of payroll fraud on workers, taxpayers and law-abiding employers, it is surprising that it is not a top priority for fair-minded policymakers. There may be many reasons for this, but this study concludes by echoing the issue raised by Belman and Sojourner in their 2019 report: these billions of dollars in wages and benefits taken from workers and social programs are not solely benefiting the immediate construction employers. These cost savings allow specialty contractors to put in lower project bids, which allows some of that savings to be shared with overseeing general contractors and, by extension, construction owners and developers. In other words, those engaged in policy debates should be mindful of the entrenched set of powerful industry stakeholders whose self-interest is contrary to effective public policy that protects and promotes the interests of workers, law-abiding employers, and taxpayers.

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Table 1. Review of Prior Studies of Payroll Fraud in the Construction Industry (Since 2002)

Author(s) (Year)	Region	Findings
<i>Unemployment Insurance Audits</i>		
Carre and Wilson (2004)	Massachusetts	Between 14%-24% of construction firms misclassify workers; among firms who engage in this practice, 40%-48% of workers are affected. Overall, 5.4% to 11% of all construction employees are misclassified. For 2001-03, the state lost \$1.0-\$3.9 million in UI taxes, \$4.2-\$6.9 million in income tax, and up to \$7 million in workers comp premiums.
Carre and Wilson (2005)	Maine	14% of construction firms misclassified workers; among employers who misclassify, 45% of workers are misclassified. Overall, 11% of all construction employees are misclassified. State loses \$314,319 annually in lost UI tax revenues, \$2.6 million in lost income tax revenue, and \$6.5 million in lost workers comp contributions.
Kelsay et al. (2006)	Illinois	<i>The Economic Costs of Employee Misclassification in the State of Illinois</i>
Donahue, Lamare and Kotler (2007)	New York State	14.8% of the construction workforce was misclassified as independent contractors; average underreporting of UI taxable wages was \$7,314.
Office of Legislative Auditor (2007)	Minnesota	15% of construction firms misclassified employees; rates highest in roofing (38%), drywall installation (31%); lowest in road and bridge construction (10%), site preparation (5%).
Belman and Block (2009)	Michigan	26.4% of construction firms misclassified employees; among those who did so, 18.9% of their employees were misclassified (i.e., 6.2% of the entire industry workforce). State lost \$2.5 million in UI tax revenue and workers underreported \$168 million in gross income.
Kelsay and Sturgeon (2010)	Indiana	16.8% of the private-sector construction workforce was misclassified as independent contractors. State lost between \$10.7 and \$17.7 million in state income tax, \$4.3 to \$7.2 million in lost local income tax, \$2.2 million in lost UI tax revenue, and \$4.2 to \$9.2 million in lost worker's compensation premiums annually due to misclassification in construction.
Joint Legislative Audit and Review Commission (2012)	Virginia	33% of construction firms misclassified employees; among those who did so, 30% of the their workforce was misclassified.

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Workers Compensation Audits

Xu and Erlich (2019)	Washington	19% of construction employers misclassify employees as independent contractors.
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Surveys

Valenzuela, Jr., et al. (2006)	National	Survey of 2,660 day laborers; 43% primarily employed in construction jobs. Top occupations include laborer, painter, roofer, carpenter, drywall installer, and electrician.
Bernhardt et al. (2009)	NYC, Chicago, LA	Survey of 250+ urban residential construction workers found 70.5% experienced overtime violations; 12.7% suffered minimum wage violations.
Workers Defense Project (2009)	Austin, TX	Survey of 312 construction workers discovered 38% were misclassified as independent contractors, 18% said employer had no workers compensation policy, and one in five workers had experienced wage theft in the past three years in the city.
Workers Defense Project (2013)	Texas	Survey of 1,194 construction workers found 41% were misclassified or working off-the-books (a loss of \$54.5 million in UI tax revenue), 22% had experienced wage theft (median=\$960), 50% did not receive OT pay, and 32% said employer had no workers comp policy.
Theodore et al. (2017)	6 Southern Cities	Survey of 1,435 construction workers discovered 32% were misclassified as independent contractors or working off-the-books, 11% experienced wage theft in career (3.8% in last year; median=\$800), and only 43% said employer had no workers compensation policy.
Ormiston et al. (forthcoming)	Mid-Michigan	Investigation of 71 drywall installers by Carpenters Local 525 found 94% of contractors misclassified workers; 73% of 1,840 workers were misclassified or working off-the-books.

Comparing IRS Data and Worker Surveys

Roemer (2002)	National	Individual matched data between worker surveys and IRS files reflected that 6.5% to 7.7% of all self-reported wage earners were working underground or were misclassified as independent contractors. Only occupations with high illegality rates were listed; construction jobs led by carpet installers (33.2%), tile setters (29.8%), painters (19.7%), construction helpers (19.2%), laborers (18.6%), and carpenters (16.6%).
Alm and Erard (2016)	National	Self-employed workers in construction estimated to have earned \$63.3 billion in 2001 via

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worker surveys. Analysis of IRS files revealed only \$40.9 billion was reported, including \$17.7 billion misreported as wages.

Comparing Payroll Data and Worker Surveys

Flaming, Haydamack and Joassart (2005)	Los Angeles	Estimated that 65,200 workers were employed informally in Los Angeles County construction industry, accounting for nearly 30% of the sector's labor force.
Fiscal Policy Institute (2007)	New York City	Estimating that 57,000 workers were misclassified or unreported (over 25% of industry workforce), resulting in estimated losses of \$272 million in Social Security and Medicare, and \$70 million in personal income tax.
Canak and Adams (2010)	Tennessee	Between 12,000 and 39,000 construction workers estimated to be misclassified or unreported; base projections suggest between 11 and 21% of construction workforce is affected. Maximum losses to state and federal programs were up to \$14.9 million for the state's UI program, \$91.6 million in lost worker's compensation premiums, \$73.4 million in federal income tax, and \$42.1 million in Social Security funding.
Liu, Flaming and Burns (2014)	California	An estimated 143,900 workers were misclassified or unreported (16% of the labor force). Highest rates in specialty trades (industry) and helpers, painters and laborers (occupation). Estimated losses included \$473 in state taxes, \$63 million in UI premiums, \$146 million in state disability funds, and \$264 million in workers compensation premiums.
Cooke, Figart and Froomjian (2016)	New Jersey	An estimated 35,000 workers were misclassified or unreported (roughly 16% of the state's payroll labor force in construction), with unreported wages totaling between \$284 and \$528 million. This amounted to \$20 million in lost state income tax revenue, and between \$3.1 to \$6.7 million in lost UI premiums.

Table 11. Differences in Construction Workers' Place of Residence vs. Place of Work, 2017 American Community Survey

State	ALL WORKERS					EXCLUDING SELF-EMPLOYED				
	Residents Employed In Cons. A	Non-Residents Working in State B	Residents Working in Other State C	Net # Change B-C	Net % Change (B-C)/A	Residents Employed In Cons. D	Non-Residents Working in State E	Residents Working in Other State F	Net # Change E-F	Net % Change (E-F)/D
Alabama	140,912	7,010	9,299	-2,289	-1.62%	108,543	5,809	8,037	-2,228	-2.05%
Alaska	25,112	748	241	507	2.02%	19,146	748	241	507	2.65%
Arizona	213,140	1,637	3,958	-2,321	-1.09%	168,903	1,610	3,635	-2,025	-1.20%
Arkansas	86,733	3,648	5,219	-1,571	-1.81%	65,036	2,521	4,745	-2,224	-3.42%
California	1,146,817	6,114	4,511	1,603	0.14%	872,850	5,164	3,418	1,746	0.20%
Colorado	235,270	3,278	2,898	380	0.16%	182,205	2,759	2,326	433	0.24%
Connecticut	104,714	4,490	10,405	-5,915	-5.65%	68,666	3,813	7,319	-3,506	-5.11%
Delaware	29,803	3,842	3,996	-154	-0.52%	22,040	3,646	3,464	182	0.83%
D.C.	10,248	27,762	3,742	24,020	234.39%	8,808	23,991	3,165	20,826	236.44%
Florida	715,243	5,884	8,402	-2,518	-0.35%	543,882	5,263	6,180	-917	-0.17%
Georgia	318,875	13,143	15,695	-2,552	-0.80%	241,029	10,959	12,927	-1,968	-0.82%
Hawaii	49,586	431	36	395	0.80%	42,522	431	36	395	0.93%
Idaho	55,007	1,155	4,830	-3,675	-6.68%	39,453	966	4,257	-3,291	-8.34%
Illinois	326,498	15,647	18,847	-3,200	-0.98%	251,003	14,251	16,723	-2,472	-0.98%
Indiana	202,926	9,162	17,903	-8,741	-4.31%	157,574	8,091	15,995	-7,904	-5.02%
Iowa	103,485	5,668	7,201	-1,533	-1.48%	79,398	5,279	6,773	-1,494	-1.88%
Kansas	87,527	9,940	9,481	459	0.52%	68,136	9,119	8,080	1,039	1.52%
Kentucky	116,194	9,930	12,525	-2,595	-2.23%	90,317	9,155	11,568	-2,413	-2.67%
Louisiana	160,358	14,844	4,762	10,082	6.29%	127,744	13,239	4,297	8,942	7.00%
Maine	42,578	515	3,509	-2,994	-7.03%	28,514	515	3,248	-2,733	-9.58%
Maryland	208,773	26,128	36,633	-10,505	-5.03%	169,061	23,256	32,818	-9,562	-5.66%
Massachusetts	203,644	19,285	8,713	10,572	5.19%	153,665	16,713	8,077	8,636	5.62%
Michigan	242,801	1,454	5,748	-4,294	-1.77%	177,697	1,301	4,587	-3,286	-1.85%
Minnesota	170,728	8,614	4,996	3,618	2.12%	127,783	8,083	4,652	3,431	2.69%
Mississippi	78,881	3,426	12,174	-8,748	-11.09%	59,839	3,043	11,326	-8,283	-13.84%
Missouri	181,267	16,167	13,658	2,509	1.38%	136,925	14,318	12,337	1,981	1.45%
Montana	41,517	819	555	264	0.64%	24,477	597	344	253	1.03%
Nebraska	63,219	5,122	2,146	2,976	4.71%	50,665	4,333	2,000	2,333	4.60%
Nevada	98,194	1,752	4,782	-3,030	-3.09%	86,769	1,730	4,341	-2,611	-3.01%
New Hampshire	48,195	6,479	11,126	-4,647	-9.64%	35,751	5,619	9,899	-4,280	-11.97%
New Jersey	251,296	13,302	41,969	-28,667	-11.41%	197,700	11,198	38,233	-27,035	-13.67%
New Mexico	56,111	2,136	3,662	-1,526	-2.72%	47,663	2,058	3,094	-1,036	-2.17%
New York	527,050	41,550	9,568	31,982	6.07%	420,947	35,613	8,532	27,081	6.43%

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State	ALL WORKERS					EXCLUDING SELF-EMPLOYED				
	Residents Employed In Cons. A	Non-Residents Working in State B	Residents Working in Other State C	Net # Change B-C	Net % Change (B-C)/A	Residents Employed In Cons. D	Non-Residents Working in State E	Residents Working in Other State F	Net # Change E-F	Net % Change (E-F)/D
North Carolina	315,336	15,145	15,732	-587	-0.19%	236,919	14,349	13,179	1,170	0.49%
North Dakota	34,861	3,538	617	2,921	8.38%	27,677	3,095	445	2,650	9.57%
Ohio	302,977	17,534	11,363	6,171	2.04%	231,930	15,794	10,936	4,858	2.09%
Oklahoma	117,876	3,783	4,738	-955	-0.81%	87,817	3,597	4,085	-488	-0.56%
Oregon	127,164	8,896	6,060	2,836	2.23%	95,145	8,262	5,239	3,023	3.18%
Pennsylvania	352,499	22,365	19,597	2,768	0.79%	265,737	20,624	17,122	3,502	1.32%
Rhode Island	30,353	4,271	5,780	-1,509	-4.97%	22,373	3,898	4,947	-1,049	-4.69%
South Carolina	149,236	13,549	10,604	2,945	1.97%	120,177	12,435	10,091	2,344	1.95%
South Dakota	31,558	1,429	1,869	-440	-1.39%	26,112	1,359	1,564	-205	-0.79%
Tennessee	195,892	14,702	7,313	7,389	3.77%	142,581	12,497	5,857	6,640	4.66%
Texas	1,125,853	14,704	16,525	-1,821	-0.16%	892,131	12,653	14,731	-2,078	-0.23%
Utah	106,145	2,191	2,003	188	0.18%	86,659	2,044	1,844	200	0.23%
Vermont	24,031	1,083	1,495	-412	-1.71%	14,910	685	1,495	-810	-5.43%
Virginia	270,802	26,198	29,191	-2,993	-1.11%	217,107	24,253	26,420	-2,167	-1.00%
Washington	247,484	7,698	10,093	-2,395	-0.97%	196,105	6,334	9,416	-3,082	-1.57%
West Virginia	44,489	6,976	10,910	-3,934	-8.84%	36,854	6,614	10,560	-3,946	-10.71%
Wisconsin	175,856	5,669	8,828	-3,159	-1.80%	136,277	5,278	8,117	-2,839	-2.08%
Wyoming	20,904	2,145	632	1,513	7.24%	15,031	1,609	487	1,122	7.46%

Source: Analysis of 2017 American Community Survey data extracted from <https://usa.ipums.org/usa>. Note: Analysis is limited to employed construction workers who report both a place of residence and a place of work. A small number of workers report American residence but claim to work in another country.