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Leveraging Quarterly Workforce Indicators to Analyze Teacher Labor Market Dynamics: Inequitable Trends in Educator Turnover

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Educator labor markets vary considerably across the country and can change quickly during recessions. We use data from the Quality Workforce Indicators (QWI) on educators in Elementary and Secondary Schools from 2000-01 to 2022-23. We demonstrate how to transform the quarter-level data in the QWI to construct valid educator labor market measures. The strengths of the QWI address the limitations of other sources of labor market data, including (1) non-standardized definitions, (2) sampling that is useful for describing local and regional trends, (3) contemporaneous availability, and (4) lack of data for sub-groups. We demonstrate how the QWI addresses each of these data gaps and describe how educator labor markets vary across time, region, and educator characteristics.

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Leveraging Quarterly Workforce Indicators to Analyze Teacher Labor Market Dynamics: Inequitable Trends in Educator Turnover

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Abstract
Educator labor markets vary considerably across the country and can change quickly during recessions. We use data from the Quality Workforce Indicators (QWI) on educators in Elementary and Secondary Schools from 2000-01 to 2022-23. We demonstrate how to transform the quarter-level data in the QWI to construct valid educator labor market measures. The strengths of the QWI address the limitations of other sources of labor market data, including (1) non-standardized definitions, (2) sampling that is useful for describing local and regional trends, (3) contemporaneous availability, and (4) lack of data for sub-groups. We demonstrate how the QWI addresses each of these data gaps and describe how educator labor markets vary across time, region, and educator characteristics.

Keywords: Retention; Teacher Context

Recessions and pandemics have unpredictable effects on educator labor markets, and the lack of up-to-date data on educator labor markets prevents policymakers from making targeted policy decisions. For instance, the Great Recession was triggered by a bubble in the housing market, leading to a sharp decline in property tax revenues, a critical source of school funds (Bowling et al., 2019; Kenyon & Reschovsky, 2014). The stimulus package that followed was broad and did not provide additional support to areas where housing values declined the most (Kabaker, 2012). Similarly, in response to the sudden changes induced by the COVID-19 pandemic, ESSER stimulus funds were provided to schools, but little to no effort was made to provide targeted support to communities that were hit hardest by the pandemic (Roza & Roza, 2022). One of the key limiting factors in how policymakers can respond to recessions is the available educator labor market data. These data are often years out of date and most often describe national instead of local trends (Bleiberg & Kraft, 2023). These two main limitations severely reduce policymakers' capacity to make targeted decisions to help schools and communities that are most affected by adverse events. To address this issue, we propose a method to transform a new source of educator labor market data from the Quality Workforce Indicators (QWI) created by the Census Bureau to ameliorate the information gap faced by policymakers.

While national and state-level data sources exist, they have important limitations. None of the commonly used datasets combines (1) standardized definitions, (2) local estimates, (3) contemporaneous availability, and (4) cross-tabulations by educator characteristics. These issues severely limit policymakers' ability to respond to unpredictable events that necessitate rapid and targeted decisions. First, definitions of labor market conditions vary widely (NCTQ, 2021). For instance, there are no common definitions of teacher shortages at the state and national level since there are multiple ways to conceptualize shortages (i.e., vacancy, underqualification, lack of high-quality applicants; see Nguyen et al., 2024).

Second, while state and national trends have value for broad policymaking, local estimates are much more useful for targeted policymaking, particularly to provide supports for the most adversely affected communities. Edwards and colleagues (2024) show teacher staffing challenges are highly localized with substantial variation existing between schools and subjects within districts and how potential solutions to teacher staffing may be rather different depending on the granularity of the data, aligning with prior works (Engel et al., 2014; Engel & Cannata, 2015; Goldhaber et al., 2014).

Third, almost all available data on educator labor markets are at least a few years out of date, when they exist at all. Almost a decade passed in between the publication of teacher turnover data from the 2011-12 Schools and Staffing Survey (SASS) and the 2020-21 National Teacher and Principal Survey (NTPS). Since the NTPS is conducted every few years, the next wave of national turnover data will not be published for at least a few more years and then will be years out of date. National teacher shortage data, including vacancy and underqualification, are not collected systematically by the federal government, but are instead collected by researchers (Nguyen et al., 2024). Even as the teacher data are years out of date, labor market data for non-teacher roles do not exist or are collected and out of date (White, 2023). Similarly, state-level data are not consistently available (Bleiberg & Kraft, 2023), and only a few states provide annual data for teachers (e.g., Texas).

Fourth, educator labor market data are typically not available by educator characteristics such as race/ethnicity, gender, and educational attainment. Prior work has shown educator characteristics have implications for equity and student learning (Bettini et al., 2025; Redding, 2022), and yet, state-level data are rarely disaggregated by educator characteristics. For example, even as the number of racially minoritized students with disabilities grows from year to year, the number of racially minoritized teachers have remained stubbornly well below numbers needed to adequately serve their students (Bettini et al., 2025). Additionally, there is little to no labor market data for teachers of color.

In sum, all recent works have consistently shown there are substantial gaps in data systems for the educator labor market. Our proposed approach using quarterly data in the QWI addresses all of these gaps by producing yearly educator labor market measures that are consistent, measured at the county- and state-level, available within 12 months of the previous school year, and can be disaggregated by educator characteristics. In this work, we ask two main questions:

1) How can the quarter-level QWI data be used to create valid school year educator labor market measures?
2) How do educator labor markets vary across time, locale, and educator characteristics?

Overview of Educator Labor Market Data

In this section, we provide an overview of the labor market data for elementary and secondary education from a variety of sources. We start with the economics-related labor market sources that include education-related information and then move to education-specific labor market data. We also discuss data collected by researchers and non-governmental agencies.

Economics-related data sources

From the economics-related labor market data, the federal government produces the Current Population Survey (CPS), the American Community Survey (ACS), the Quarterly Census of Employment and Wages (QCEW), and the Job Openings and Labor Turnover Survey (JOLTS). The CPS is one of the most widely used sources of labor market participation at the regional and national level by surveying sixty thousand households each month (Census Bureau, 2024b). The CPS provides recent comprehensive and detailed data on occupation and individual characteristics. However, each monthly sample includes only a few hundred educators spread across every state, rendering the data unusable for nuanced analyses of educator labor markets. The ACS provides detailed census information such as demographic, economic, and social characteristics, but does not include labor market measures such as turnover or shortages (Census Bureau, 2024c).

The QCEW data provide quarterly counts of employees by industry and are available at the county level, but there are two particular limitations. First, the QCEW does not take into account the number of people leaving specific organizations, which limits the type of information needed to comprehensively describe the educator labor market. Second, it does not include demographic information. JOLTS does provide educator labor market data, but unfortunately, it is designed for a national overview and not regional and local analyses. In particular, JOLTS data are available for the 2-digit NAICS codes rather than the more detailed 4-digit codes which describe elementary and secondary education school employees.

Similarly, the education-specific data, have their own limitations and tradeoffs. We specifically discuss some of the most relevant data sources, including the SASS/NTPS, the School Pulse Panel (SPP), and the Civil Rights Data Collection (CRDC).

Education-specific data sources

The SASS has been conducted by the National Center for Education Statistics (NCES) every few years since 1988, and its new iteration, the NTPS, started in 2015. As noted previously, while the SASS/NTPS provides national data on teacher turnover, it is routinely years out of date. Moreover, it has very limited information on other aspects of the labor market (e.g., supply and demand. vacancies). Another limitation is that the granular data from SASS/NTPS are not readily available to policymakers because they are restricted data that require stringent requirements for access.

The SPP collects data on the impact of the pandemic and includes monthly surveys, some of which are repeated over time and some unique to a specific month. The intention was to provide contemporaneous data at the national level that could be used in a rapid response to the pandemic. Currently, SPP has data from January to December of 2022 and from August 2023 to October 2024. The data describe broad ranges of vacancies as well as more detailed questions about vacancies for specific subjects. If funding for the SPP continues, it could provide valuable national data including the number of vacancies nationally.

The CRDC collects teacher labor market data from every U.S. school. Vacancy and turnover data were available in 2013-14, but have not been available since then. This mitigates the CRDC's value as a tool for studying teacher labor markets. Additionally, the CRDC is conducted every few years and therefore provides snapshots over time rather than a true longitudinal dataset. More importantly, because it takes time to collect the CRDC survey data from every school, policymakers do not have access to the data in when it is most useful. . For example, school-level data from 2020-2021 are still not available in early 2025. CRDC data was last collected in 2023-24, but it may be years before those data are publicly available.

Succinctly put, education-specific data sources are incomplete, and more importantly, they are often many years out of date. Together this limits the usefulness of education-specific data for policymakers to make informed and targeted policy decisions. To partly address this, researchers and organizations have collected data that can be used for policymaking.

Researchers and non-governmental data sources

RAND's American Educator Panels (AEP) is an annual survey of more than 25,000 teachers, 8,000 principals, and 1,000 school district leaders. The survey is representative for about 20 states and the nation overall. The AEP survey includes data on how educators feel about these teacher shortages, but not the number of teachers who turn over or switch from one school to another or the number of vacant positions. The AEP is most suitable for describing educators' perceptions of some aspects of the teacher labor market, and the results are most appropriate for a national sample (Doan et al., 2023; Grant et al., 2023; Hamilton et al., 2020).

Individual researchers also collect labor market data to provide timely results for policymaking. LPI and Nguyen et al. collected annual data on teacher vacancy and underqualification at the state level (Franco & Patrick, 2023; Nguyen et al., 2024). Goldhaber and colleagues (2024) provided a novel way of examining educator shortages by collecting job posting information for Washington state. White et al. collected annual data on superintendent turnover (White, 2023). While each of these sources provides unique data on the educator labor market, they require intensive resources and some cannot provide local estimates.

Data and Methods

We explore educator labor markets using the QWI. The QWI is virtually unused in educator labor market research. The QWI includes quarter level counts of labor market conditions (e.g., employment, separations, hiring) (Census Bureau, 2016). The QWI includes North American Industry Classification System (NAICS) industries from 1990 Q1 to 2024 Q1,

including elementary and secondary schools (6111). This industry group includes traditional public schools (e.g., kindergarten, elementary, high), parochial schools, private schools, charter schools, military academies, and schools for disabled students (Census Bureau, 2022b). We use changes in quarter-to-quarter counts of labor market measures to construct county-level school-year measures for turnover and net-negative job-flow for educators.

QWI differs from other sources of labor market data in that it is created by linking employer and employee records from the Longitudinal Employer-Household Dynamics (LEHD) program operated by the Census Bureau and includes data linking employers and employees for about 95% of jobs in the United States (Census Bureau, 2022a). The QWI is created using information on whether an educator left their specific school district. The QWI is updated quarterly, and the data are at most nine months out of date. For instance, in January 2024 the most recent QWI data are for the first quarter of 2024. Similar to other federal datasets the QWI from prior years are revised as new information becomes available.[1] To create the QWI, the Census Bureau supplements Unemployment Insurance records with QCEW data on firms (e.g., industry, worksite locations), employee-level demographic data from the ACS, Social Security administrative records, and individual tax returns.

Defining Educator Employee Occupations

Most elementary and secondary school employees are teachers. Appendix Figure A1 describes the proportion of employees by Census Occupation Classification using the CPS (Economic Policy Institute, 2024). 75.9% of elementary and secondary education employees teach as a core function of their job (i.e., primary and secondary school teachers, special education teachers, pre-Kindergarten teachers). We refer to all employees of elementary and secondary schools as educators because non-classroom based instructional roles are integral for fostering an effective learning environment.

Analytic Sample

We explore educator labor market conditions for a near census of counties from 2000 Q1 to 2024 Q1. Appendix Figure A2 describes the number of states and counties observed by year. Labor market measures are observed for at least 48 states and about 90% of counties from 2003 to 2024. The number of states observed in the QWI rises from 3 in 1990 to 36 in 1999. Due to the paucity of data before 1999, we use data from 2000 to 2024.[2]

Defining Turnover

To estimate educator turnover, we use the count of new hires and the total count of employees. The QWI defines newly hired employees as the, "estimated number of workers who started a new job. More specifically, total hires that, while they worked for an employer in the specified quarter, were not employed by that employer in any of the previous four quarters" (Census Bureau, 2019).[3] The QWI defines the count of employees in a specific reference quarter as the, "count of people employed in a firm at any time during the quarter. This is not a count of

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[1] QWI data for these analyses were extracted from the API on January 21, 2025.

[2] We consider the turnover measure to be missing in years in which the number of leavers in a county differs from the county average by 33% or more. Consequently, the number of counties/years with observed turnover decreased from ~23% to ~34 percent. We removed outliers in part to address the noise infused into the QWI data that creates implausible estimates. Removing outliers that are twice as large as the county average does not substantively change the results described here.

[3] Count of newly hired employees is the variable *hirn* in the QWI API. Technical definition: "A worker *i* is defined as a new hire for employer *j* in *q* if has positive earnings at *j* in *t* but no earnings from *j* in *q-1*, *q-2*, *q-3*, *q-4*" (Census Bureau, 2019).

jobs. This measure may also be referred to as "flow" employment." (Census Bureau, 2019).[4] To estimate the number of leavers, we follow the logic of Reichardt et al. (2020) who demonstrated that the number of people leaving a school district equals the change in total employment subtracted from the number of hires. To estimate turnover, we divide the number of leavers by lagged employment.

$$turnover_{cst} = \frac{\left(hires_{csq3t-1} + hires_{csq4t-1} + hires_{csq1t} + hires_{csq2t}\right) - \left(emp_{csq2t} - emp_{csq4t-1}\right)}{emp_{csq4t-1}}$$

Where *turnover* is the proportion of educators who left their school district in county *c*, school year *s*, and calendar year *t*. We subtract the difference in employment for *q2* (quarter 2) and calendar year *t* from *q4* (quarter 4) in year *t-1* from the sum of hires in *q1* year *t*, *q2* year *t*, *q3* year *t-1*, and *q4* year *t-1*. A strength of our approach is that it translates calendar year quarters into school years. More specifically, laggeds quarter 3 and 4 correspond to the fall component of the school year and quarters 1 and 2 correspond to the spring component. Subtracting the difference of employment for *q2* (quarter 2) and calendar year *t* from *q4* (quarter 4) in year *t-1* allows us to capture late hires and educators who leave their positions during the school year. Using lagged Q4 employment creates a measure that parallels state data that are typically collected in October or November.

The measure of turnover provided by the QWI is not appropriate for examining educator labor markets for three reasons. First, the "stable" measures are not useful for measuring educator labor market trends that follow seasonal patterns and follow a calendar rather than school year. Second, the QWI's stable employment measure is highly sensitive to the quarter. More specifically, stable employment is the number of employees at firm *j* quarters in *q-1*, *q*, and *q+1*. Observed stable employment levels declined by ~5.8% from early spring (Q1) to late summer/fall (Q3). This is likely due to the number of seasonal educators who do not receive pay checks in the summer. Finally, conventional education turnover measures for the current school year are created by dividing the number of leavers in the next year by the number of employees in the current year. QWI's stable measure of employment averages across the number of quarters in the current school year. Because the number of educators increases on average across time using stable employment from the current year slightly increases the number of employees, which in turn increases estimated turnover.

Our measure of turnover addresses each of the issues with the QWI. We use quarter-to-quarter counts rather than the stable measures. Additionally, we lag these quarter-to-quarter measures to estimate turnover by dividing the number of leavers by employment in the prior school year. We find our measure of turnover has a stronger correlation with state labor market measures than the QWI measure of turnover.[5] An additional challenge in using the QWI measure of turnover is that the implied number of educators who leave their position in any specific quarter is either too low or too high. For example, QWI Q2 turnover is correlated with comparable state measures, but underestimates the total number of leavers because the number of education jobs declines in the summer.

Defining Net-Negative Job-Flow

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[4] Count of employment in a specific reference is the variable *emptotal* in the QWI API. Technical definition: "A worker *i* is flow employed with employer *j* in *t* if worker has positive earnings at *j* in *q*." (Census Bureau, 2019).

[5] Correlations between state education staff turnover (i.e., Pennsylvania, Colorado), our measure of turnover, and stable QWI turnover across quarters: our measure 0.7849, QWI stable turnover Q1 0.3269, QWI stable turnover Q2 0.7422, QWI stable turnover Q3 0.3599, and QWI stable turnover Q4 0.7161.

$$NNJF_{cq} = abs(emp_{cq+1} - emp_{cq})$$

We use the quarter level counts of net-negative job-flow to create a school year measure.

$$NNJF_{cst} = NNJF_{csq1t} + NNJF_{csq2t} + NNJF_{csq3t-1} + NNJF_{cqs4t-1}$$

Net-negative job-flow in county *c*, school year *s*, and calendar year *t* equals the sum of net-negative job-flow in *q1* year *t*, *q2* year *t*, *q3* year *t-1*, and *q4* year *t-1*. Net-negative job-flow is related to the same construct as a vacancy. State definitions of vacancies are highly inconsistent (Nguyen et al., 2024). Broadly speaking, a shortage occurs when a position is vacant or unfilled. A vacancy is likely a consequence of a reduction in the total number of employees. For example, if a school district has 100 employees in Q3 and 90 employees in Q4, then it is reasonable to infer that 10 positions remain unfilled or vacant. We consider net-negative job-flow a useful proxy for recent increases in the number of unfilled educator positions.

We further explore turnover and net-negative job-flow by educator race/ethnicity because of the shortage of teachers of color (Carver-Thomas, 2018; Castro, 2022; Gershenson et al., 2021). Additionally, we examine trends by educational attainment because it allows for an inference about teacher labor markets.

Methods

Our analysis begins by validating the QWI data. We test the convergent validity of our QWI labor market measures with similar state data. It is necessary to demonstrate the validity of our approach because of the differences between the QWI and more commonly used state/federal measures. More specifically, the quarter-to-quarter counts may not provide useful information about school-year educator labor market trends. Although, net-negative job-flow is conceptually related to vacancies, it is important to test how strongly the constructs are related to each other.

We then report graphical and descriptive analyses for the distribution of turnover and net-negative job-flow and how they vary across time, county, and by educator characteristics. Finally, we explore recent changes during the pandemic. The focus on the analysis is both to describe novel information about labor market trends, but also to demonstrate how others can use the QWI.[6]

Validating Measures

Our QWI based turnover measure is strongly correlated with state data. Figure 1 includes scatter plots of QWI and state educator labor market measures. Panels A, B, and C describe the convergent validity of the components of turnover (i.e., leavers and employees) and turnover. Data on educator turnover, leavers, and employees were collected from Pennsylvania and Colorado (Colorado Department of Education, 2024; Pennsylvania Department of Education, 2024). These two states were selected because labor market data were available for staff, administrators, and teachers. Data from Pennsylvania and Colorado are strongly correlated with the QWI measures of leavers (R=0.94) and employees (R=0.97). The correlation between state and QWI measures of turnover is attenuated, but remains strong (R=0.78).

State and QWI turnover data differ for three reasons. First, the QWI data include noise to ensure confidentiality (Abowd et al., 2009). Second, the QWI data include non-public schools (e.g., charter, private) that are not included in the state data. Finally, districts in Pennsylvania and Colorado are typically, but not exclusively, located within a single county. The relationship

[6] Analyses using proportions or rates (e.g., turnover, net-negative job-flow per 100 employees) are weighted by the inverse number of Full Time Equivalents (FTE). This approach upweights large counties when estimating national trends. The FTE data were merged at the county by year level from the Common Core of Data.

between state and QWI measures are attenuated to the extent that school districts cross county boundaries.

Our QWI measure of net-negative job-flow is strongly correlated with state vacancy rates. Panel D visualizes the convergent validity of net-negative job-flow and educator vacancies. We compare QWI net-negative job-flow data to Virginia staff and teacher vacancy data from 2021-22 and 2022-23 (Virginia Department of Education, 2024). We used data from Virginia because it is the only state that makes teacher and staff vacancy data available. Additionally, Virginia school districts and counties have the same borders. QWI net-negative job-flow and Virginia teacher vacancy data are strongly associated (R=0.73). Net-negative job-flow represents one dimension of educator vacancies. Net-negative job-flow occurs when there is a decrease in the number of employees from one quarter to the next. If the number of employees increases over time, then net-negative job-flow equals zero. However, it is still possible for the number of vacancies to increase if net job flow is positive, and the number of employees increases. Overall, evidence of convergent validity suggests that QWI measures are useful tools for describing vacancies.

Variation Across Time and Local Areas

Turnover and net-negative job-flow vary considerably across counties. Figure 2 describes the distribution of educator labor market measures by county from the 2000-01 school year to the 2022-23 school year. Figure 2, Panel A, displays the proportion of educators to leaving their school district by county and year. On average, one in four educators (Median=25.1; Mean=26.1) leaves their school district each year. The distribution of turnover has a heavy left tail, and in a small number of districts (1 percent), half or more of educators leave each year. In a typical county, turnover is between about 20 and 30% (Inter Quartile Range=10.1). A substantial proportion of educators leave their school districts each year.[7] On average, education jobs tend to increase across time. Figure 2, Panel B displays the log of net-negative job-flow. The labels on the x-axis describe net-negative job-flow in a specific county year cell. The median net-negative job-flow is 42 and average net-negative job-flow is 72.66. In a typical county, between about 24 and 76 jobs are lost (Inter Quartile Range=52). In a typical district net-negative job-flow is quite low and on average slightly under 1 job per 100 employees (0.76) is lost.

Educator turnover and net-negative job-flow followed different patterns after the pandemic. Figure 3 describes educator labor market conditions by county from the 2000-01 school year to the 2022-23 school year. Figure 3, Panels A and C, describe the rate of turnover and net-negative job-flow. Figure 3, Panels B and D, describe the total number of leavers and jobs lost throughout the country in a specific year. The black dots and bars describe the 25th, 50th, and 75th percentiles, while the dashed line describes the mean. Educator turnover and total leavers remained about the same from the end of the Great Recession in 2008-09 to the year prior to the pandemic (2018-19). Median turnover peaked during the first year of the pandemic recession (2019-2020, 23.9 percent) then fell precipitously in 2020-21 to 15.3 percent. Median turnover remained high (22.7) in 2021-22 and 2022-23, compared to the historical average. Following the Great Recession (2009-10) net-negative job-flow per 100 positions declined slowly. In the first year (2019-20) of the pandemic, the net-negative job-flow rate surged. The result was the loss of 1.1 million education jobs. In 2021-22 and 2022-23 net-negative job-flow declined considerably and remains below the pre-pandemic average.

[7] More detailed information on turnover and net-negative job-flow pooled across the years from 2000-01 to 2022-23 is available in Appendix Table A1.

The QWI shows that labor market conditions are worse for racial and ethnic minorities. Figure 4 describes median educator turnover and net-negative job-flow per 100 by race and ethnic groups at the state level. Turnover and net-negative job-flow for all non-White educators is higher than for White educators. From 2000-01 to 2022-23, median turnover for White educators is at least 6.5 percentage points and median net-negative job-flow per 100 positions is at least 1.1 jobs lower than non-White educators. Similarly, turnover and net-negative job-flow are high for non-Hispanic educators compared to Hispanic educators. The pandemic does not appear to have exacerbated differences in labor market conditions by either race or ethnicity. The turnover and net-negative job-flow rates by race and ethnicity rose and then fell by about the same level for all groups. Non-White educators are more likely to either lose or leave their positions compared to their White colleagues.

The QWI shows that school employees with college degrees are less likely to leave their positions. Figure 5, Panel A describes median educator turnover by attainment and state. Median turnover for educators with a bachelor's or advanced degree (15.9%) is about 4.3 percentage points lower than educators at other observed levels of attainment. The median turnover level for educators with a bachelor's or advanced degree is about 2 percentage points above the average teacher turnover reported by states (Bleiberg & Kraft, 2023). This implies that the QWI's data on educators with a bachelor's or advanced degree can provide some useful information about teacher turnover specifically rather than for educators overall.

Since the conclusion of the Great Recession, educators with college degrees have been more likely to lose their positions than educators without college degrees. Figure 5, Panel B describes median educator turnover by attainment and state. The trend in net-negative job-flow by educational attainment differs from turnover. Pooling across each school year from 2000-01 to 2022-23 median net-negative job-flow is higher for educators with a bachelor's or advanced degree. Prior to 2013-14 about 13 educators per 100 positions with less than a high school degree and about 10 educators with a high school degree or greater per 100 positions lost their jobs. However, from 2017-18 to 2022-23 educators with a bachelor's or advanced degree were more likely to have lost their position (about 1 more position lost per 100 positions) than educators with a less advanced degree. The QWI's data on net-negative job-flow by educational attainment is useful for providing unique insight into educator labor market conditions.

Discussion

We demonstrate that the QWI's quarter-to-quarter counts can serve as proxies for county by school year measures of educator labor markets. We find that our school year QWI measures are strongly correlated with state reported data for turnover (R=0.78) and vacancies (R=0.73). We then present descriptive statistics exploring variation between and within counties. Median turnover has remained high in 2021-22 and 2022-23 (about 27 percent) compared to the pre-pandemic average. Net negative job flow was highest in the first year of the pandemic (2019-20) when about 1.1 million education jobs were lost. The variation between counties is 63.5% larger for turnover and 75.9% larger for net-negative job-flow compared to the variation within counties. Turnover is about 10.5 percentage points lower and net-negative job-flow is about 5.3 jobs per 100 positions lower for White educators compared to non-White educators.

The QWI includes unique information on educator labor market conditions, but also has important limitations. The public QWI data describe labor market conditions for 4 digit NAICS codes, which includes elementary and secondary schools (6111). Ideally, the more detailed NAICS codes (i.e., 6 digit) would differentiate between teachers and non-classroom educators. Unfortunately, this nuance is not captured in NAICS's hierarchy of industries, which does not

differentiate between jobs. Currently, the QWI divides race/ethnicity into two non-mutually exclusive categories. This approach is meant to avoid conflating common ancestry and culture (Viano & Baker, 2020). However, this distinction is misaligned with popular conceptions of race/ethnicity. The Office of Management and Budget has plans to update its standards for "maintaining, collecting and presenting race/ethnicity data across federal agencies" (Marks et al., 2024). Future QWI releases could use available personnel records to create a combined race/ethnicity measure consistent with the updated standard. Finally, while the county-level data provide a detailed view of educator labor markets, it would be valuable to include district-level estimates. District level data could be estimated following the procedure used to create Small Area Income Poverty Estimates (Census Bureau, 2024a).

The procedure we describe to transform the QWI data is useful for researchers and policymakers. The data are freely available via the API created by the Census Bureau (2016). The measures of turnover and net-negative job-flow we propose are particularly useful for making regional comparisons. Descriptively exploring between county variation has numerous implications for reacting to changing labor markets. For example, school leaders from rural counties can benefit from straightforward comparisons with their neighbors. Local education leaders can use these data to help recruit staff. Additionally, the QWI are a valuable tool for leaders and researchers seeking to promote a more equitable education workforce. Finally, the procedure we describe here could easily be adapted to create similar measures for the post-secondary education sector.

After the pandemic, local education leaders relied on their experience during the Great Recession. Their response was built upon the assumption that property tax revenues would decline, when in reality housing prices rose rapidly (Bleiberg & Kraft, 2023; St. Louis Fed, 2025). To a certain extent, the conditions that lead to a recession are unexpected. The lack of targeted support also assumes that identifying the communities hit hardest by a recession is not possible. Policymakers can now use the QWI to better shield schools from future economic hardship.

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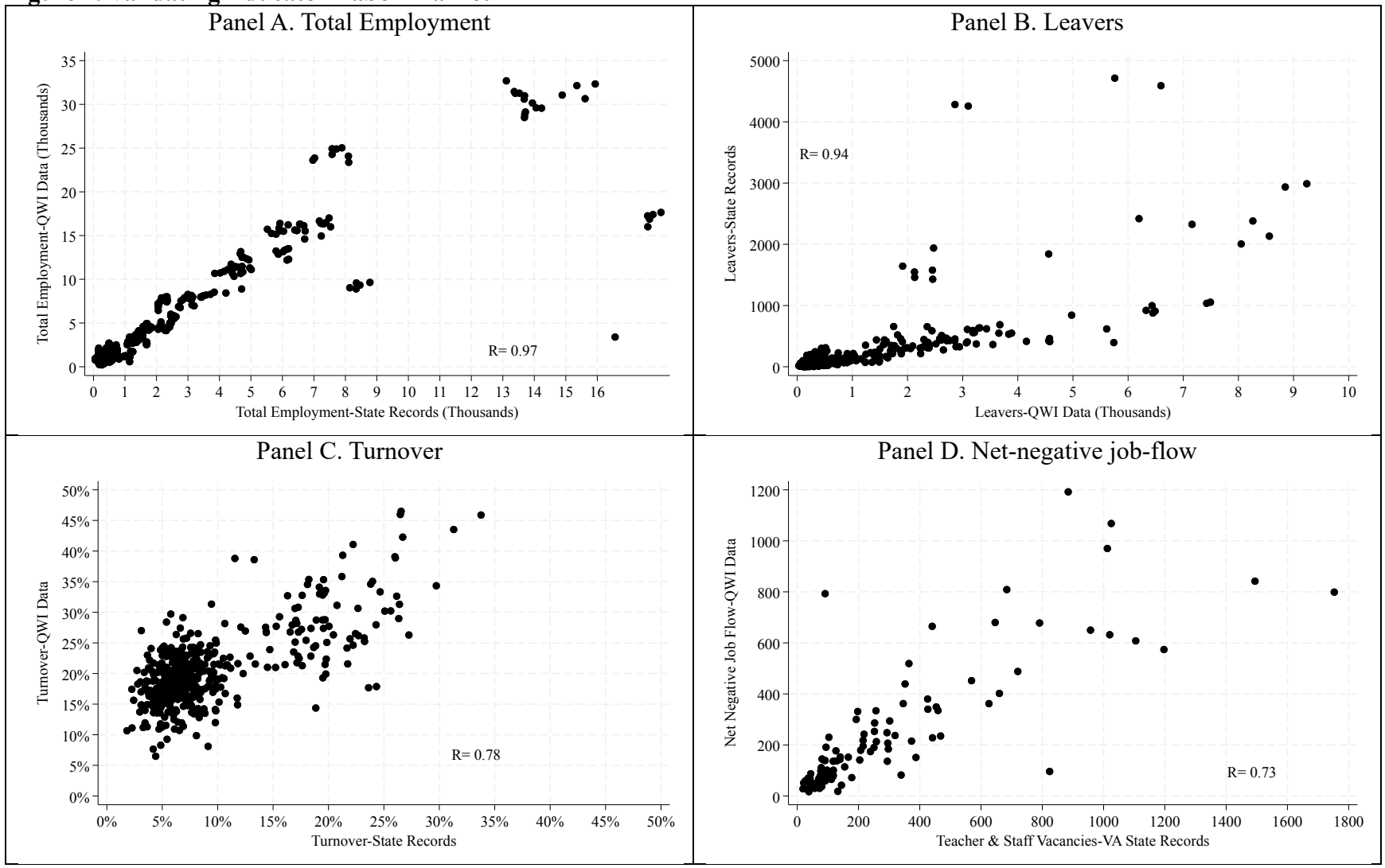
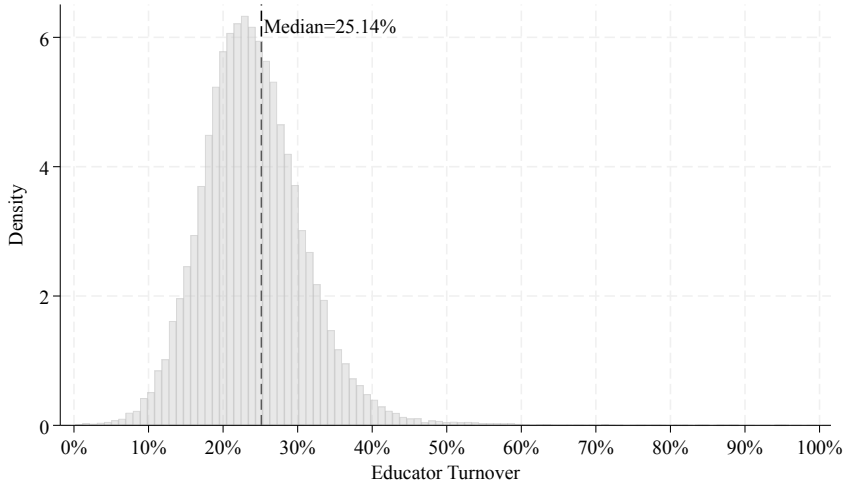
Figure 1. Validating Educator Labor Market



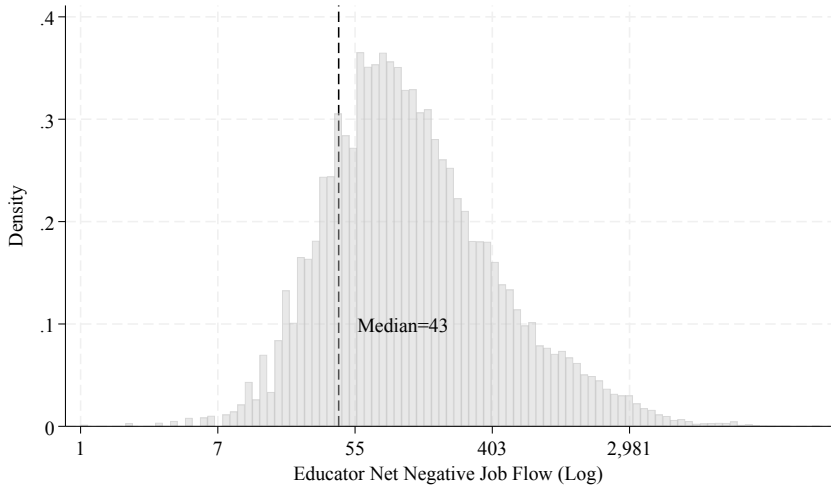
Note: Panels A, B, and C use state records from Pennsylvania (2014-15 to 2021-22) and Colorado (2016-17 to 2021-22). Panel D uses records from Virginia (2021-22 to 2022-23).

Figure 2. Distribution of Educator Labor Market

Panel A. Turnover

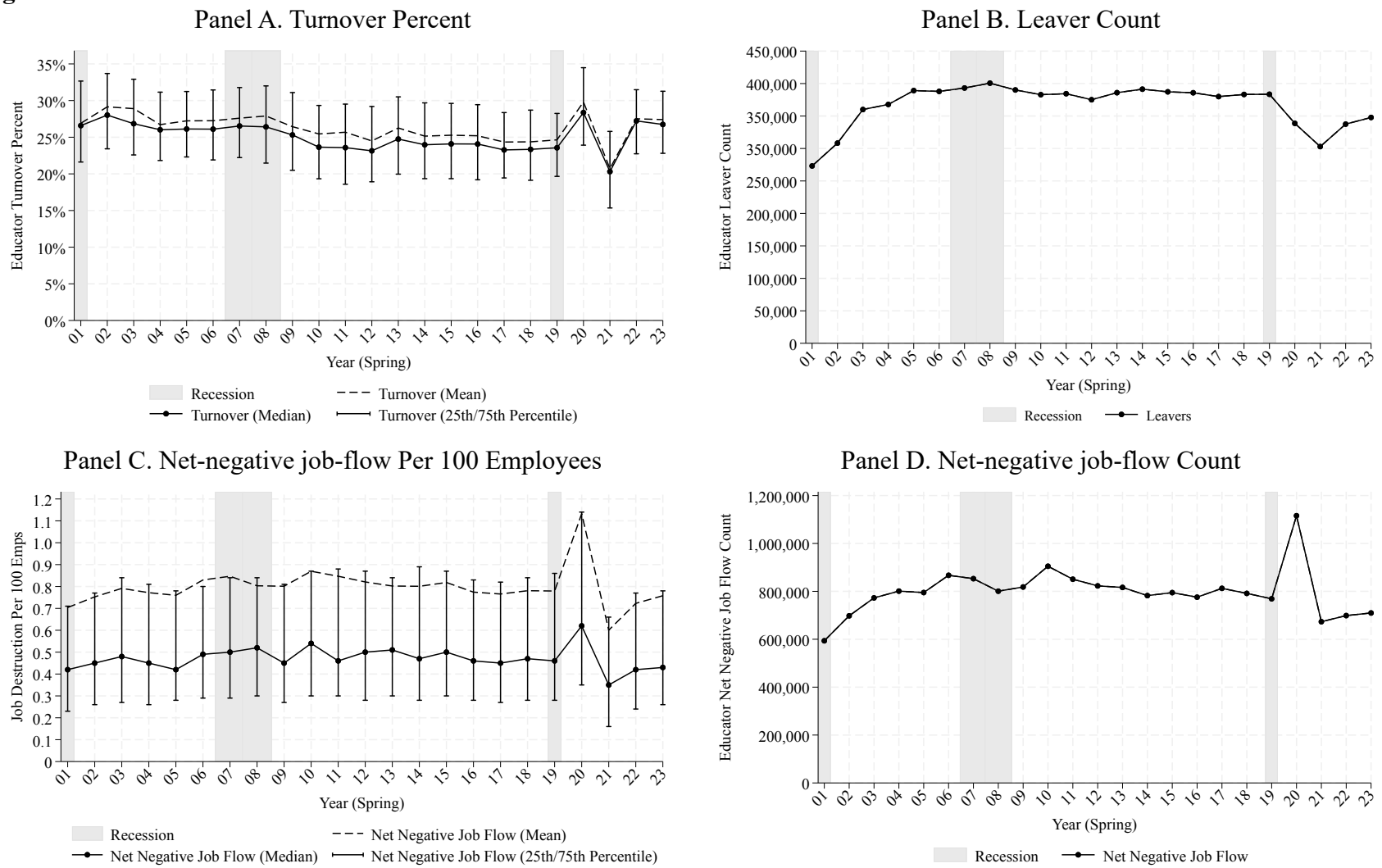


Panel B. Net-negative job-flow



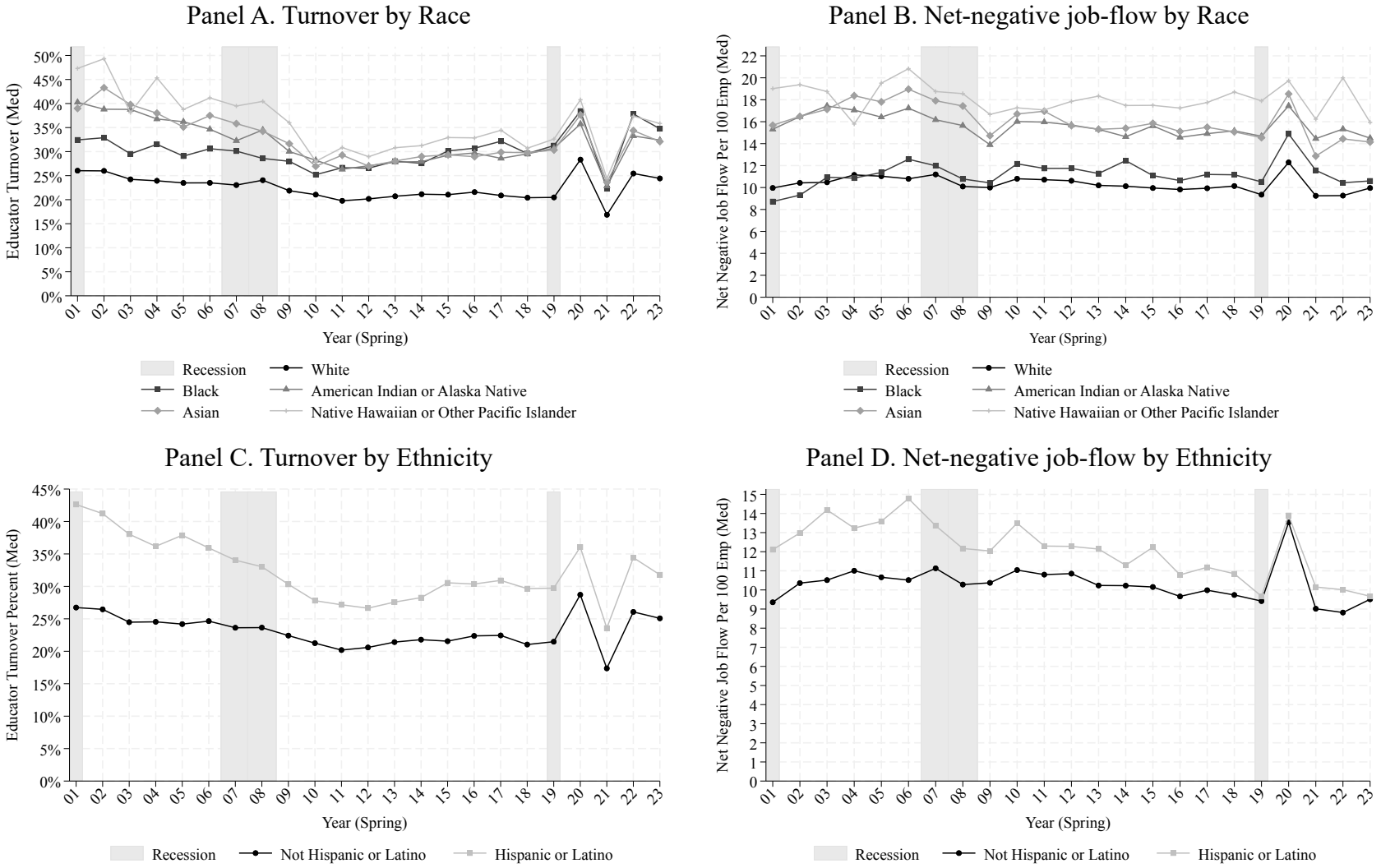
Note: Distributions are weighted by the inverse of county Full-Time Equivalents.

Figure 3. Educator Labor Market Conditions Over Time



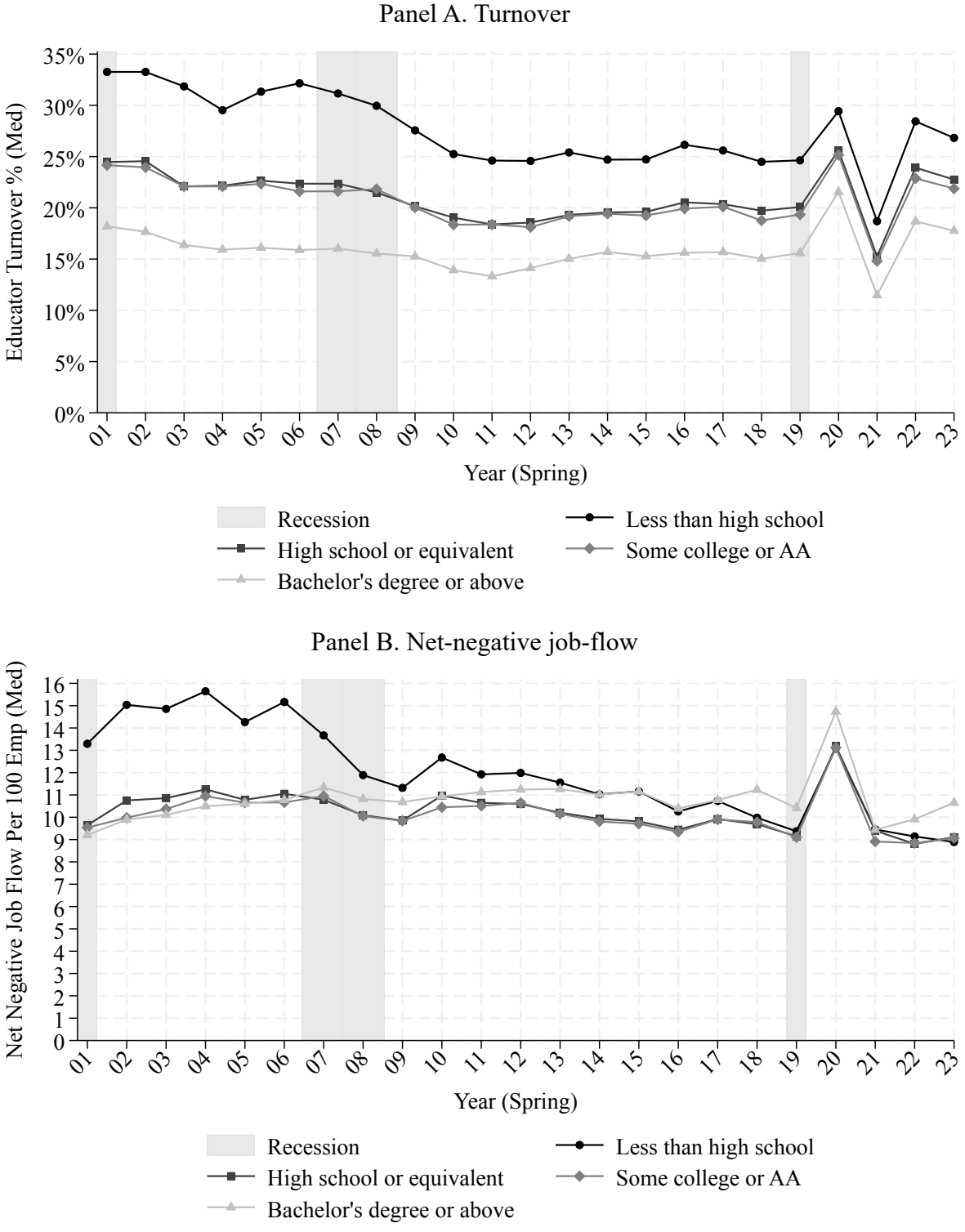
Note: Statistics in Panel A and C are weighted by the inverse of county Full-Time Equivalents.

Figure 4. Educator Labor Market Over Time and Race/Ethnicity



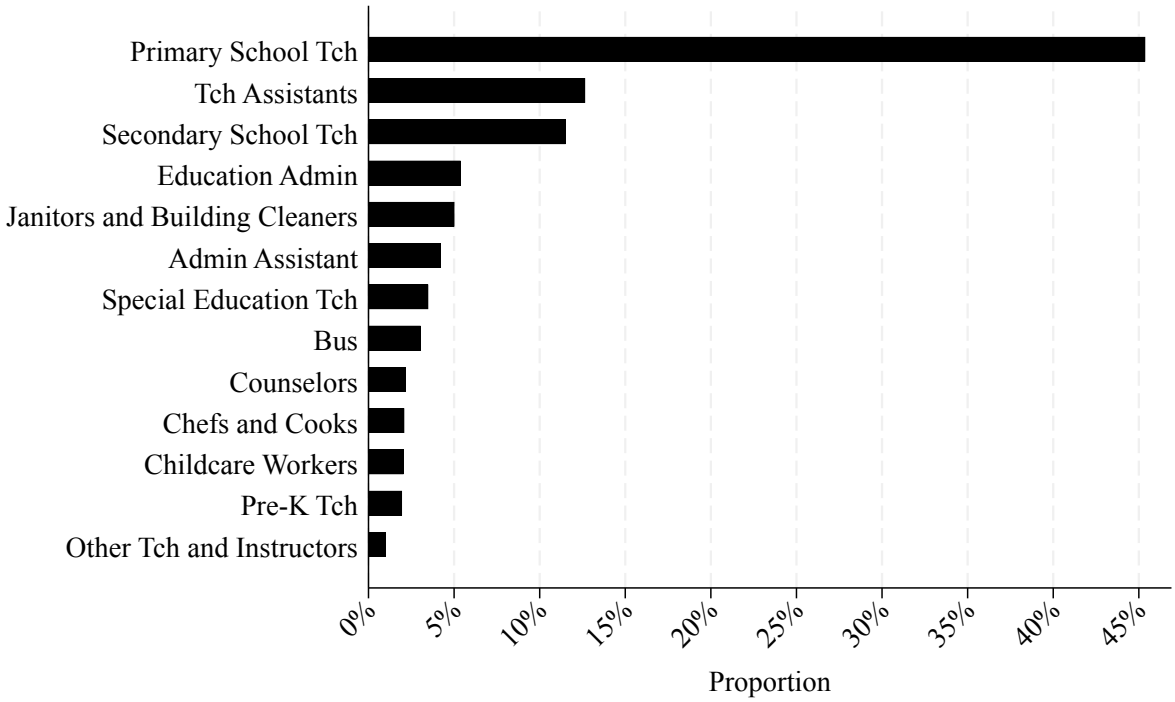
Note: Describes state level median turnover and net-negative job-flow by race and ethnicity.

Figure 5. Educator Labor Market Over Time and Educational Attainment



Note: Describes state level median turnover and net-negative job-flow by educational attainment. AA=Associates Degree.

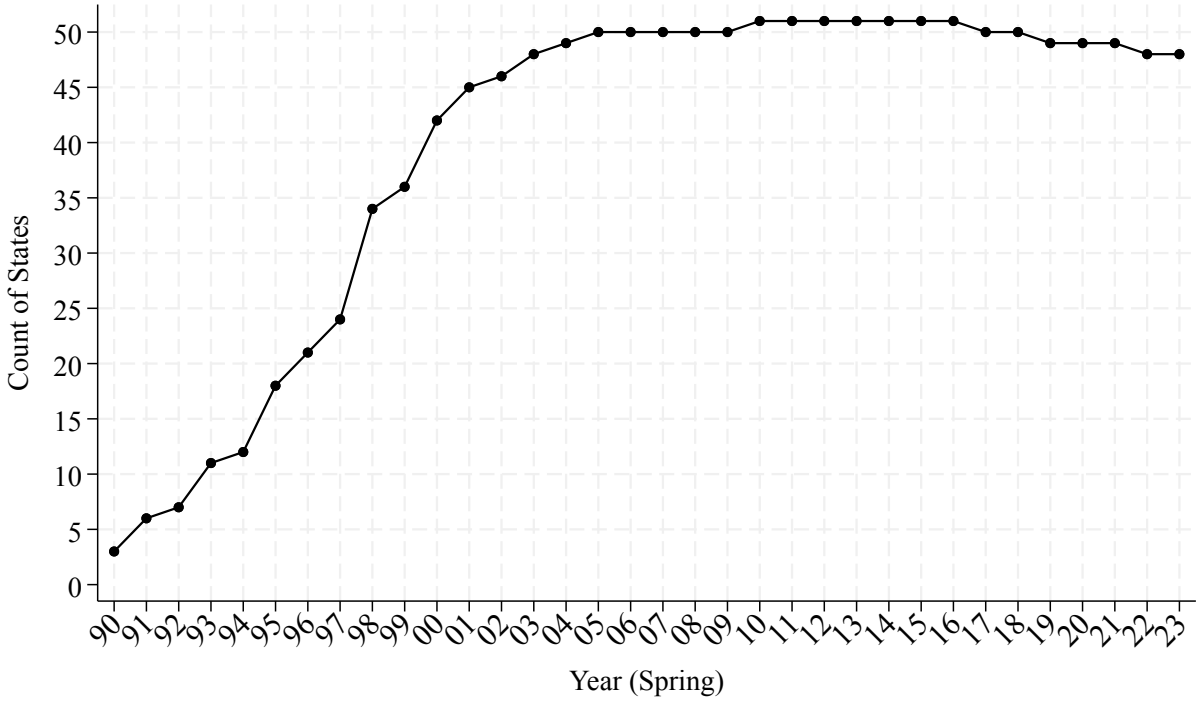
Appendix Figure A1. Census Occupation Codes for Educators



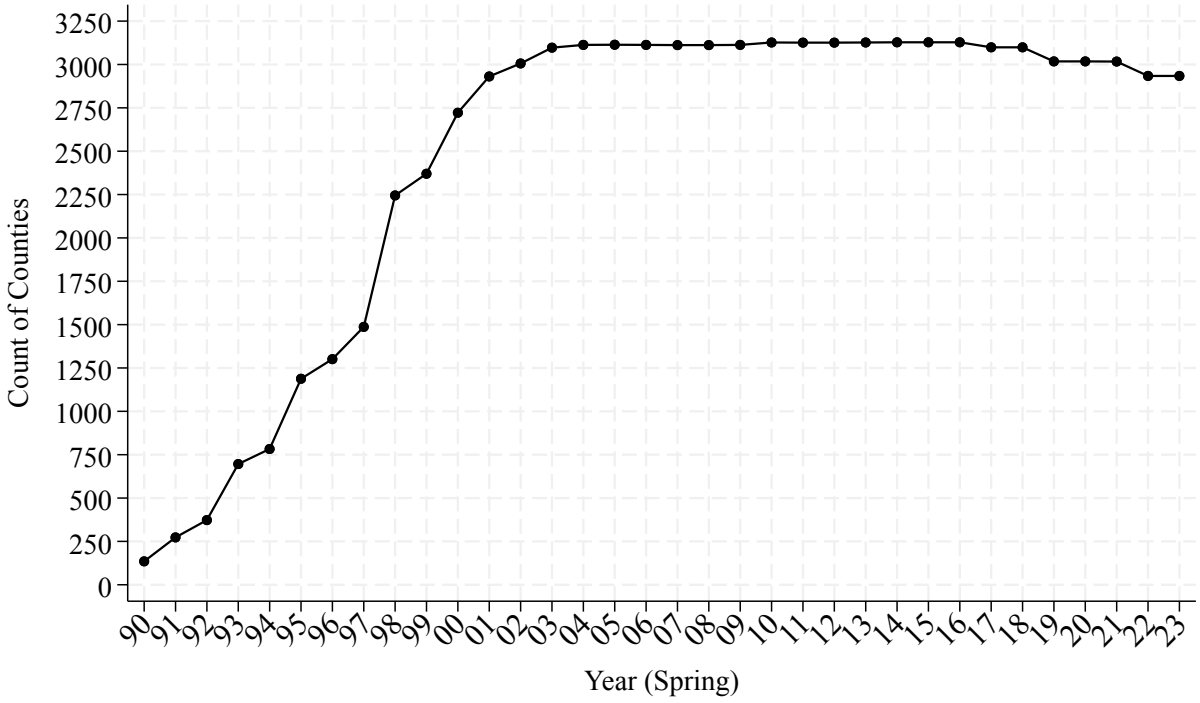
Note: Describes Census Occupation Codes in the Current Population Survey public level micro data for North American Industry Classification System (NAICS) code 6111. Data pools across the years from 2001 to 2022.

Appendix Figure A2. States and Counties Observed in QWI Across Time

Panel A. States



Panel B. Counties



Note: Describes the count of states and county for which QWI data is available by year.

Appendix Table A1. Labor Market Conditions during the Pandemic by State

State	Turnover	Turnover	Leaver	NNJF	NNJF	NNJF
Statistic	Mean	Median	Total	Mean	Median	Total
Alabama	19.6%	20.3%	26,920	10.8	9.3	13,757
Alaska						
Arizona	27.7%	27.9%	27,996	11.0	10.8	11,711
Arkansas	19.3%	19.2%	27,633	11.9	11.2	15,562
California	25.6%	27.3%	82,018	13.3	12.3	34,982
Colorado	30.8%	31.5%	16,945	17.5	12.1	13,016
Connecticut						
Delaware	19.8%	14.8%	15,391	7.1	7.9	6,064
DC	32.1%	28.9%	40,075	7.0	6.9	7,435
Florida	22.5%	22.7%	65,598	14.8	9.0	39,747
Georgia	18.9%	18.4%	47,126	13.0	8.3	26,387
Hawaii	16.8%	17.9%	20,901	7.7	4.6	9,048
Idaho	31.5%	31.1%	7,552	14.7	13.7	5,784
Illinois	25.9%	26.1%	56,044	10.4	9.6	22,844
Indiana	28.8%	28.8%	74,919	9.3	8.8	26,420
Iowa	24.1%	24.1%	41,460	12.6	12.4	22,558
Kansas	29.6%	30.0%	35,803	14.5	14.0	16,140
Kentucky	23.7%	23.4%	27,886	10.0	9.4	15,522
Louisiana	24.4%	23.0%	35,280	13.2	7.7	15,226
Maine	27.3%	28.3%	26,489	10.9	11.2	11,323
Maryland	16.8%	18.8%	22,384	9.8	7.4	16,613
Massachusetts	24.4%	28.3%	79,279	10.3	9.8	25,120
Michigan	18.1%	16.6%	20,424	10.7	9.0	8,589
Minnesota	28.7%	29.4%	48,484	14.7	14.1	28,425
Mississippi						
Missouri	25.0%	25.0%	50,569	16.9	15.2	30,309
Montana	32.3%	33.1%	15,175	19.2	18.9	6,525
Nebraska	23.7%	24.5%	13,147	10.6	10.0	4,513
Nevada	18.7%	18.3%	1,253	11.4	8.1	963
New Hampshire	27.4%	27.0%	27,204	14.3	12.4	13,945
New Jersey	20.2%	21.1%	123,308	8.5	8.2	55,445
New Mexico	24.3%	25.6%	18,040	13.5	10.8	10,818
New York	23.7%	23.6%	123,725	9.6	7.8	46,850
North Carolina	20.4%	20.6%	50,673	10.9	9.8	24,817
North Dakota	27.4%	27.4%	9,852	15.3	14.5	5,658
Ohio	23.0%	23.4%	102,251	8.8	8.2	39,239
Oklahoma	24.9%	25.6%	33,426	14.0	13.6	17,837
Oregon	27.4%	28.4%	16,775	27.2	15.5	8,957
Pennsylvania	18.3%	18.9%	128,541	7.3	6.6	34,132
Rhode Island	26.1%	25.0%	14,268	9.8	8.9	5,707
South Carolina	22.2%	21.9%	22,474	19.8	11.4	16,639
South Dakota	28.7%	28.2%	10,319	13.0	12.3	5,366
Tennessee	23.7%	20.9%	33,289	11.1	9.7	18,864
Texas	27.5%	27.6%	114,037	12.4	11.6	62,840
Utah	26.9%	26.2%	8,314	12.6	13.7	4,577
Vermont	34.8%	37.0%	10,280	15.8	13.5	5,573
Virginia	24.2%	24.2%	57,602	12.5	8.9	33,246
Washington	27.6%	29.5%	22,273	12.2	10.7	15,297
West Virginia	15.1%	15.1%	10,793	10.0	7.5	8,547
Wisconsin	24.0%	24.3%	36,816	11.7	11.3	23,644
Wyoming	21.0%	21.4%	8,376	12.1	11.2	4,916

Note: Describes county turnover and NNJF from 2019-20 to 2022-23. Data are not available from Hawaii, Mississippi, and Connecticut. NNJF mean and median are per 100 employees. NNJF=Net-negative job-flows.