The Effects of Medicaid Expansion on Labor Market Outcomes: Evidence from Border Counties

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Abstract
This paper provides new empirical evidence on the employment and earning effects of the recent Medicaid expansion. Unlike most existing studies that use a conventional state and year fixed effects approach, our main identification strategy is based on the comparison of employment and wages in contiguous county-pairs in neighboring states (i.e. border counties) with different Medicaid expansion status. Using the 2008-2016 Quarterly Census of Employment and Wages, we estimate a set of distributed lag models in order to examine the dynamic effects of Medicaid expansion. Results from our preferred specification suggest a small but statistically significant decrease in employment of 1.3 percent one year after the Medicaid expansion. This disemployment effect is transitory and appears to primarily occur in low-wage sectors. In particular, employment returns to pre-expansion levels within two years. We also do not find any statistically significant effect of the Medicaid expansion on wages at any point.

Key Words: Medicaid Expansion, Employment, Wages, Border Counties.
JEL Codes: H51, I13, J20

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1. Introduction

The Affordable Care Act (ACA) has substantially increased health insurance coverage across all income and demographic groups. It is estimated that nearly 20 million previously uninsured nonelderly adults gained coverage since the enactment of the law in 2010, resulting in a historically low uninsured rate of 8.6 percent as of early 2016 (Avery et al., 2016). Although the ACA has multiple provisions that aim to expand coverage, most of the gains in coverage resulted from the expansion of state Medicaid programs and establishment of individual health insurance exchanges (i.e. "Health Insurance Marketplaces").[1] However, due to state decisions to reject Medicaid expansion, there is a large imbalance in the increase in Medicaid enrollment between expansion and non-expansion states: enrollment gains exceeded 12 million in states that adopted the Medicaid expansion, compared to enrollment growth of just 2 million people in non-expansion states.

Given this sharp increase in Medicaid enrollment across the U.S., it is important to assess the consequences for labor markets. Standard economic theory suggests that public insurance programs such as Medicaid may create disincentives to work by weakening the link between health insurance coverage and employment. This disincentive effect has been cited by many opponents of Medicaid expansion as one of the main arguments against expanding the program. In fact, a number of states that adopted the expansion are now contemplating the introduction of work requirements in Medicaid for able-bodied individuals.

[1] Uberoi et al. (2016) report that enrollment in Medicaid and the Children's Health Insurance Program (CHIP) increased by over 14 million between September 2013 and December 2015; the number of insurance plans issued through the Health Insurance Marketplaces reached 12.7 million in the 2016 open enrollment period. Note that the sum of these enrollment gains is greater than the net change because of "churning" (i.e. individuals switching among different sources of health insurance coverage).

Since its establishment, traditional Medicaid has been an entitlement program where coverage is not contingent upon employment requirements, and no state had been successful in imposing work requirements before 2018.[2] On January 12, 2018 Kentucky became the first state to obtain approval from the Centers for Medicare and Medicaid Services (CMS) to institute a work requirement in its Medicaid program. As of August 2018, three additional states (Arkansas, Indiana, and New Hampshire) have obtained waivers from CMS to impose work requirements, and several other states currently have applications pending with CMS (Garfield et al., 2018a). However, on June 29, 2018 a federal judge issued a ruling that blocks the implementation of work requirements in Kentucky, further stoking controversy around the issue.[3]

In light of these initiatives by state policy makers it is important to accurately assess the labor market effects of the ACA Medicaid expansion. Unfortunately, current empirical evidence on this front is rather inconclusive. While there is a vast literature on how public insurance programs affect individual labor supply decisions, much of this literature focuses on low-income women (such as pregnant women or women with or without dependent children) and the results are mixed (for example, see Gruber and Madrian, 2002; Hamersma and Kim, 2009; Dave et al., 2015). Furthermore, these studies are not informative in the current policy context since the ACA Medicaid expansion mainly targets low-income adults without dependent children.

To date, the strongest empirical evidence on the labor supply decisions of nonelderly childless adults with public health insurance coverage comes from three studies that exploit exogenous changes in state Medicaid eligibility requirements and enrollment policies. Baicker et

[2] For example, during its negotiations on Medicaid expansion with the federal government, Pennsylvania attempted to include a "watered down" version of the work requirement (i.e. "actively search for work"). The provision was opposed by CMS and was not included in the final agreement between the state and federal governments.
[3] See media coverage of the ruling at https://www.nytimes.com/2018/06/29/health/kentucky-medicaid-work-rules.html. Accessed September 5, 2018.

al. (2014) does not find any statistically significant change in employment after Medicaid enrollment using data from the Oregon Medicaid Experiment. In contrast, Garthwaite et al. (2014) estimates a large increase in labor supply as a result of forced disenrollment in Tennessee's Medicaid program. Similarly, Dague et al. (2017) exploits an unexpected suspension in enrollment in Wisconsin's previous expansion of its Medicaid program and reports a sizable reduction in employment among individuals who gained public health insurance coverage. It is worth noting that the different findings in these studies may stem from differences in the particular population studied and macroeconomic context (Dague et al., 2017).

There are also several studies that directly examine how the ACA Medicaid expansion affects labor market outcomes by exploiting state decisions to reject Medicaid expansion for identification. Using standard state-year difference-in-differences models applied to nationally representative survey data, none of these studies detect any statistically significant changes in employment, wages, or hours worked after the implementation of the Medicaid expansion (Gooptu et al., 2016; Kaestner et al., 2017; Leung and Mas, 2016; Frisvold and Jung, 2018). However, as pointed out in a recent paper by Duggan et al. (2017), labor market effects may be masked at the aggregate (state) level if changes in labor supply in smaller geographic areas are averaged out in a state-level model. In particular, Duggan et al. (2017) reports that labor force participation *increased* in areas with greater potential for Medicaid enrollment and *decreased* in areas with greater potential for Marketplace enrollment.

In this paper, we provide new empirical evidence on the employment and earnings effects of the recent Medicaid expansion. Unlike the aforementioned studies, our main identification strategy is based on the comparison of employment and wages in contiguous county-pairs in neighboring states (i.e. border counties) with different Medicaid expansion status. This approach is similar to Dube et al. (2010), which uses minimum wage differentials between contiguous counties to study the employment and wage effects of state minimum wage laws. Compared to a standard difference-in-differences approach, restricting the analysis to border-county pairs greatly improves the comparability between treatment and control units and accounts for spatial heterogeneity, which can confound the relationship between Medicaid expansion status and employment or wages. Consequently, our preferred specification uses only within county-pair variation in Medicaid expansion status for identification and allows for arbitrary time effects across county pairs. Using data from the 2008-2016 Quarterly Census of Employment and Wages (QCEW), we estimate a set of county-level distributed lag models which allow us to examine the dynamic effects of the Medicaid expansion.[4] In addition, we take advantage of detailed industry-level data afforded by the QCEW to examine whether Medicaid expansion has a differential impact on individuals employed across different industries.

Consistent with previous studies, we do not find any statistically significant effects on either employment or wages when estimating a conventional county and year fixed effects model on the full sample. However, in our border county-pair sample we find a small but statistically significant decrease in employment of 1.3 percent one year after the implementation of the Medicaid expansion. Importantly, this effect is transitory and quickly dissipates in the second post-expansion year. In addition, we find suggestive evidence that this disemployment effect is concentrated in low-wage industries. We do not detect any statistically significant change in wages in our border sample. Overall, our estimates suggest that the ACA Medicaid expansion had a modest and transitory effect on labor supply at the extensive margin. These findings not only enhance our understanding of the total costs of the ACA Medicaid expansion, but also

[4] Almost all existing studies use annual data with a timeframe up to 2015, which effectively rules out the inclusion of dynamic effects in the model.

contribute to the growing literature on the impact of public insurance programs on labor market outcomes.

The rest of the paper is organized as follows. Section 2 provides the institutional background of the ACA Medicaid expansion. Section 3 details our empirical strategy and section 4 describes the data. Section 5 presents the main results and robustness checks, and Section 6 contains the discussion and conclusions.

2. The ACA Medicaid expansion and labor market

Prior to the ACA Medicaid expansion, there was significant variation in Medicaid eligibility across states. While most states provided generous coverage to children (either through traditional Medicaid or a standalone Children's Health Insurance Program), many states did not cover able-bodied adults regardless of their income unless they had dependent children or were pregnant. Among the few states that did provide full Medicaid benefits to certain low-income childless adults, only Vermont, Hawaii, and the District of Columbia had an income eligibility threshold above 100 percent of the Federal Poverty Level (FPL). Although a number of other states offered more limited coverage to childless adults, the majority of these programs stopped accepting new enrollees before 2014 (Kaiser Family Foundation, 2013).

The provisions of the ACA mandated that states expand their Medicaid programs by raising the income eligibility threshold for all individuals to 138 percent FPL. However, a Supreme Court ruling in 2012 gave states the right to opt out, and as of December 31, 2016, thirty one states and the D.C. have implemented the expansion. In most of these states expanded coverage became available at the beginning of 2014, while a few states (such as Pennsylvania and Indiana) adopted the expansion later in 2015 and 2016. As discussed above, this led to a large discrepancy in Medicaid enrollment growth between expansion and non-expansion states.

As of June 2018, the rejection of the Medicaid expansion by some states created a coverage gap in which approximately 2.2 million childless adults in non-expansion states with incomes below 100 percent FPL are too poor to qualify for subsidies provided to the low-income purchasers of Marketplace plans. But at the same time, these individuals are not eligible for Medicaid (Garfield et al., 2018b).

The labor market effects of the ACA Medicaid expansion might be empirically ambiguous for several reasons. First, just as standard economic theory would predict, gaining public insurance may reduce labor supply for those with the highest disutility from work (e.g. sick individuals now do not have to be employed in order to maintain health insurance). But since access to public coverage could also improve job mobility, it is possible that individuals could re-sort to different jobs after acquiring Medicaid coverage (leading to no overall change in employment) or that newly eligible Medicaid beneficiaries would be more willing to accept employment even when employers do not provide health insurance (leading to higher overall employment). For the same reason, it is unclear how wages would change under the Medicaid expansion. Reservation wages may be higher since individuals no longer need to work to maintain coverage. At the same time, individuals with incomes near the Medicaid eligibility threshold may have an incentive to manipulate (or misreport) incomes to become (or remain) eligible for Medicaid benefits.[5]

Second, the establishment of the Marketplaces gives low-income individuals access to heavily subsidized coverage even when their incomes exceed the Medicaid eligibility threshold. This could potentially dampen the work disincentive effect of the Medicaid expansion.

[5] For example, Shi (2016) finds evidence of income manipulation to gain subsidized insurance in the Massachusetts health insurance exchange by individuals with incomes near the established thresholds.

3. Empirical Strategies

We begin our analysis with a standard difference-in-differences specification that includes county and year fixed effects. Specifically, we estimate a baseline model of the following form:

$$Ln\, Y_{cst} = \alpha + \beta \cdot D_{cst} + \gamma' \cdot X_{cst} + \theta_c + \tau_t + \varepsilon_{cst}, \qquad (1)$$

where Y_{cst} is the outcome of interest (total employment or average wage) in county c and state s in year t; D_{cst} is a binary indicator that equals one for counties in state s after the state's adoption of the Medicaid expansion; X_{cst} is a vector of time-varying county characteristics; θ_c is a county fixed effect that removes time-invariant unobserved county-level factors; τ_t is a time fixed effect that captures contemporaneous shocks common to all states; and ε_{cst} is a random error term. The parameter of interest β represents the difference-in-differences estimate of the labor market effect of the ACA Medicaid expansion.

Note that identification in equation (1) hinges on the assumption that employment and wages would have followed similar paths in expansion and non-expansion states in the absence of the ACA's implementation. Although it is unlikely that states rejected the Medicaid expansion on the basis of local labor market conditions (i.e., no policy endogeneity), it is still possible that employment and wages evolved differently in expansion states before they opted to expand their Medicaid programs. A technique commonly used in the program evaluation literature is to estimate an augmented model that controls for a set of state-specific linear trends. Unlike equation (1), identification in this specification comes from sharp deviations in the outcomes from linear trends in the expansion states relative to non-expansion states. However, as pointed out by Dube et al. (2010), although these linear trends can help control for unobserved heterogeneity under a set of parametric assumptions, it is possible that some useful variation for identification is removed because the estimated trends can also be affected by the treatment.

Following Dube at al. (2010), we further address spatial heterogeneity by restricting our analysis to contiguous counties in neighboring states with different decisions on Medicaid expansion. We re-formulate equation (1) for estimation on the border county-pair sample:

$$Ln\, Y_{cpt} = \alpha + \beta \cdot D_{cst} + \gamma' \cdot X_{cpt} + \theta_c + \tau_t + \varepsilon_{cpt}, \qquad (2)$$

where p denotes county pairs. Note that under this specification a county can enter the estimation sample more than once if it is included in multiple border-county pairs. Estimation of equation (2) is still subject to the implicit assumption that counties in the non-expansion states are good control units for *all* treatment counties. Therefore, we add to equation (2) a set of county-pair fixed-effects ψ_p:

$$Ln\, Y_{cpt} = \alpha + \beta \cdot D_{cst} + \gamma' \cdot X_{cpt} + \theta_c + \psi_p + \tau_t + \varepsilon_{cpt}. \qquad (3)$$

Since this specification only uses within county-pair variation for identification, for a given treatment county only the contiguous county in the neighboring non-expansion state is used as the control unit. To correct for possible pre-existing differential trends across treatment and control counties, we modify equation (3) to allow for county-pair-by-year fixed effects

$$Ln\, Y_{cpt} = \alpha + \beta \cdot D_{cst} + \sigma' \cdot X_{cpt} + \theta_c + \mu_{pt} + \varepsilon_{cpt}, \qquad (4)$$

where μ_{pt} is the full set of interactions between county-pair and year fixed effects.[6] By allowing for arbitrary time effects across county-pairs, equation (4) it does not rely on any untestable parametric assumption on the evolution of the outcomes (unlike models with state-specific linear trends). Finally, to uncover the dynamic effects of the Medicaid expansion on employment and wages, we include a set of distributed lags in equations (1) – (4). Since our sample period ends in 2016, we are able to include up to two lags as the earliest expansions under the ACA were

[6] In other words, we include a separate county-pair fixed effect for each year of the sample period.

implemented in 2014. This distributed lag model with county-pair-by-year fixed effects is our preferred specification.

Due to the fact that the authority to implement the Medicaid expansion rests with state governments, it is natural to cluster the standard errors at the state level when conducting statistical inference. This accounts for both serial correlation in the outcomes and within-state correlation in the error terms. However, one complication in our border county-pair analysis is that a county may belong to multiple county-pairs along a single border segment, which creates another source of correlation across county-pairs. To address this issue, we adjust the standard errors using a two-way clustering method to correct for both within-state and within-county-pair correlations (Dube et al., 2010; Cameron and Miller, 2015).

4. Data

We use data from the 2008-2016 Quarterly Census of Employment and Wages (QCEW) compiled by the Bureaus of Labor Statistics (BLS). The QCEW is a comprehensive census of all business establishments that report to the unemployment insurance programs. These data contain detailed information on quarterly and annual employment and earnings by industry and by three different levels of geographic aggregation (national, state, and county). According to the BLS, the QCEW covers 97 percent of U.S. civilian employment.[7] Despite almost being a census of jobs, the QCEW has been rarely used in the health economics literature due to its lack of information on individual characteristics. Instead, most existing studies on the labor market effects of the ACA Medicaid expansion either use the American Community Survey (ACS) or the Current Population Survey (CPS). However, one significant advantage of the QCEW is that it

[7] For more information on the QCEW, see https://www.bls.gov/cew/cewfaq.htm (accessed on March 21, 2018).

allows the measurement of changes in employment and wages over time at the *county-level*, which is a more appropriate approximation for the boundaries of local labor markets. By supplementing the QCEW data with other county demographic and economic characteristics, we are able to conduct a county-level analysis of the labor market effects of the Medicaid expansion.

One issue when estimating distributed lag models is multicollinearity among the contemporaneous term and lags. As the number of included lags increases, estimated coefficients on the lagged terms tend to become unstable, sometimes in ways that are at odds with economic theory. For this reason, we limit the lag length by collapsing the monthly county-level total employment counts and quarterly weekly wages to county-year cells. We use as dependent variables the logarithm of these annual averages in our regression models. Although we primarily focus on the annual-level analyses, we also present results using quarterly outcome measures as a robustness check. Note that since the total employment counts include both part-time and full-time jobs, it is possible that an individual may be counted multiple times in the data if the person holds more than one job. For this reason, we use the raw employment count instead of employment rate as our outcome variable, while controlling for county population. It is also worth noting that the wages reported in the QCEW represent the total compensation received by workers, which may include non-wage compensation such as bonuses, stock options, and even employers' contributions to retirement plans. Finally, the QECW does not contain information on hours worked. As a result, we are not able to investigate the labor supply effect of the Medicaid expansion at the intensive margin.

Next, we describe the construction of our estimation samples. To create a balanced panel, we exclude counties that have missing employment counts or wages in the QCEW for any of the 36 quarters between 2008 and 2016. We also drop counties in Alaska and Hawaii as they do not border any states. We merge information on each state's decision to expand Medicaid between January 1, 2014 through December 31, 2016 to our main dataset (see Table A1). The final sample consists of 3,058 counties, representing 27,522 county-year observations (hereafter referred to as the "full sample"). In order to improve the comparability between the treated and control counties, we further create two contiguous border-county pairs samples. We first identify all contiguous border-county pairs using the 2010 Census county adjacency file, and then subset the full sample to county-pairs in neighboring states with different Medicaid expansion status.[8] The resulting sample contains 584 distinct counties in 38 states, yielding 590 county-pairs and 10,620 county-year observations (hereafter referred to as "border sample 1"). Note that a county can be included in multiple county-pairs along a single border segment. Additionally, county-pairs in two neighboring states can be included in this analysis even if both states expanded their Medicaid programs, but did so at different times (for example, Michigan and Indiana).

The inclusion of the late adoption states in the estimation sample may attenuate the coefficients on the Medicaid expansion variables if the expansion has long lagged effects. To address this concern, we further refine our border sample by removing states that implemented the Medicaid expansion after January 1, 2014. This reduces the number of county-pairs to 360 (in 27 states), representing 6,480 county-year observations (hereafter referred to as "border sample 2"). Although we present results from both border samples, we use border sample 2 as our preferred analysis sample. In Figure 1 we display the locations of the county-pairs in these two border samples.

All of our regression models include controls for the following time-varying county characteristics: the effective minimum wage rate, county population, poverty rate, and median

[8] The Census county adjacency file can be accessed at https://www.census.gov/geo/reference/county-adjacency.html (accessed on November 1, 2017).

household income.[9] The effective minimum wage is calculated by the higher of federal and state minimum wages obtained from the January edition of *Monthly Labor Review*. County population estimates and economic data are obtained from the Census Bureau Population Estimates Program (PEP) and the Small Area Income and Poverty Estimates (SAIPE) Program, respectively. In Table 1 we compare the demographic and economic characteristics of counties in expansion and non-expansion states in all of our three estimation samples. These statistics show that the treatment and control counties are clearly more similar along a few key economic indicators in the two border samples than in the full sample. For example, the gap in poverty rate between treatment and control counties is about 2 percentage points in the full sample (and statistically significant at 1 percent level), but no statistically significant difference exists in the poverty rate between the treatment and control counties in both border samples. Overall, these comparisons support restricting the analysis to border county-pairs.

5. Results

5.1 Main results

In Table 2, we present the conventional difference-in-differences estimates from the full sample. Columns 1-3 of Table 2 contain estimates from models that control for county and year fixed effects with a different number of lags. We do not find any statistically significant changes in either employment or wages after the implementation of the Medicaid expansion from these specifications. Also, the estimates remain statistically insignificant after we add state-specific linear trends to the models (see columns 4-6 of Table 2). Overall, these results are consistent

[9] Since poverty rates are potentially endogenous, we re-estimated our models without the poverty rate variable and the results were largely unchanged.

with the findings from most existing studies that the ACA Medicaid expansion had no detectable impact on labor markets.

Next, we turn to the results from our border county-pairs analysis. We report in Table 3 the estimates using border sample 1 (all expansion states). Just as in the full sample, none of the estimated coefficients are statically significant in employment or wage models with only county and year fixed effects (see columns 1-3 of Table 3). This is not surprising since this specification still relies on within-county variation for identification. We then estimate a set of models that additionally control for county-pair fixed effects. Unlike earlier models, identification under this specification is from variation in Medicaid expansion status within each county-pair. We find that the coefficients on the contemporaneous or lagged treatment dummies remain imprecisely estimated (see columns 4-6 of Table 3). However, one caveat with these models is that the year fixed effects impose a common path for time-varying unobserved factors across county-pairs, and when the late expansion states are included in the sample, this restriction may fail to account for differences in how employment or wages evolve over time within county-pairs. Therefore, we estimate a set of models with county-pair-by-year fixed effects that allow for arbitrary time effects across county-pairs (see columns 7-9 of Table 3). These results suggest that the Medicaid expansion is associated with a 1.3 percent decrease in total county-level employment one year after its implementation. Also, the coefficient estimate on the second lag of the treatment dummy is small and imprecisely estimated. We, however, continue to find no evidence of any statistically significant change in wages.

To address the concern that the inclusion of late expansion states in the sample may attenuate the estimated effects, we repeat the analysis in Table 3 using border sample 2 where all late expansion states (IN, LA, MI, MT, NH, and PA) are excluded. We report the estimates from this exercise in Table 4. In this case, the estimated effects on employment are remarkably similar across all three specifications. The estimates from our preferred specification with county-pair-by-year fixed effects suggest that total employment in the treatment counties decreased by 1.3 percent relative to their neighboring control counties one year after the adoption of the Medicaid expansion. Just as with the estimates using border sample 1, the second lag of the treatment dummy is small in magnitude and falls below conventional levels of statistical significance. Again, we find no effect on wages.

Since coverage eligibility gains primarily occur among low-income childless adults, the effects of Medicaid expansion are likely to be more pronounced in low-wage industries.[10] To explore potential heterogeneous effects across industries, we extend our analysis to three industries: retail trade (NAICS code 44-45), accommodation and food services (NAICS code 72), and construction (NAICS code 23).[11] We select these industries based on a few practical considerations. First, among all 2-digit NAICS industries, the retail trade and accommodation and food services industries contain the largest proportion of low-wage workers and have been studied extensively in the literature (Addison et al., 2009; Dube et al., 2010). Second, since the QCEW suppresses data reporting for industries with few employers, these two industries are among the few low-wage industries containing a sufficient sample size for county-level

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[10] McMorrow et al. (2017) estimates that the ACA Medicaid expansion is associated with a 21.4 percentage-point decrease in uninsurance among low-income childless adults between 2013 and 2015.

[11] We chose to conduct our analysis using the two-digit NAICS codes because more disaggregated data based on the three- or more digit NAICS codes do not provide sufficient sample size for our analysis.

analysis.[12] In contrast to retail trade/accommodation and food services, the construction industry has the lowest proportion of minimum wage workers.[13]

We report the industry-specific results using our preferred border sample 2 in Table 5. In these models the point estimates on the contemporaneous and lagged treatment dummies are consistently negative for employment across all three specifications in the retail trade and accommodation and food services industries. Although we find the same transitory disemployment effect for retail trade and accommodation and food services as in the main model, this effect is only precisely estimated in the model with county-pair, county and year fixed effects (columns 5 and 8). In contrast, none of the Medicaid expansion variables are statistically significant when the model is estimated using the construction industry.

The imprecision of the point estimates in these models is not surprising due to the multicollinearity among the treatment dummies, especially in the small samples. Following Meer and West (2016), we calculate the sum of the estimated coefficients on the contemporaneous term and lags, which provides a more accurate assessment of the impact of the Medicaid expansion when multicollinearity makes it difficult to separately identify the lagged effect in each period. Based on the sum of coefficients in all time periods we find that the Medicaid expansion is associated with a decrease of 2.9 and 2.6 percent in total employment in the retail trade and food and accommodation industries, respectively (see columns 5 and 8 in Table 5) in estimates from models with county-pair, county and year fixed effects. Both estimates remain

[12] The QCEW employs a set of complex suppression rules to protect the identity of employers. For our applications, this creates discrepancies in sample size across different industries. In particular, we note that the retail trade industry border sample has slightly more observations than the all-industry border sample. This is because data are suppressed for all-industry employment but not for retail trade employment in a few counties.

[13] According to the 2016 CPS data, retail trade and accommodation and food services have the highest number of workers earning at or below the federal minimum wage, accounting for approximately 73 percent of all such workers in the U.S. In contrast, only 0.4 percent of all workers in construction earn at or below the federal minimum wage.

negative but lose statistical significance when we augment the models with county-pair by year fixed effects (see columns 6 and 9 in Table 5), although the estimate for retail trade is marginally significant (p=.13). Consistent with our main results, we do not find any statistically significant changes in wages in any of these three industries.

Taken together, the results from our contiguous border county analysis provide strong evidence for a transient overall reduction in employment after states implemented the Medicaid expansion. And there is suggestive evidence that the disemployment effect is concentrated in the low-wage industries.

5.2 Robustness checks

We conduct a series of additional checks to assess the robustness of our main findings on employment. To streamline the presentation of the results, we only discuss findings using border sample 2 since the results are similar when border sample 1 is used.

We first conduct a set of falsification tests by re-estimating our main models using the employment outcomes of public-sector workers who typically have employer-sponsored health insurance. In particular, we compare changes in combined employment at local and state governments in expansion counties relative to their non-expansion neighboring counties. Finding a statistically significant decrease in the number of government jobs would indicate the presence of unobserved heterogeneity in employment growth that could also be confounding the relationship between Medicaid expansion and private-sector employment. In support of our empirical approach, we do not find any statistically significant decrease in employment at state and local governments after the implementation of the Medicaid expansion (see Table 6).

Next, we test whether pre-existing trends in employment are causing us to overestimate the effect of the Medicaid expansion. This could occur if counties in expansion states were already experiencing slower growth in employment relative to their counterparts across the state border in non-expansion states. In order to examine the presence of such pre-existing trends, we re-estimate equations (2) - (4) with three leads of the treatment dummy. As shown in Table 7, we do not find the coefficient on any lead variable to be statistically significant. Although the parallel trend assumption in our model cannot be proven using empirical methods, these results suggest that it is unlikely our main finding on employment from the contiguous border samples is driven by pre-existing differential trends across county-pairs.[14]

One potential issue with the aggregation of the QCEW to county-year cells is that we may not fully capture the dynamic relationship between Medicaid expansion and employment. To further explore this possibility, we re-estimate our main specification on employment using quarterly data. We report in column 1 of Table 8 estimates from a model that includes seven quarterly lag terms. In general, these estimates mirror the findings from the annual models. In particular, the sum of estimated coefficients on the contemporary through the third quarterly lag terms (equivalent to the contemporary term in the annual models) is close to zero, and the sum of the fourth to seventh lags (the first lag in the annual models) equals -0.02 ($p<0.01$), suggesting a statistically significant decrease in employment one year after the Medicaid expansion. These estimates correspond closely to the findings from the annual models.

Because multicollinearity in these models may contribute to instability in the point estimates of individuals lag coefficients, we re-estimated the models using a third-order polynomial distributed lag specification (Amemiya and Morimune, 1974; Baldwin, 1988).[15]

[14] We do not find any evidence against the parallel trend assumption in the industry-specific analysis either. Results are available from the authors upon request.
[15] The eigenvalue condition number for the unrestricted quarterly model in Table 8 is 16.87, which exceeds 10, the conventional minimum standard for instability of regression coefficients due to multicollinearity. In contrast, the eigenvalue condition number for our preferred annual model is 4.13, which falls well below the instability threshold.

Consistent with the unstructured model, estimates from the restricted model also show a transitory decline in employment that occurs about one year after the Medicaid expansion, with the effect disappearing after seven quarters post-implementation (see column 2 in Table 8). However, in this case the individual lag coefficients for quarters 4 – 6 (and only these coefficients) are precisely estimated. Overall, results from the quarterly models lend support to our main findings, and suggest that the true labor market effects are not masked when the models are estimated using annual data.

Next, we assess whether our results are sensitive to alternative definitions of the analytical sample. Specifically, we re-estimate our preferred specification after excluding 1) states that expanded Medicaid eligibility to childless low-income adults before 2014;[16] and 2) ten large counties that are less densely populated in the western U.S. [17] The estimates are largely unchanged using these alternative samples, indicating that our main results are not affected by either states' early adoption decisions or county population density (see Table A2).

Finally, we evaluate whether the Medicaid expansion results in employment spillovers across borders. In particular, our estimates will understate any disemployment effect if residents in a non-expansion state leave their jobs and migrate across state borders to receive Medicaid benefits. Following Dube et al. (2010), we conduct an analysis designed to compare the employment effects of the Medicaid expansion between border counties and those in the interior

[16] We remove from border sample 2 the states of California, Connecticut, Maine, and Minnesota, all of which implemented Medicaid expansion at some point prior to 2014. We obtain information on states' prior expansions from Kaestner et al. (2017) and Simon et al. (2017). When there are discrepancies between the two sources, we use the information directly from state Medicaid websites. See Table A1 for more details.

[17] Meer and West (2016) note that population density is an important determinant of both demand for and supply of local labor markets. Large counties in the western U.S. are typically less densely populated. To address this issue, we remove from our preferred border sample 2 ten counties with land areas greater than 10,000 square miles. These counties include San Bernardino County and Inyo County in California, Coconino County, Mohave County, and Apache County in Arizona, Nye County, Elko County, and Lincoln County in Nevada, Sweetwater County in Wyoming, and Harney County in Oregon.

of the state. Specifically, we re-estimate our preferred model after demeaning the dependent variable and all control variables by subtracting the corresponding means of the state interior counties. Finding statistically significant positive coefficients on the treatment dummies would indicate a downward bias in our main results due to migration. For this exercise we exclude county-pairs in states that are either in the Mountain Time Zone or Pacific Time Zone since border counties in these states tend to be larger and not as similar to their interior counterparts in terms of demographics and economic conditions as county pairs in the rest of the country. For comparison purposes, we replicate our main analysis with two lags using this subsample. As shown in Table A3, the estimated disemployment effects are virtually unchanged (columns 1-3); and none of the point estimates are statistically significant in our spillover analysis (columns 4-6), suggesting that it is unlikely that cross-border spillovers bias our main results.

6. Discussion and Conclusions

In this paper, we study the labor market effects of the ACA Medicaid expansion. Unlike most existing studies that conduct the analysis at the state-level with a standard difference-in-differences approach, our main empirical strategy compares the employment and wages in contiguous county-pairs in neighboring states with different Medicaid expansion status. Most notably, our approach does not involve any parametric assumption on state- or county-specific trends when estimating the treatment effect of the expansion. Consistent with previous studies, we do not find any statistically significant effects on either employment or wages when estimating a conventional county and year fixed effects model on the full sample (Gooptu et al., 2016; Kaestner et al., 2017; Leung and Mas, 2016; Frisvold and Jung, 2018). Using only within-county-pair variation, our preferred estimates from the border county samples suggest a 1.3 percent decrease in employment one year after states implemented the Medicaid expansion. We also provide suggestive evidence that the disemployment effect is concentrated in low-wage industries. However, we do not find any evidence of an effect of the Medicaid expansion on wages. Overall, our findings contribute to the growing literature on the impact of the ACA Medicaid expansion on labor market outcomes and highlight the importance of controlling for spatial heterogeneity when studying the effects of public insurance programs.

We find it interesting that the Medicaid expansion had a modest and transient effect on labor supply at the extensive margin but did not affect wages. One possible explanation for these findings is that the Medicaid expansion may have induced a small number of low-income individuals with the highest disutility from work (possibly due to the presence of chronic conditions) to leave the labor force. If these workers were easily replaced, which is consistent with the transient nature of the disemployment effect, then wages need not increase in the local labor market for employers to maintain adequate staffing. Another possibility is that low-wage industries typically have low rates of unionization. The lack of collective bargaining power makes it difficult for low-skilled workers to leverage a short-term decrease in labor supply to boost their wages.

A particularly important consideration in the context of the ACA Medicaid expansion is the establishment of the Health Insurance Marketplaces. These government-run health insurance exchanges may have muted the labor market responses to the Medicaid expansion since low-income individuals are now eligible for generous subsidies to purchase private insurance coverage, even if their incomes exceed the Medicaid eligibility threshold.[18] For this reason, the potential increase in job mobility from the Medicaid expansion and Marketplaces may mean that

[18] Recent studies suggest that the ACA Medicaid expansion is also associated with lower premiums in the Health Insurance Marketplaces (Peng, 2017; Sen and DeLeire, 2018). This may further weaken the link between employment and insurance for residents in the expansion states.

the temporary decrease in employment we find is a composition of employment effects in different industries. For example, it is possible that employers have compensated for the initial loss of workers due to the Medicaid expansion without hiring replacement workers, but at the same time, employment increased in other industries that benefited the most from workers having improved access to health insurance. Unfortunately, we are not able to fully investigate the heterogeneity of the disemployment effects across a wide range of different industries due to data limitations.

A final possibility is that the transitory nature of the disemployment effect identified in our models is a result of the same workers re-sorting into different jobs. Because Medicaid insurance is portable across jobs, these workers are able to separate from their current job, enroll in Medicaid and re-enter the labor market after selecting a job that better suits their needs and abilities. Under this scenario it is possible that the costs of providing public coverage could be partially or fully offset by greater productivity in the labor market after workers re-sort to different jobs.

We note that our study is subject to several limitations. First, the QCEW does not contain information on hours worked or what proportion of the total employment counts are part-time jobs. As a result, we are not able to examine how the Medicaid expansion affects labor supply at the intensive margin. In addition to the disemployment effect, it is also possible that individuals worked fewer hours in order to qualify for Medicaid coverage in response to rising income eligibility. Likewise, workers with the highest disutility from full time work may have reduced their hours beyond the threshold necessary to receive benefits and acquire health insurance through Medicaid. Therefore, there may be other work disincentive effects of the Medicaid expansion that are not reflected in our analysis of total employment.

Despite the limitations, the findings in this study have several important policy implications. As discussed above, opponents of the ACA Medicaid expansion often cite the concern that more generous public insurance programs reduce labor supply and may even trap beneficiaries in poverty. Our findings show that such work disincentive effects are rather limited and transient in this case. A related point is that a few states are actively pursuing work requirements in their Medicaid programs, which are aimed at further weakening the work disincentives commonly associated with social assistance programs. Although our estimates do not speak directly to how these work requirements will affect the labor supply decisions of existing Medicaid beneficiaries, they do suggest that it is unlikely that a large of number of individuals would terminate their employment to qualify for Medicaid coverage. Furthermore, Musumeci et al. (2018) presents evidence that only 7 percent of Medicaid beneficiaries would be subject to new work requirements, as the majority of able-bodied adults covered by Medicaid are already working. Policy makers will therefore need to determine whether the administrative cost of implementing the work requirements is justified by the benefits of higher employment among a limited set of Medicaid beneficiaries.[19] A related issue that requires further study is whether work requirements could adversely affect beneficiaries with chronic medical conditions that have a limited ability to work. In general, a complete welfare analysis of the proposed work requirements that builds on our findings would be a beneficial area of future research.

[19] According to a report by Fitch Ratings, the administration costs increased more than 40 percent in Kentucky's Medicaid program after the state instituted work requirements (See https://www.fitchratings.com/site/pr/10038515. Accessed on September 5, 2018).

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Tables and Figures

Table 1. Comparisons of treatment and control counties in 2013

	Full sample		Border sample 1		Border sample 2	
	Expansion	Non-expansion	Expansion	Non-expansion	Expansion	Non-expansion
Wage	746.2	696.1	740.2	705.0	696.6	702.4
	(192.1)	(168.1)	(178.5)	(179.8)	(157.7)	(183.0)
Employment count	47,590.7	24,962.2	36,132.9	21,568.9	19,394.4	22,961.5
	(16,3713.7)	(88,318.5)	(126,875.7)	(63,194.1)	(44,597.4)	(67,710.5)
Population estimate	133,514.6	74,245.2	104,830.5	62,054.4	62,646.8	65,019.8
	(418,831.4)	(209,671.4)	(317,486.0)	(145,100.6)	(131,957.1)	(154,867.9)
Minimum wage	7.58	7.28	7.46	7.27	7.51	7.27
	(0.49)	(0.11)	(0.38)	(0.04)	(0.45)	(0.04)
Poverty rate (%)	16.1	18.2	16.5	17.0	17.5	16.7
	(6.1)	(6.8)	(6.7)	(7.4)	(7.4)	(7.4)
Median household income (in thousands)	49.86	45.83	48.90	48.03	47.03	48.50
	(12.53)	(11.24)	(13.02)	(14.64)	(13.21)	(15.03)
Number of counties	1,431	1,627	363	221	174	189
Number of states	29	19	24	14	14	13
Number of county-pairs	NA		590		360	

Notes: Standard deviation is reported in parenthesis. Border sample 1 includes states that adopted the Medicaid expansion any time between 2014 and 2016. Border sample 2 includes only states that implemented the Medicaid expansion on January 1, 2014.

Table 2. Estimated effects of Medicaid expansion from standard difference-in-difference models, 2008-2016

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. log of total employment						
Medicaid expansion	0.004	0.000	-0.001	-0.005	-0.004	-0.001
	(0.005)	(0.005)	(0.004)	(0.006)	(0.003)	(0.004)
1st lag of Medicaid expansion		0.003	0.003		-0.000	0.002
		(0.006)	(0.004)		(0.009)	(0.007)
2nd lag of Medicaid expansion			0.001			0.001
			(0.006)			(0.009)
Panel B. log of average weekly wage						
Medicaid expansion	-0.004	-0.007	-0.006	-0.003	-0.002	-0.000
	(0.006)	(0.006)	(0.005)	(0.004)	(0.004)	(0.004)
1st lag of Medicaid expansion		0.004	0.005		0.009	0.009
		(0.005)	(0.004)		(0.008)	(0.006)
2nd lag of Medicaid expansion			0.000			0.004
			(0.004)			(0.007)
N	27,522	24,464	21,406	27,522	24,464	21,406
County fixed effects	X	X	X	X	X	X
Year fixed effects	X	X	X	X	X	X
State-specific linear trends				X	X	X

Notes: Levels of significance are *p<0.1, **p<0.05, ***p<0.01. Standard errors that are clustered on the state only are reported in parentheses. All models include county and year fixed effects. Other control variables include the county-level poverty rate, median household income, population, and state minimum wage.

Table 3. Estimated effects from contiguous county-pair models: All expansion states

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A. log of total employment									
Medicaid expansion	0.008	0.011	0.008	0.008	0.011	0.008	0.007	0.014	0.013
	(0.009)	(0.008)	(0.007)	(0.009)	(0.008)	(0.007)	(0.010)	(0.010)	(0.009)
1st lag of Medicaid expansion		-0.006	-0.006		-0.006	-0.006		-0.013*	-0.013**
		(0.007)	(0.006)		(0.007)	(0.006)		(0.007)	(0.006)
2nd lag of Medicaid expansion			-0.004			-0.004			-0.001
			(0.003)			(0.003)			(0.004)
Panel B. log of average weekly wage									
Medicaid expansion	0.001	-0.001	-0.002	0.001	-0.001	-0.001	0.003	0.003	0.002
	(0.006)	(0.005)	(0.005)	(0.006)	(0.005)	(0.005)	(0.004)	(0.004)	(0.003)
1st lag of Medicaid expansion		0.002	0.002		0.002	0.002		0.000	-0.000
		(0.003)	(0.002)		(0.003)	(0.002)		(0.003)	(0.003)
2nd lag of Medicaid expansion			-0.000			-0.000			0.001
			(0.005)			(0.005)			(0.004)
N	10,620	9,440	8,260	10,620	9,440	8,260	10,620	9,440	8,260
County fixed effects	X	X	X	X	X	X	X	X	X
Year fixed effects	X	X	X	X	X	X			
County-pair fixed effects				X	X	X			
County-pair-by-year fixed effects							X	X	X

Notes: Levels of significance are *p<0.1, **p<0.05, ***p<0.01. Two-way clustered standard errors (state and county border segment) are reported in parentheses. All models include county and year fixed effects. Other control variables include the county-level poverty rate, median household income, population, and state minimum wage.

Table 4. Estimated effects of Medicaid expansion from contiguous county-pair models: States that adopted expansion on January 1, 2014

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A. log of total employment									
Medicaid expansion	-0.006	0.006	0.005	-0.006	0.006	0.004	-0.010	0.002	0.001
	(0.011)	(0.010)	(0.009)	(0.011)	(0.010)	(0.009)	(0.010)	(0.008)	(0.008)
1st lag of Medicaid expansion		-0.013***	-0.012**		-0.013**	-0.012**		-0.014***	-0.013***
		(0.005)	(0.005)		(0.005)	(0.005)		(0.005)	(0.004)
2nd lag of Medicaid expansion			-0.002			-0.002			-0.004
			(0.004)			(0.004)			(0.004)
Panel B. log of average weekly wage									
Medicaid expansion	0.002	0.003	0.002	0.002	0.003	0.002	0.001	0.001	0.000
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.007)	(0.005)	(0.005)	(0.005)
1st lag of Medicaid expansion		-0.001	0.001		-0.001	0.000		0.001	0.002
		(0.005)	(0.004)		(0.005)	(0.004)		(0.005)	(0.004)
2nd lag of Medicaid expansion			-0.002			-0.002			-0.001
			(0.005)			(0.005)			(0.004)
N	6,480	5,760	5,040	6,480	5,760	5,040	6,480	5,760	5,040
County fixed effects	X	X	X	X	X	X	X	X	X
Year fixed effects	X	X	X	X	X	X			
County-pair fixed effects				X	X	X			
County-pair-by-year fixed effects							X	X	X

Notes: Levels of significance are *p<0.1, **p<0.05, ***p<0.01. Two-way clustered standard errors (state and county border segment) are reported in parentheses. All models include county and year fixed effects. Other control variables include the county-level poverty rate, median household income, population, and state minimum wage.

Table 5. Estimated employment effects of Medicaid expansion by sector from contiguous county-pair models: States that adopted expansion on January 1, 2014

	Construction			Retail trade			Accommodation and food services		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Medicaid expansion	0.043	0.022	0.026	-0.004	-0.014	-0.005	0.002	-0.007	0.000
	(0.031)	(0.030)	(0.022)	(0.009)	(0.010)	(0.008)	(0.012)	(0.012)	(0.009)
1^{st} lag of Medicaid expansion	-0.014	-0.013	-0.016	-0.005	-0.008*	-0.007	-0.007	-0.013*	-0.009
	(0.023)	(0.021)	(0.017)	(0.005)	(0.004)	(0.005)	(0.008)	(0.007)	(0.008)
2^{nd} lag of Medicaid expansion	0.006	0.005	0.004	-0.004	-0.007	-0.007	0.001	-0.005	-0.001
	(0.018)	(0.013)	(0.016)	(0.005)	(0.006)	(0.005)	(0.009)	(0.010)	(0.009)
Sum of Medicaid expansion effects	0.035	0.014	0.013	-0.013	-0.029**	-0.019	-0.004	-0.026*	-0.010
	(0.045)	(0.038)	(0.033)	(0.013)	(0.012)	(0.012)	(0.013)	(0.013)	(0.012)
N	3,080	3,080	3,080	5,082	5,082	5,082	1,750	1,750	1,750
County fixed effects	X	X	X	X	X	X	X	X	X
Year fixed effects	X	X		X	X		X	X	
County-pair fixed effects		X			X			X	
County-pair by year fixed effects			X			X			X

Notes: Levels of significance are *p<0.1, **p<0.05, ***p<0.01. Two-way clustered standard errors (state and county border segment) are reported in parentheses. We estimate the model that include county and county-pair by year fixed effects. Other control variables include the county-level poverty rate, median household income, population, and state minimum wage.

Table 6. Falsification tests of Medicaid expansion effect on public-sector employment from contiguous county-pair models: States that adopted expansion on January 1, 2014

	(1)	(2)	(3)
Medicaid expansion	-0.001	-0.001	-0.001
	(0.007)	(0.006)	(0.006)
1st lag of Medicaid expansion	0.004	0.004	0.005
	(0.004)	(0.004)	(0.004)
2nd lag of Medicaid expansion	-0.000	-0.000	0.001
	(0.005)	(0.005)	(0.004)
N	3,010	3,010	3,010
County fixed effects	X	X	X
Year fixed effects	X	X	X
County-pair fixed effects		X	
County-pair by year fixed effects			X

Notes: Levels of significance are *p<0.1, **p<0.05, ***p<0.01. Two-way clustered standard errors (state and county border segment) are reported in parentheses. All models include county and year fixed effects. Other control variables include county-level poverty rate, median household income, population, and state minimum wage.

Table 7. Pre-trend tests of Medicaid expansion effect on employment from contiguous county-pair models: States that adopted expansion on January 1, 2014

	(1)	(2)	(3)
Medicaid expansion	0.000	-0.008	-0.010
	(0.000)	(0.008)	(0.009)
1st lead of Medicaid expansion	-0.002	-0.002	-0.003
	(0.005)	(0.005)	(0.004)
2nd lead of Medicaid expansion	0.000	0.000	-0.001
	(0.005)	(0.005)	(0.004)
3rd lead of Medicaid expansion	-0.000	-0.000	0.002
	(0.007)	(0.007)	(0.006)
N	4,320	4,320	4,320
County fixed effects	X	X	X
Year fixed effects	X	X	X
County-pair fixed effects		X	
County-pair by year fixed effects			X

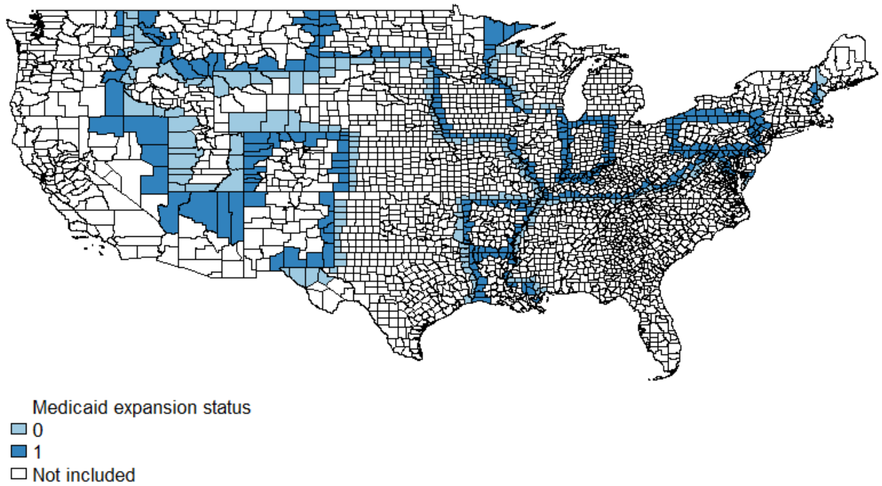
Notes: Levels of significance are *p<0.1, **p<0.05, ***p<0.01. Two-way clustered standard errors (state and county border segment) are reported in parentheses. All models include county and year fixed effects. Other control variables include county-level poverty rate, median household income, population, and state minimum wage.

Table 8. Estimated employment effect using quarterly QCEW data from contiguous county-pair models: States that adopted expansion on January 1, 2014

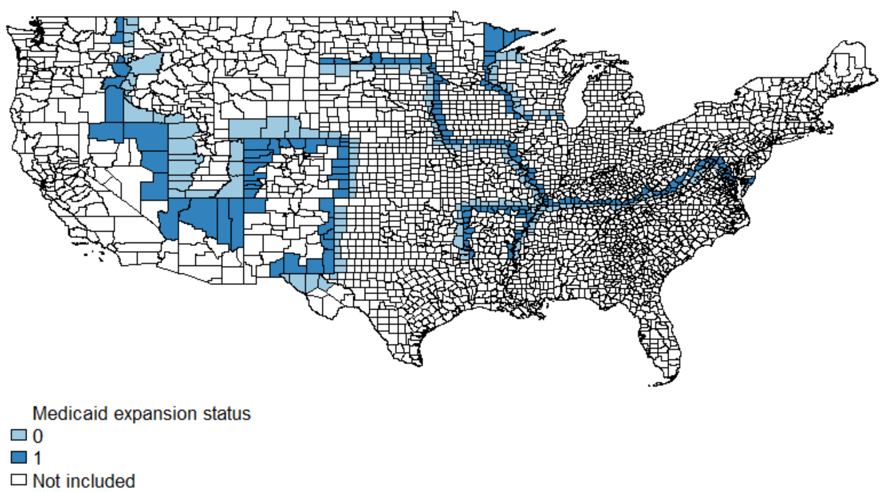
	Unstructured Distributed Lag Model	Polynomial Distributed Lag Model
	(1)	(2)
Medicaid expansion	0.007	-0.003
	(0.008)	(0.007)
1st lag of Medicaid expansion	-0.012**	0.003
	(0.005)	(0.003)
2nd lag of Medicaid expansion	0.003	0.003
	(0.003)	(0.003)
3rd lag of Medicaid expansion	0.007	-0.000
	(0.006)	(0.002)
4th lag of Medicaid expansion	0.003	-0.005***
	(0.004)	(0.001)
5th lag of Medicaid expansion	-0.021***	-0.008***
	(0.007)	(0.002)
6th lag of Medicaid expansion	-0.007*	-0.007***
	(0.004)	(0.002)
7th lag of Medicaid expansion	0.004	0.000
	(0.005)	(0.003)
Sum of coefficients (treat to 3rd lag)	0.004	0.003
	(0.010)	(0.009)
Sum of coefficients (4th to 7rd lag)	-0.020***	-0.020***
	(0.005)	(0.005)
Eigenvalue condition number	16.869	
N	20,880	20,880
County fixed effects	X	X
County-pair by quarter fixed effects	X	X

Notes: Levels of significance are *p<0.1, **p<0.05, ***p<0.01. Two-way clustered standard errors (state and county border segment) are reported in parentheses. We estimate the model that include county and county-pair by quarter fixed effects. Other control variables include the county-level poverty rate, median household income, population, and state minimum wage. The polynomial distributed lag model restricts the lag coefficients to lie on a cubic function. An eigenvalue condition number above 10 indicates instability of regression coefficients due to multicollinearity.

Figure 1. Contiguous border county-pairs in the U.S. with different Medicaid expansion status: 2014-2016



Panel A. Border sample 1



Panel B. Border sample 2

Appendix

Table A1. ACA Medicaid Expansion status as of December 31, 2016

State	Medicaid Expansion Decision	Notes
Alabama	Not Adopted	
Alaska	Adopted	
Arizona	Adopted	Section 1115 waiver
Arkansas	Adopted	Section 1115 waiver
California	Adopted	Prior expansion
Colorado	Adopted	
Connecticut	Adopted	Prior expansion
Delaware	Adopted	Prior expansion
District of Columbia	Adopted	Prior expansion
Florida	Not Adopted	
Georgia	Not Adopted	
Hawaii	Adopted	Prior expansion
Idaho	Not Adopted	
Illinois	Adopted	
Indiana	Adopted	Expansion coverage began 2/1/2015; section 1115 waiver
Iowa	Adopted	Section 1115 waiver; section 1115 waiver
Kansas	Not Adopted	
Kentucky	Adopted	
Louisiana	Adopted	Expansion coverage began 7/1/2016
Maine	Not Adopted	Prior expansion
Maryland	Adopted	
Massachusetts	Adopted	Prior expansion
Michigan	Adopted	Expansion coverage began 4/1/2014; section 1115 waiver
Minnesota	Adopted	Prior expansion
Mississippi	Not Adopted	
Missouri	Not Adopted	
Montana	Adopted	Expansion coverage began 1/1/2016; section 1115 waiver
Nebraska	Not Adopted	
Nevada	Adopted	
New Hampshire	Adopted	Expansion coverage began 8/15/2014; section 1115 waiver
New Jersey	Adopted	Prior expansion
New Mexico	Adopted	
New York	Adopted	Prior expansion

North Carolina	Not Adopted	
North Dakota	Adopted	
Ohio	Adopted	
Oklahoma	Not Adopted	
Oregon	Adopted	
Pennsylvania	Adopted	Expansion coverage began 1/1/2015
Rhode Island	Adopted	
South Carolina	Not Adopted	
South Dakota	Not Adopted	
Tennessee	Not Adopted	Prior expansion
Texas	Not Adopted	
Utah	Not Adopted	
Vermont	Adopted	Prior expansion
Virginia	Not Adopted	
Washington	Adopted	Prior expansion
West Virginia	Adopted	
Wisconsin	Not Adopted	Wisconsin covers adults up to 100% FPL in Medicaid but did not adopt the ACA expansion.
Wyoming	Not Adopted	

Notes: Coverage under the Medicaid expansion became effective January 1, 2014 in all states that have adopted the Medicaid expansion except for the following: Michigan (4/1/2014), New Hampshire (8/15/2014), Pennsylvania (1/1/2015), Indiana (2/1/2015), Alaska (9/1/2015), Montana (1/1/2016), and Louisiana (7/1/2016).

Table A2. Estimated employment effect under alternative samples

	Baseline	Excluding prior expansion states	Excluding large western counties
	(1)	(2)	(3)
Medicaid expansion	0.001	-0.000	0.001
	(0.006)	(0.009)	(0.008)
1st lag of Medicaid expansion	-0.013***	-0.010**	-0.013***
	(0.003)	(0.005)	(0.004)
2nd lag of Medicaid expansion	-0.004	-0.002	-0.004
	(0.004)	(0.004)	(0.004)
N	5,040	3,878	4,998
County fixed effects	X	X	X
County-pair by year fixed effects	X	X	X

Notes: Levels of significance are *p<0.1, **p<0.05, ***p<0.01. Two-way clustered standard errors (state and county border segment) are reported in parentheses. We estimate the model that include county and county-pair by year fixed effects. In column 2 we exclude all counties in the states of California, Connecticut, Maine, and Minnesota. In column 3, we exclude the counties of San Bernardino, Coconino, Nye, Elko, Mohave, Apache, Lincoln, Sweetwater, Inyo, and Harney, all of which have a land area greater than 10,000 square miles. Other control variables include county-level poverty rate, median household income, population, and state minimum wage.

Table A3. Tests of cross-border spillover effects of Medicaid expansion on employment from contiguous county-pair models: States that adopted expansion on January 1, 2014

	Baseline (N=3,668)			Spillover (N=3,668)		
	(1)	(2)	(3)	(4)	(5)	(6)
Medicaid expansion	0.013	0.013	0.008	0.011	0.010	0.007
	(0.011)	(0.011)	(0.009)	(0.010)	(0.010)	(0.011)
1st lag of Medicaid expansion	-0.011**	-0.011**	-0.012**	-0.005	-0.005	-0.005
	(0.005)	(0.005)	(0.005)	(0.008)	(0.008)	(0.005)
2nd lag of Medicaid expansion	-0.001	-0.001	-0.003	0.001	0.002	0.002
	(0.004)	(0.004)	(0.004)	(0.005)	(0.005)	(0.005)
County fixed effects	X	X	X	X	X	X
Year fixed effects	X	X		X	X	
County-pair fixed effects		X			X	
County-pair by year fixed effects			X			X

Notes: Levels of significance are *p<0.1, **p<0.05, ***p<0.01. Two-way clustered standard errors (state and county border segment) are reported in parentheses. All models include county, county-pair, and year fixed effects. Other control variables include the county-level poverty rate, median household income, population, and state minimum wage. The spillover sample excludes the following states in the Mountain and Pacific Time Zones: Arizona, Colorado, Oregon, Nevada, New Mexico, Washington, and Wyoming.