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EdWorkingPaper No. 26-1445

Operational Funding and Early Educator Wage Growth: Evidence from Massachusetts

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VERSION: April 2026

Suggested citation: Caronongan, Pia, and Katie Hyland. (2026). Operational Funding and Early Educator Wage Growth: Evidence from Massachusetts. (EdWorkingPaper: 26-1445). Retrieved from Annenberg Institute at Brown University: https://doi.org/10.26300/qrfv-mc07

WORKING PAPER 2026-2
WINTER 2026

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ABSTRACT

Early educators are among the lowest-paid workers in the United States, in part because most early care and education (ECE) programs operate within constrained business models. In Massachusetts, the Commonwealth Cares for Children (C3) program distributes noncompetitive grants to licensed providers that can be used for operational expenses, including workforce investments. Using monthly application data submitted by center-based ECE programs participating in C3 from July 2021 to September 2024, we examined how educator wages changed during the program's implementation and what factors explain variation in wage growth. We estimate multilevel models to examine wage growth over time and variation across centers and multi-site organizations. Average wages for teachers, assistant teachers, and directors increased between fiscal years 2022 and 2025, though gains are smaller after adjusting for inflation. Baseline wages varied substantially across centers, with differences associated with provider characteristics and community context. Wage growth was faster in centers serving infants and toddlers and centers receiving subsidies, narrowing the pay gaps observed at baseline. Despite these gains, wages remain far below ideal levels, and many baseline disparities persist.

ACKNOWLEDGMENTS

The authors are grateful to the Massachusetts Department of Early Education and Care (particularly to Jocelyn Bowne, Amy Checkoway, Adrienne Murphy, and Ashley White) for providing data access and sharing their insights and expertise; the Commonwealth Children's Fund and an anonymous donor for their financial support; and Meagan Comb and Olivia Chi for their feedback and suggestions. The findings and conclusions in this paper are those of the authors and do not necessarily represent the positions or policy of the Massachusetts Department of Early Education and Care. Design support for this paper was provided by lazar design.

INTRODUCTION

Despite being a crucial ingredient to the delivery of high-quality early care and education (ECE), early educators are among the lowest-paid workers in the United States. The challenging economic prospects for early educators contribute to high rates of turnover and workforce instability. As such, improving financial well-being is a key first step in building and sustaining the ECE workforce.

ECE workers are among the lowest-paid workers in the United States, in large part because of the constrained business model within which most ECE programs operate (Workman, 2021; Mclean et al., 2024). Because many families struggle to pay fees out of pocket, programs are often unable to charge for the true cost of providing services. Although public investment in ECE has been growing, ECE programs still rely heavily on private pay (NSECE project team, 2022).

Pandemic relief funding created new opportunities for states to address longstanding challenges in the ECE sector (Schulman, 2022). Many states distributed stabilization grants to ECE programs to sustain operations and support the workforce during the COVID-19 pandemic. While some states required funds to be used for workforce supports, others allowed providers greater flexibility in how funds were allocated (Schulman, 2022; Center for the Study of Child Care Employment, 2025). These investments represent a large-scale test of supply-side funding strategies designed to improve workforce conditions.

This study contributes to research on how different funding strategies can improve compensation in the early educator workforce. The persistence of low wages and high turnover in the ECE sector is well-documented (Amadon et al., 2024; Bassok et al., 2013; McLean et al., 2024). Other work examines targeted policy interventions, such as wage supplements, that directly increase educator pay (Doromal et al., 2025; Jimenez Parra et al., 2025; Schochet and Jones, 2024). However, less is known about how flexible, supply-side grants to providers influence wage trajectories across centers and organizations over time.

In Massachusetts, the Commonwealth Cares for Children (C3) program provides non-competitive, formula-based grants to licensed child care providers. Originally established with federal child care stabilization funds, the program became fully state-funded beginning in fiscal year 2023 and has been codified in state statute. Grant amounts are determined by programs' licensed capacity and enrollment, the age distribution of children served, and hours of operation. An equity adjustment provides additional funds to programs serving a larger share of children receiving subsidies through Massachusetts' child care financial assistance program and/or are located in a geographic area with fewer resources. C3 funds may be used for a broad range of operational expenses, including quality improvement supports and workforce investments.[1]

Studying C3 provides an opportunity to understand how flexible supply-side funding in the ECE workforce. As states consider how to sustain workforce investments after pandemic relief funds expire, evidence on how provider-directed grants relate to wage growth can inform decisions about longer-term funding strategies and complementary policy interventions. We use longitudinal data on center-based ECE programs participating in C3 to examine:

1. How did wages change among centers participating in the C3 grant program?
2. How and to what extent did wage trajectories vary?
3. What explains variation in wage growth?

We find that average wages for teachers, assistant teachers, and directors increased between fiscal years 2022 and 2025, though gains are smaller once adjusted for inflation. Baseline wages varied substantially across centers, with differences associated with provider characteristics such as for-profit and multi-site status, ages of children served, subsidy participation, and community needs. Wage growth was faster in centers serving infants and toddlers and centers receiving subsidies, narrowing the pay gaps observed at baseline. Despite these gains, wages remain below ideal levels, and many baseline disparities persist.

DATA

To receive C3 grants, ECE programs are required to apply each month. For this analysis, we used monthly application data that centers submitted from July 2021 to September 2024. 2,907 centers submitted at least one application during this period. In September 2024, 2,491 centers submitted an application, representing over 85% of licensed centers in the state. Table 1 shows characteristics of centers included in our analytic samples.

Wages. Each month, centers reported the highest and lowest wages for each of 3 roles, as applicable: teacher, assistant teacher, and director.[2] We converted reported wages to 2024 dollars using the consumer price index (CPI). We calculated the average of the highest and lowest wages for each role in each month and then took the average for each fiscal year.[3] Our sample includes centers with at least one year of wage data, although 75% of centers in our sample have 4 years of data.

Center characteristics. We examine variation in wages by several center characteristics, including: whether a center serves infants or toddlers (based on whether they reported having any infant or toddler classrooms in any month during a fiscal year), licensed capacity (as an indicator of center size), whether a center served any subsidized children (in any month during a fiscal year), and whether a center was in a high-need community (based on being located in a census tract with a social vulnerability index of 0.75 or higher).

Organizational characteristics. Some of the centers in our sample are part of multi-site organizations, meaning that a larger organization oversees some of the center operations. In our sample, about half of the centers are single-site centers, about 30% are part of 305 multi-site organizations that run between 2–10 sites, and 15–16% of centers are part of 27 multi-site organizations with more than 10 sites.[4] Fifty-nine percent of centers in our sample are part of for-profit organizations.

METHODS

We fit multilevel models to account for the nested structure of the data and estimate variance at different levels. Importantly, these models also allow us to estimate wage growth by looking at changes among the same centers over time, rather than comparing snapshots of centers from each year. Centers with only a single observation are still included in our models, contributing to the estimation of average wages at each time point, while centers observed at multiple time points contribute to estimates of growth. Because the composition of centers changes over time, examining the data longitudinally allows us to examine wage growth setting aside changes in wages coming from changes in the mix of centers.

To answer our first research question, we fit unconditional growth models estimating nominal and real wages over time, as follows:

$$wage_{tij} = \gamma_{00} + \gamma_{10} YEAR_{tij} + r_{0ij} + r_{1ij} YEAR_{tij} + u_{0j} + u_{1j} YEAR_{tij} + \varepsilon_{tij} \quad (1)$$

In this model, $wage_{tij}$ is the average wage in year t for center i in organization j. It is a function of the fixed effects: γ_{00}, the average wage in year 0 across centers and organizations and γ_{10}, the average yearly change in wage across centers and organizations. Our model includes random intercepts: r_{0ij} is the deviation of center i's wage in year 0 from the mean wage in organization j in year 0, u_{0j} is the deviation of organization j's wage in year 0 from the grand mean wage across organizations in year 0, and ε_{tij} is the deviation of center i change in wage in year t from the average yearly change for center i. We also include random slopes: r_{1ij} is the deviation of center i's average yearly change in wage from the average yearly change in organization j, u_{1j} is the deviation of organization j's average yearly change in wage from the average yearly change across organizations.

To examine our second research question, we modify equation 1 to include center- and organization-level covariates, as follows:

$$\begin{aligned} wage_{tij} = \gamma_{00} + \gamma_{10} YEAR_{tij} + \boldsymbol{X}_{ij} (\boldsymbol{\theta_0} + \boldsymbol{\theta_1} YEAR_{tij}) + \boldsymbol{Z}_{ij} (\boldsymbol{\delta_0} + \boldsymbol{\delta_1} YEAR_{tij}) \\ + r_{0ij} + r_{1ij} YEAR_{tij} + u_{0j} + u_{1j} YEAR_{tij} + \varepsilon_{tij} \end{aligned} \quad (2)$$

In equation 2, θ_0 is a vector of coefficients describing how center-level covariates X_{ij} affect the intercept, θ_1 is a vector of coefficients describing how center-level covariates X_{ij} affect the slope, δ_0 is a vector of coefficients describing how organization-level covariates Z_{ij} affect the intercept, and δ_1 is a vector of coefficients describing how organization-level covariates Z_{ij} affect the slope.

Our primary model specifications assume independent random intercepts and slopes. As a robustness check, we also fit a supplementary set of models allowing an unstructured covariance between random intercepts and slopes.

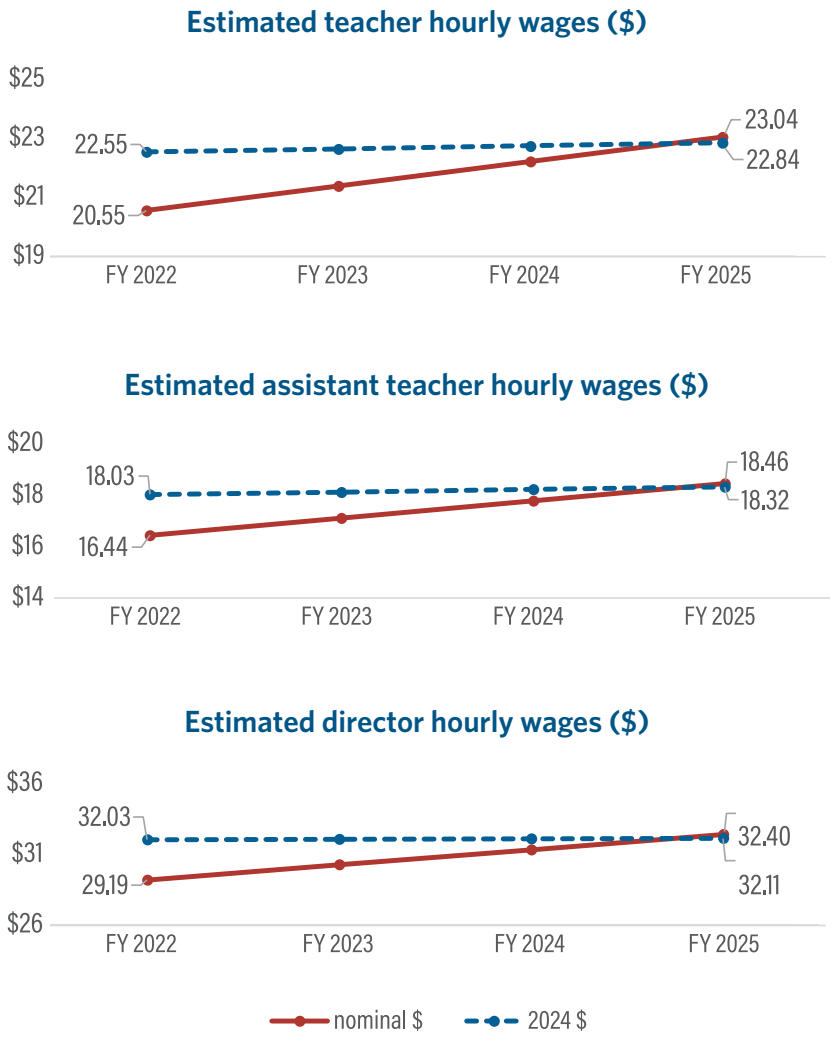
RESULTS

How did wages change among centers participating in the C3 grant program?

Average hourly wages increased for teachers, assistant teachers, and directors between fiscal years 2022 and 2025. Table 2 shows estimates from unconditional growth models of nominal and real wages for the three staff roles. We see positive and statistically significant yearly growth in nominal wages for all three types of staff. We observe the largest yearly increases in hourly wages among directors, whose wages rose by an estimated $1.07 per year. For teachers, the estimated yearly increase was about $0.83. Assistant teachers had the smallest yearly increase at $0.67 per year.

The increases are smaller in magnitude once we adjust for inflation. In terms of real wages, we see an increase of about $0.10 per year for both teachers and assistant teachers. For directors, the estimated yearly increase in real wages is not statistically significant, indicating that observed nominal wage growth mainly kept pace with inflation. Figure 1 shows how yearly changes translate over the 4-year period. For teachers, nominal wages increased by approximately 12% (from $20.55 in FY 2022 to $23.04 in FY 2025) and 1.30% when accounting for inflation (from $22.55 to 22.84 in 2024 dollars). Assistant teacher nominal wages increased from $16.44 to $18.46—a 12% increase in nominal wages and a 1.61% increase (from $18.03 to $18.32 in 2024 dollars) after accounting for inflation. Director nominal wages increased from $29.19 to $32.40, on average, an 11% increase in nominal wages and a <1% increase after accounting for inflation (from $32.03 to $32.11 in 2024 dollars).

Figure 1. Estimated wage growth trajectories based on unconditional growth models



Note: Figures show predicted wages from multilevel models.

How and to what extent did wage trajectories vary?

Table 3 shows the estimated standard deviations of random effects from the unconditional wage growth models. We present estimates from models using nominal wages as well as real wages (in 2024 dollars). The random effects estimates from models using real wages are similar to the estimates from the nominal wage models. The notable differences are that the baseline wage standard deviations are slightly larger when we use real wages, and the yearly increase standard deviations tend to be smaller. This is not surprising because we used the national consumer price index to obtain real wages, which adjusts for inflation trends over time but not differences due to other factors. We focus our discussion below on the random effects from the nominal wage models, for brevity.

There was substantial variation in baseline wages when C3 began. Among centers in multi-site organizations, we observe greater variation in baseline wages across organizations than between centers within the same organization. This pattern is not surprising, as organizations often aim to maintain consistent pay structures across the sites they oversee. For example, for teacher nominal wages, the organizational level standard deviation is $4.84, indicating that among multi-site organizations, approximately two-thirds of baseline wages fall between $15 to $25. The center-level standard deviation is smaller at $1.37—this suggests, for an organization with an average (across centers) teacher baseline wage of $20, about two-thirds of centers would have baseline wages between $18 to $21. We see a similar pattern for assistant teacher baseline wages, although there is less variation at both the organization level (SD=$2.50) and center level (SD=$0.80), which suggests wage ranges are narrower for these staff. Organization-level variation is particularly pronounced for director wages, for which the standard deviation is $8.73. Notably, the standard deviation in baseline director wages among centers within the same multi-site organization (SD=$8.73) is larger than the organizational-level standard deviation for teacher baseline wages.

Centers that are not part of multi-site organizations do not contribute to our estimation of organizational- vs. center-level variation. However, we may approximate variation in baseline wages for single sites using the total variation in baseline wages among sites in our sample.[5] Under this approach, single site organizations vary in wages by approximately +/- $5 at baseline.

There is also meaningful variation in yearly wage increases. The standard deviations of the yearly increase in wages in Table 3 show substantial heterogeneity in wage growth, relative to the average yearly increase. Among multi-site organizations, the typical difference between an organization's yearly increase for teachers and the overall mean is within +/- $0.67. Given the fixed effect estimate for yearly increases in teachers' hourly nominal wages is $0.83, this suggests that approximately two-thirds of organizations have average yearly increases between $0.16 and $1.50. For a full-time employee working 40 hours per week, this corresponds to about $330 to $3,120 in additional annual earnings, a fairly wide range. As we saw with baseline wages, there is also variation among centers within multi-site organizations, although the standard deviation is smaller at $0.35. We also see meaningful variation in yearly increases in assistant teacher nominal wages. The standard deviations are smaller at both the organization-level (SD=$0.46) and center-level (SD=$0.32), but these estimates suggest a wide range relative to the average yearly increase for these staff ($0.67). As we saw with baseline director wages, yearly increases for these staff vary substantially, with a standard deviation in nominal dollars of $1.17 at the organization level and $0.94 at the center level.

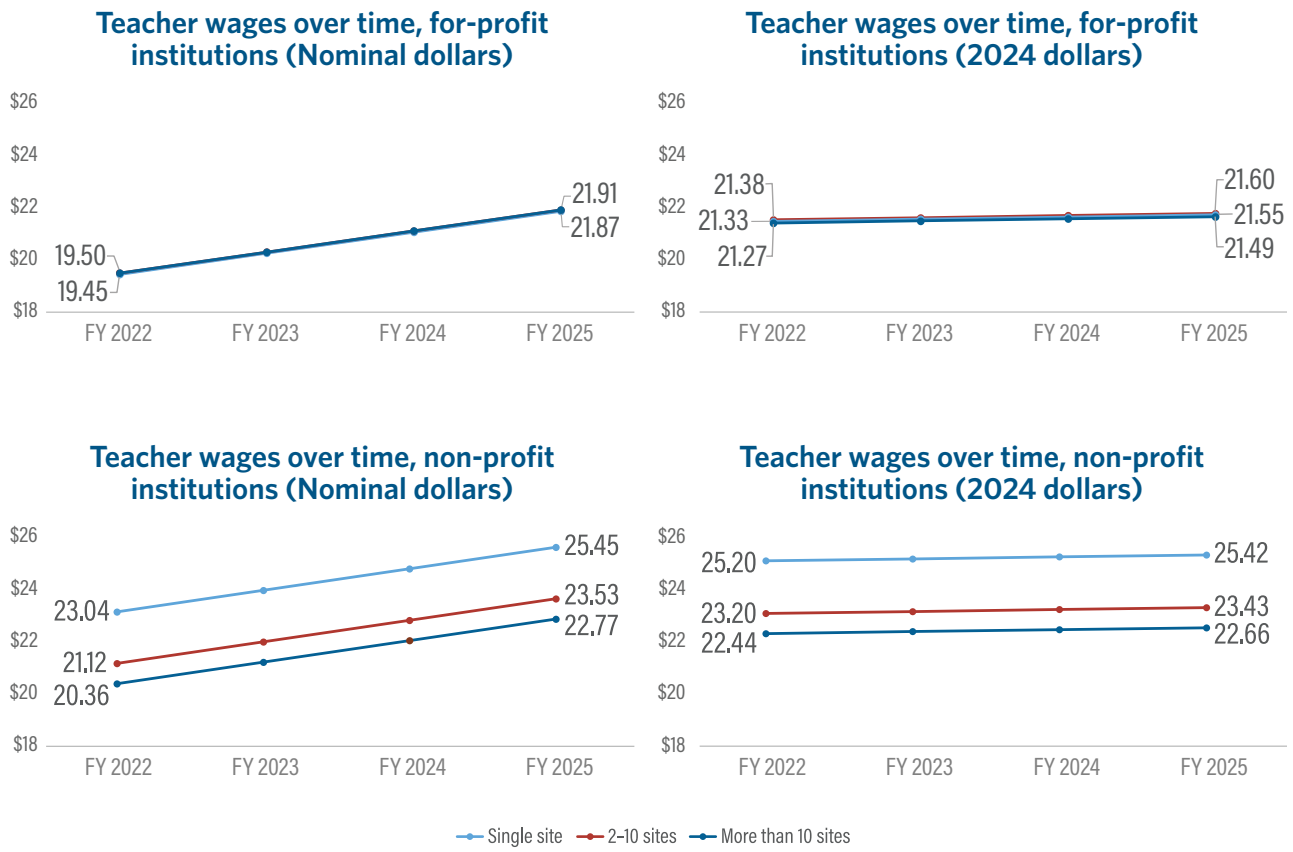
We generally see less variation in yearly increases among centers within multi-site organizations compared to organization-level variation; however, there are differences by type of staff. For teachers, center-level variation in wage growth is about 52% the size of organization-level variation, indicating relatively similar wage growth trajectories across centers within the same organization. In contrast, for directors, center-level variation is about 80% the size of organization-level variation, suggesting less standardization in wage increases within multi-site organizations.

What explains variation in wage growth?

Tables 4 and 5 show fixed effect estimates from wage growth models with organization- and center-level covariates included. We illustrate the relationship between wages and the various covariates in Figures 2 to 7. Figures show estimated wage trajectories in nominal and inflation-adjusted 2024 dollars. Our discussion focuses primarily on nominal wage trajectories, as the substantive conclusions regarding associations between organization- and center-level characteristics and wages are similar in the real-dollar models. As expected, the wage trajectories are flatter when expressed in 2024 dollars. We note instances where results differ between the nominal wage models and the models using 2024 dollars.

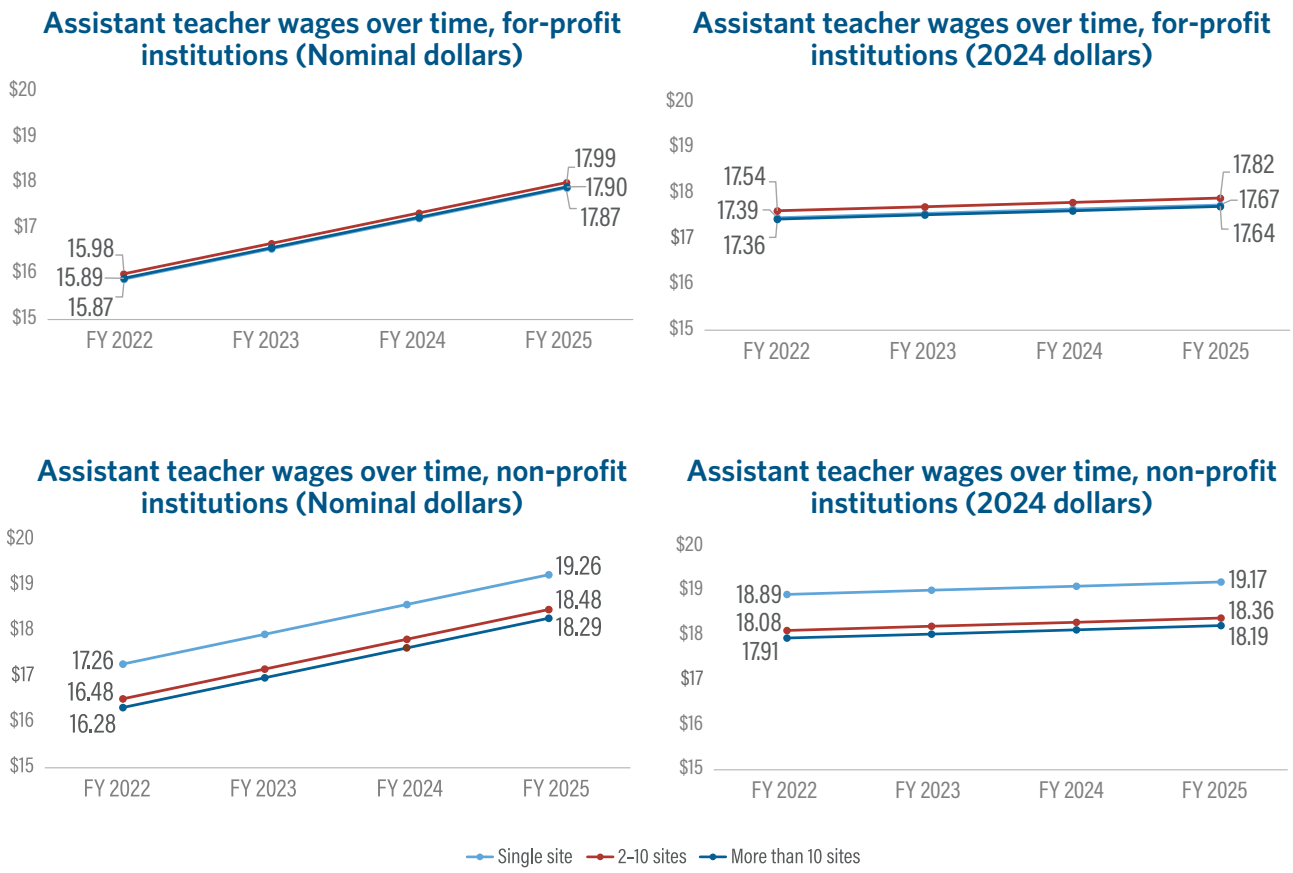
For-profit status and number of sites. The number of centers within a multi-site organization and for-profit status are both related to differences in baseline wages, but not yearly wage increases. For-profit centers paid lower wages at baseline than non-profit centers, regardless of multi-site status. However, we find that the relationship between the number of sites and wages depends on for-profit status. Figures 2 to 4 illustrate this interaction by showing estimated wage trajectories by for-profit status and number of sites, holding other center characteristics constant. Among for-profit centers, baseline teacher wages were very similar regardless of the number of sites, averaging about $19.45 to $19.50. In contrast, baseline wages varied more across non-profit centers. Teachers in large multi-site non-profits (more than 10 sites) earned a baseline wage of $20.36 per hour, compared with $21.12 in non-profits with 2-10 sites and $23.04 in single-site non-profit centers. Because the average yearly increase does not vary by for-profit status or number of sites, the figures show parallel wage trajectories through FY 2025. We see a similar pattern among assistant teachers, with minimal differences in baseline wages among centers in for-profit organizations with varying numbers of sites. Among non-profit centers, assistant teachers in single-site centers had an average baseline wage of $17.26, $0.98 higher than assistant teachers in organizations with more than 10 sites, and $0.78 higher than assistant teachers in organizations with 2–10 sites. For directors, differences in average baseline wages are more pronounced among both for-profit and non-profit organizations. Among for-profit centers, directors in single-site centers have the lowest baseline wages on average, at $27.32. Directors in multi-site organizations with more than 10 sites have the highest baseline wages at $29.13. The rank order is reversed among non-profit centers. Single-site non-profit centers have the highest director wages at baseline at $33.40, and directors from non-profit organizations with more than 10 sites have the lowest director wages at baseline of $28.60.

Figure 2. Estimated wage trajectories for teachers, by for-profit status and number of sites



Note: The figure displays estimated wage trajectories derived from the multilevel model with organization- and center-level covariates. Predicted wages are calculated while holding all other covariates at their mean values.

Figure 3. Estimated wage trajectories for assistant teachers, by for-profit status and number of sites



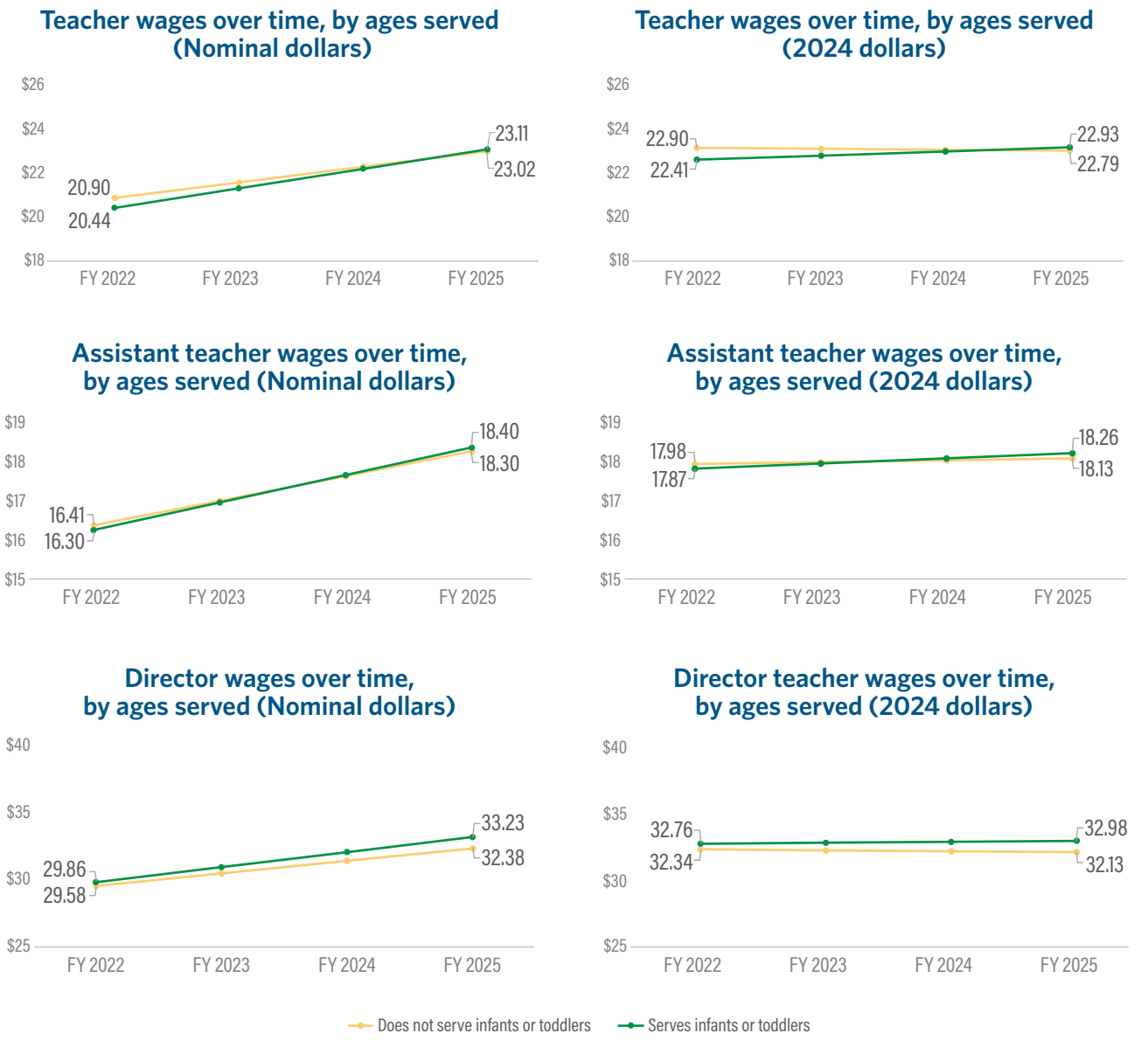
Note: The figure displays estimated wage trajectories derived from the multilevel model with organization- and center-level covariates. Predicted wages are calculated while holding all other covariates at their mean values.

Figure 4. Estimated wage trajectories for directors, by for-profit status and number of sites

Note: The figure displays estimated wage trajectories derived from the multilevel model with organization- and center-level covariates. Predicted wages are calculated while holding all other covariates at their mean values.

Ages of children served. Serving infants and toddlers is more resource-intensive than serving older children, largely because the lower child-to-staff ratios required increase program costs without a corresponding increase in revenue. Consistent with these constraints, average baseline wages for teachers were lower in centers that serve infants and toddlers. We see similar patterns for assistant teachers and directors, but the differences in average baseline wages are not statistically significant. However, average yearly increases were larger among centers that serve infants and toddlers for all three types of staff. This is evident in the different slopes of the trajectories shown in Figure 5. By FY 2025, average wages for teachers and assistant teachers in centers that serve infants and toddlers were similar to their counterparts in centers that did not serve infants and toddlers. For directors, the difference in average yearly increases by ages served is not statistically significant in the real wage model.

Figure 5. Estimated wage trajectories for center staff, by ages of children served

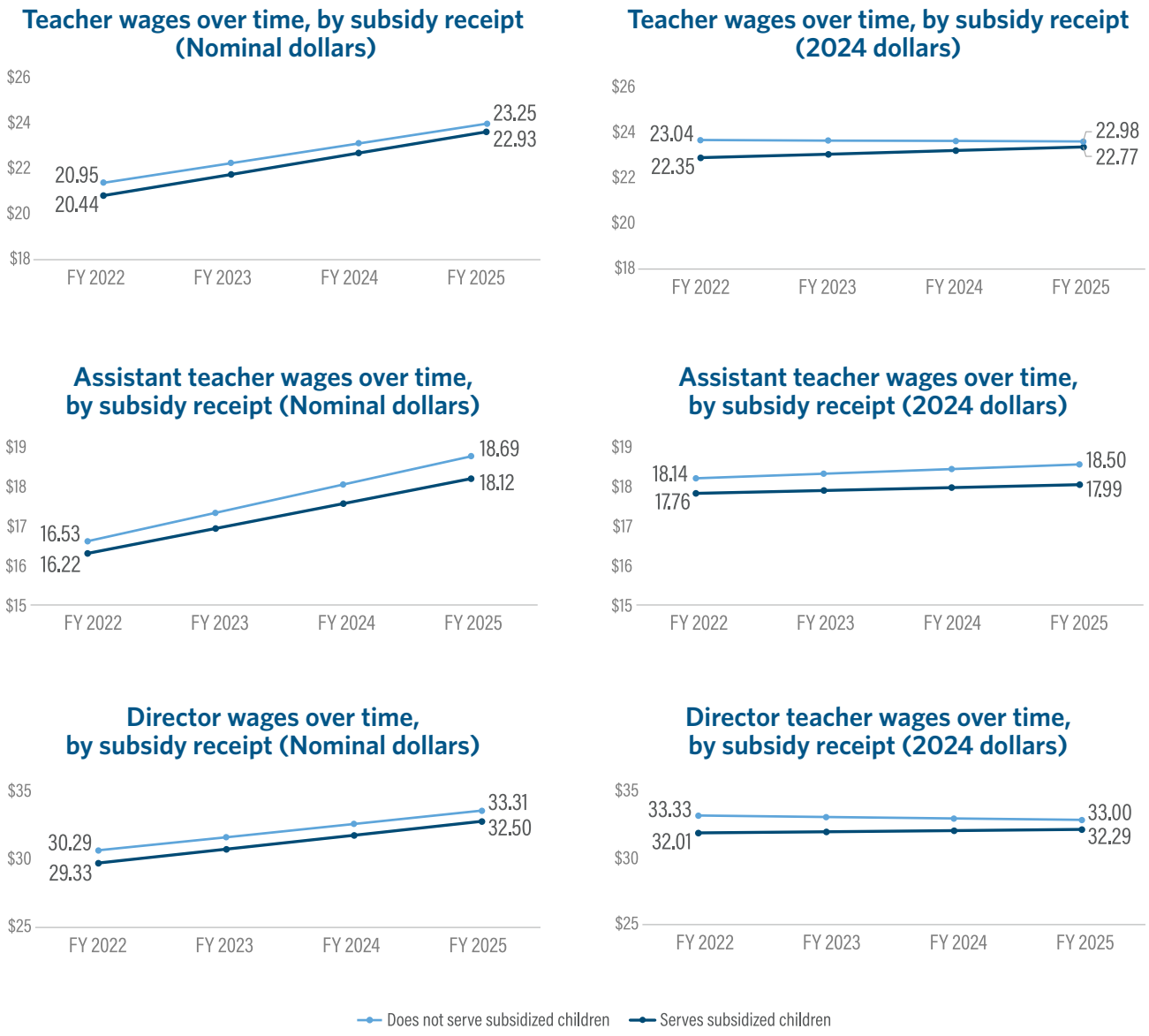


Note: The figure displays estimated wage trajectories derived from the multilevel model with organization- and center-level covariates. Predicted wages are calculated while holding all other covariates at their mean values.

Subsidy receipt. Centers that accept subsidies typically serve families with limited ability to pay out-of-pocket, which constrains program revenues and is associated with lower staff wages. Consistent with this, centers that serve children who are subsidized through Massachusetts' Child Care Financial Assistance Program had lower average baseline wages for teachers, assistant teachers, and directors, compared to centers that do not serve subsidized children. We also see some differences in average yearly increases in wages by subsidy receipt. For teachers and directors, average yearly increases are larger in subsidized centers, which leads to some convergence in estimated trajectories over time. Figure 6 shows how the wage gap in average wages for these staff narrows, although teachers and directors in centers receiving subsidies still have lower average wages by FY 2025. In the nominal wage models, the difference in yearly

increase by subsidy receipt is not statistically significant, but it is statistically significant in the real wage models. This suggests that teachers and directors in centers serving subsidized children experienced larger increases in purchasing power compared to their counterparts in centers that do not serve subsidized children. For assistant teachers, the trend is reversed. The average yearly increase is smaller in subsidized centers, such that we see the gap between the wage trajectories widens over time. The difference in yearly increase by subsidy receipt is only statistically significant for nominal wages, indicating that assistant teacher wages in subsidized centers have not kept up with inflation to the same extent as their counterparts in centers that do not serve subsidized children.

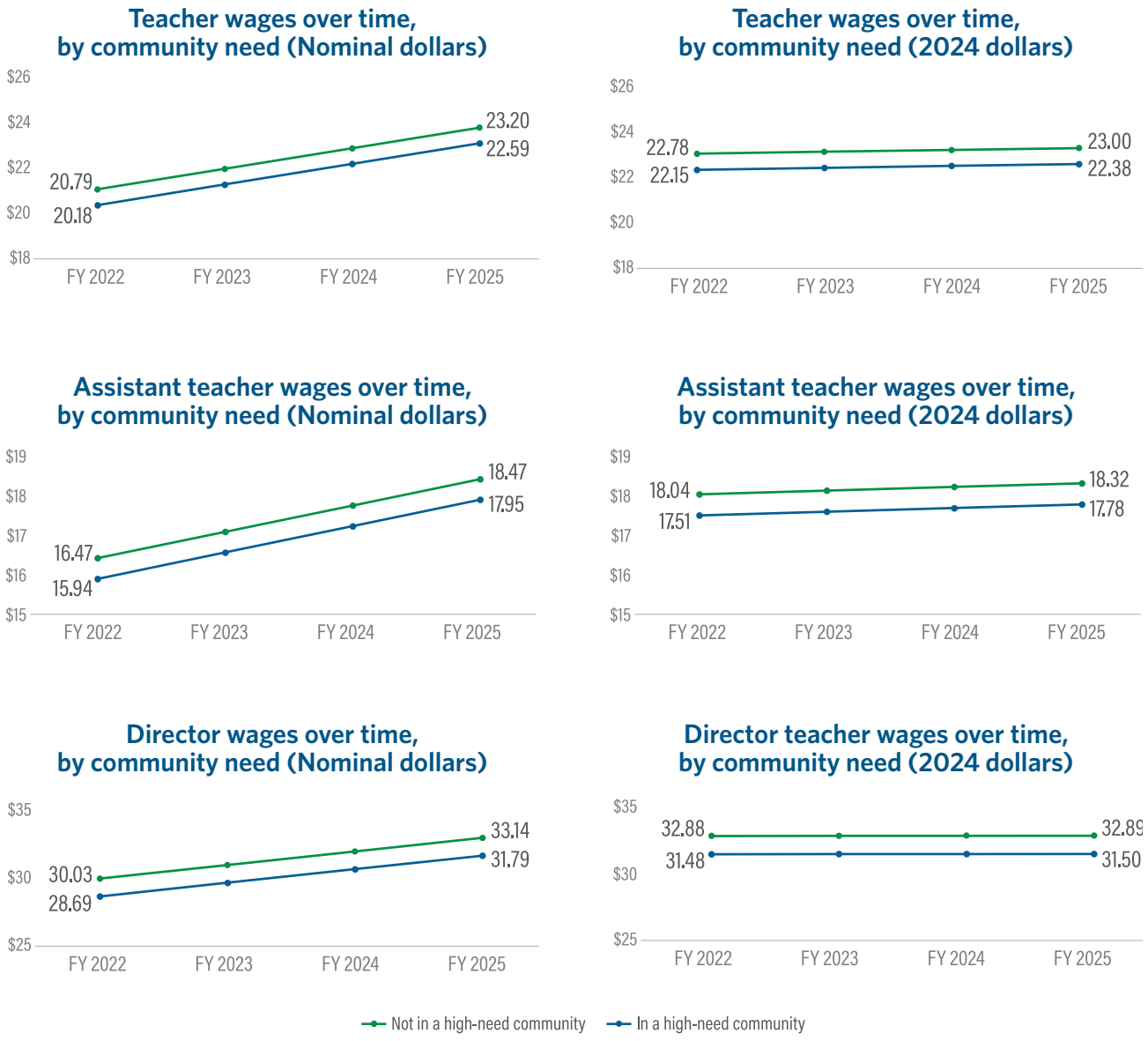
Figure 6. Estimated wage trajectories for center staff, by center subsidy participation



Note: The figure displays estimated wage trajectories derived from the multilevel model with organization- and center-level covariates. Predicted wages are calculated while holding all other covariates at their mean values.

Community needs. Centers in high-need communities often serve families with limited child care options, while operating with more constrained financial resources. Consistent with this, we find that centers in high-need communities had lower average baseline wages for teachers, assistant teachers, and directors. However, we do not find differences in average yearly increases in wages by community need. As Figure 7 shows, center staff in high-need communities start off with lower wages in FY 2022 and have consistently lower wages through FY 2025, compared to their counterparts in communities that are not defined as high-need based on the social vulnerability index.

Figure 7. Estimated wage trajectories for center staff, by community need



Note: The figure displays estimated wage trajectories derived from the multilevel model with organization- and center-level covariates. Predicted wages are calculated while holding all other covariates at their mean values.

To understand the extent to which the organization- and center-level characteristics included in the models explained wage differences, we compared the total variation in intercepts and slopes from models including these covariates to the unconditional wage growth models. These characteristics explained 13 to 28 percent of the unexplained variance in baseline wages, but only up to 2 percent of the variance in yearly wage increases. This indicates that, although typical yearly wage growth varies substantially across centers, the included characteristics explain little of that variation. In contrast, the organization- and center-level factors explain substantially more of the differences in baseline wages.

Supplementary Analysis

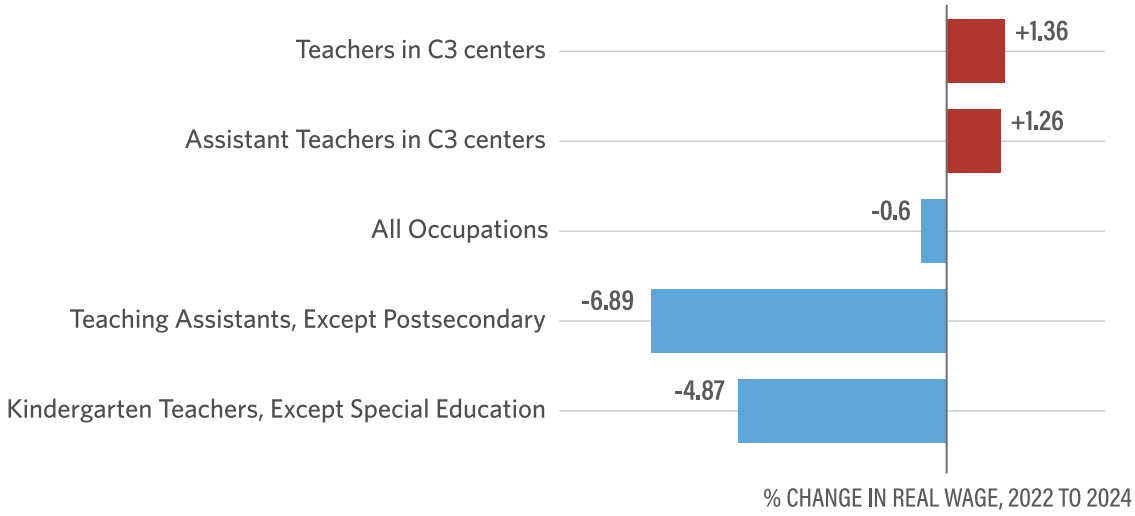
We estimated supplemental models that allow unstructured covariance between random intercepts and slopes in the models with organization- and center-level covariates. Table 6 shows estimated correlations from those models. The estimated correlations indicate that in some cases organizations with lower baseline wages tend to experience larger wage increases over time, whereas those with higher baseline wages experience smaller annual increases. For teachers' real wages, the correlation between organization-level random intercepts and random slopes was -.40, indicating that organizations with lower baseline wages show faster growth, leading to some narrowing of wage differences over time. In contrast, the correlation at the center level for teacher wages is near zero, indicating little relationship between baseline wages and wage growth among centers within organizations. In models using teacher nominal wages, the organization-level correlation is smaller, and the center-level correlation is modestly positive (=-.22 across organizations, = .19 within organizations). These weaker or reversed correlations in the nominal wage models likely reflect the shared influence of inflation on nominal wage growth over time. For program directors, we find evidence of real wage convergence (faster wage growth among those with lower baseline wages) both within organizations (= -.48) and across organizations (=-.26), but again this relationship weakens or disappears when considering nominal wages (=-.36 and = .04 respectively). For assistant teachers, we do not find evidence of significant wage convergence or divergence at either the organization or site level, for either real or nominal wages.

Some of the fixed effect parameter estimates from the models with unstructured covariance vary slightly from our primary models; however, findings are generally consistent. The full results from these unrestricted models are reported in Appendix A.

CONCLUSION

Findings show suggestive evidence that C3 supported growth in nominal wages and helped wages keep up with inflation. Because data on wages were only collected from centers during their participation in the C3 program, we cannot directly estimate what might have happened to wages in the absence of C3. However, using Bureau of Labor Statistics data, we compared wage growth in C3 centers to similar occupations in Massachusetts. Figure 8 shows that, between 2022 and 2024, Massachusetts teaching assistants and kindergarten teachers experienced substantial declines in real wages (-6.89% and -4.87%, respectively) while average real wages of teachers and assistant teachers in C3 centers grew by +1.36% and +1.26%, respectively. This offers suggestive evidence that the C3 funds have helped bolster wages for center-based educators over a period of general real wage declines.

Figure 8. Percentage change in C3 staff real wages compared to similar Massachusetts occupations, 2022 to 2024



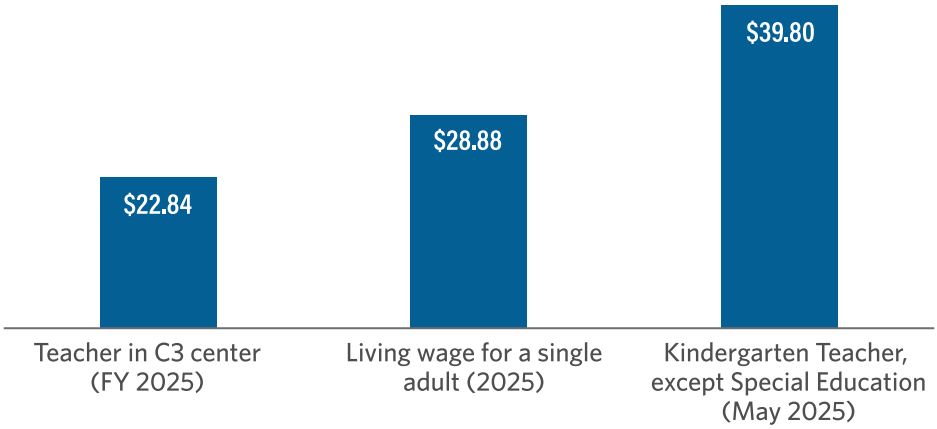
Note. Values represent the simple percentage change in average real wages for each occupation. For staff in C3-participating centers, we calculate the difference in average wages in fiscal years 2022 and 2024 for each role at each time point. Data for other occupations comes from the U.S. Bureau of Labor Statistics OEWS tables for the years 2022 and 2024, for occupation codes 25-9045 (teaching assistants, except postsecondary), 25-2012 (kindergarten teachers, except special education). The 25-9045 occupation code includes some teaching assistants in child care settings (based on industry code), but approximately 89% of those employed under this occupation are in non-early childhood settings. We use 2024 as the endpoint for comparison because that is the latest BLS data available. Hourly wages for kindergarten teachers are estimated by dividing the reported average salary by 2080, i.e., based on a 40-hour work week for 52 weeks per year.

Source. U.S. Bureau of Labor Statistics. (2025). Occupational Employment and Wage Statistics (OEWS) Tables: 2022, 2024.

Although educator wages grew in C3 participating centers, the average wages are still a considerable distance away from ideal wage levels. For example, the average teacher's hourly wage as of FY 2025 is $22.84. This is below a living wage for an adult in Massachusetts with no children ($28.88, Living Wage Institute, 2025) and the hourly wage for a kindergarten teacher in Massachusetts ($39.80, Bureau of Labor Statistics, 2024) (Figure 9).

Baseline wage differences by various organizational and center characteristics largely persisted over the study period. Our models show wage differences at baseline related to characteristics such as for-profit status, community need, and subsidy receipt. Although we also found some differences in annual wage increases, most of the wage gaps we observed when C3 began have persisted over time. Further, substantial unexplained variation in wage trajectories remains, which suggests that other factors not captured in our data contribute to differences in wages.

Figure 9. Comparison of average teacher hourly wage to other Massachusetts benchmarks



Note: Living wage data sourced from the Living Wage Institute via https://livingwage.mit.edu/states/25. Data for kindergarten teachers comes from the U.S. Bureau of Labor Statistics OEWS tables for 2024, for occupation codes 25-2012 (kindergarten teachers, except special education). Hourly wages for kindergarten teachers are estimated by dividing reported average salary by 2080, i.e. based on a 40-hour work week for 52 weeks per year.

Taken together, these findings indicate that flexible supply-side grants like C3 are necessary but not sufficient to achieve the level of wage growth needed to substantially improve educator compensation or close persistent equity gaps. Operational funding can stabilize programs and create conditions for wage growth, but meaningful progress may require layering additional, targeted wage support on top of core operational funding to ensure both broad improvements and reductions in pay disparities. Equity-weighted wage supplements may be especially useful for programs where gaps have been most persistent, such as those serving subsidized children or those in high-need communities. Our findings show that many of the wage gaps present at C3's launch have persisted or not fully closed, suggesting that direct wage investment in these contexts may be needed to complement flexible operational funding. At the same time, broader wage growth across all programs is fundamental to ensuring compensation keeps pace with the demands placed on educators.

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Table 1. Characteristics of centers included in analysis of wage growth over time

	TEACHER SAMPLE	ASSISTANT TEACHER SAMPLE	DIRECTOR SAMPLE
Center-level characteristics			
Serves infants/toddlers	72%	74%	72%
Serves subsidized children	59%	60%	59%
In a high-need community	20%	20%	19%
Licensed capacity	70.43 (50.46)	74.27 (52.82)	71.92 (52.06)
Organization-level characteristics			
For-profit	59%	59%	59%
Number of sites			
Single-site	55%	54%	54%
2 to 10 sites	30%	30%	30%
More than 10 sites	15%	16%	15%
Number of centers	2278	2126	2238

Table 2. Fixed effect estimates from unconditional wage growth models (no covariates)

	TEACHERS	ASSISTANT TEACHERS	DIRECTORS
Nominal wages			
Intercept (Baseline wage γ_{00})	20.553***	16.444***	29.185***
	(0.13)	(0.07)	(0.25)
Year (Annual increase γ_{10})	0.829***	0.674***	1.072***
	(0.02)	(0.02)	(0.04)
Wages in 2024 dollars			
Intercept (Baseline wage γ_{00})	22.548***	18.027***	32.029***
	(0.14)	(0.08)	(0.27)
Year (Annual increase γ_{10})	0.098***	0.097***	0.028
	(0.02)	(0.02)	(0.05)
N (center-year observations)	8065	7296	7888

*p<.01, **p<.05, ***p<.001

Table 3. Estimated standard deviations of random effects from unconditional wage growth models (no covariates)

	TEACHER	ASSISTANT TEACHERS	DIRECTORS
Nominal wages			
Random intercepts (Baseline wage)			
Organization-level (u_{0j})	4.84	2.50	8.73
Center-level (r_{0ij})	1.37	0.80	4.43
Residual (ε_{tij})	0.98	0.73	1.70
Random slopes (Annual increase)			
Organization (u_{1j})	0.67	0.46	1.17
Center (r_{1ij})	0.35	0.32	0.94
Wages in 2024 dollars			
Random intercepts (Baseline wage)			
Organization-level (u_{0j})	5.21	2.66	9.45
Center-level (r_{0ij})	1.45	0.86	4.74
Residual (ε_{tij})	1.01	0.74	1.81
Random slopes (Annual increase)			
Organization (u_{1j})	0.70	0.45	1.21
Center (r_{1ij})	0.34	0.32	0.97

Table 4. Fixed effect estimates from wage growth models with organization- and center-level covariates (Nominal dollars)

	TEACHERS	ASSISTANT TEACHERS	DIRECTORS
Within-center variables			
Intercept (Baseline wage)	23.170***	18.023***	27.357***
	(0.42)	(0.27)	(0.97)
Year (Annual increase)	0.670***	0.680***	0.907***
	(0.04)	(0.03)	(0.08)
Center-level characteristics			
Any infant or toddler classroom	-0.456***	-0.116	0.280
	(0.13)	(0.09)	(0.30)
Any infant or toddler classroom * Year	0.181***	0.071*	0.188**
	(0.04)	(0.04)	(0.09)
Serves subsidized children	-0.505***	-0.309***	-0.952***
	(0.11)	(0.08)	(0.21)
Serves subsidized children * Year	0.064	-0.086***	0.046
	(0.04)	(0.03)	(0.08)
In a high-need community	-0.614***	-0.524***	-1.345***
	(0.16)	(0.10)	(0.42)
Organization-level characteristics			
For-profit	-3.582***	-1.391***	-6.085***
	(0.29)	(0.16)	(0.57)
Number of sites			
2 to 10 sites	-1.917***	-0.782***	-2.705***
	(0.49)	(0.26)	(0.93)
More than 10 sites	-2.680**	-0.975*	-4.806**
	(1.12)	(0.58)	(2.05)
Number of sites * For-profit status			
2 to 10 sites * For-profit	1.962***	0.899***	3.579***
	(0.65)	(0.34)	(1.22)
More than 10 sites * For-profit	2.726	1.001	6.619*
	(1.81)	(0.94)	(3.39)
N (center-year observations)	7579	6880	7411

*p<.01, **p<.05, ***p<.001

Note: Standard errors are shown in parentheses. The intercept represents the estimated average staff wage in the baseline year (FY 2022). Year is coded as 0 in FY 2022 and increases by one in each subsequent year. Models also include controls for region and licensed capacity.

Table 5. Fixed effect estimates from wage growth models with organization- and center-level covariates (2024 dollars)

	TEACHERS	ASSISTANT TEACHERS	DIRECTORS
Within-center variables			
Intercept (Baseline wage)	25.195***	19.523***	29.616***
	(0.45)	(0.28)	(1.03)
Year (Annual increase)	-0.130***	0.074**	-0.190**
	(0.04)	(0.03)	(0.09)
Center-level characteristics			
Any infant or toddler classroom	-0.487***	-0.113	0.417
	(0.14)	(0.10)	(0.31)
In a high-need community	-0.625***	-0.537***	-1.396***
	(0.17)	(0.11)	(0.45)
Serves subsidized children	-0.691***	-0.380***	-1.322***
	(0.11)	(0.08)	(0.22)
Infant toddler classroom * Year	0.208***	0.082**	0.144
	(0.05)	(0.04)	(0.09)
Serves subsidized children * Year	0.160***	-0.044	0.204**
	(0.04)	(0.03)	(0.08)
Organization-level characteristics			
For-profit	-3.867***	-1.499***	-6.549***
	(0.31)	(0.17)	(0.61)
Number of sites			
2 to 10 sites	-1.995***	-0.808***	-2.758***
	(0.53)	(0.28)	(1.00)
More than 10 sites	-2.758**	-0.980	-5.004**
	(1.20)	(0.62)	(2.20)
Number of sites * For-profit status			
2 to 10 sites * For-profit	2.046***	0.957***	3.676***
	(0.69)	(0.37)	(1.31)
More than 10 sites * For-profit	2.696	0.949	6.786*
	(1.94)	(1.00)	(3.65)
N (center-year observations)	7579	6880	7411

*p<.01, **p<.05, ***p<.001

Note: Standard errors are shown in parentheses. The intercept represents the estimated average staff wage in the baseline year (FY 2022). Year is coded as 0 in FY 2022 and increases by one in each subsequent year. Models also include controls for region and licensed capacity.

Table 6. Estimated standard deviations of random effects from wage growth models with organization- and center-level covariates

	TEACHER	ASSISTANT TEACHERS	DIRECTORS
Nominal wages			
Random intercepts (Baseline wage)			
Organization-level (u_{0j})	4.34	2.21	7.71
Center-level (r_{0ij})	1.41	0.82	4.38
Residual (ε_{tij})	0.98	0.74	1.71
Random slopes (Annual increase)			
Organization (u_{1j})	0.66	0.45	1.19
Center (r_{1ij})	0.36	0.33	0.94
Wages in 2024 dollars			
Random intercepts (Baseline wage)			
Organization-level (u_{0j})	4.80	2.35	8.31
Center-level (r_{0ij})	1.48	0.88	4.68
Residual (ε_{tij})	1.01	0.75	1.82
Random slopes (Annual increase)			
Organization (u_{1j})	0.69	0.44	1.22
Center (r_{1ij})	0.35	0.32	0.97

Table 7. Estimated correlations between random intercepts and random slopes from models allowing unstructured covariance

	TEACHERS	ASSISTANT TEACHERS	DIRECTORS
Nominal Wages			
Organization-level	-.22	.02	-.04
Center-level	.19	-.09	-.36
Wages in 2024 dollars			
Organization-level	-.40	-.13	-.26
Center-level	-.0006	-.18	-.48

Note. Values reflect the correlations between random intercepts and random slopes in model versions where this parameter is free to vary. Model coefficients vary slightly from our primary model version restriction this correlation to zero, however, findings are generally consistent. The full results from these unrestricted models are reported in Appendix A.

APPENDIX A

Table A1. Fixed effect estimates from wage growth models with organization- and center-level covariates (Nominal dollars), unrestricted correlation between random effects

	TEACHERS	ASSISTANT TEACHERS	DIRECTORS
Within-center variables			
Intercept (Baseline wage)	23.115***	18.029***	27.300***
	(0.42)	(0.27)	(0.96)
Year (Annual increase)	0.697***	0.678***	0.928***
	(0.04)	(0.03)	(0.08)
Center-level characteristics			
Any infant or toddler classroom	-0.440***	-0.119	0.267
	(0.14)	(0.09)	(0.31)
Any infant or toddler classroom * Year	0.171***	0.072*	0.197**
	(0.04)	(0.04)	(0.09)
Serves subsidized children	-0.643***	-0.311***	-0.864***
	(0.16)	(0.08)	(0.22)
Serves subsidized children * Year	0.020	-0.085***	-0.014
	(0.04)	(0.03)	(0.08)
In a high-need community	-0.643***	-0.527***	-1.416***
	(0.16)	(0.10)	(0.42)
Center capacity (logs)	0.182**	-0.073	1.760***
	(0.08)	(0.05)	(0.20)
Organization-level characteristics			
For profit	-3.632***	-1.391***	-6.110***
	(0.29)	(0.16)	(0.57)
Number of sites			
2 to 10 sites	-1.764***	-0.787***	-2.649***
	(0.49)	(0.26)	(0.92)
More than 10 sites	-2.489**	-0.976*	-4.678**
	(1.12)	(0.58)	(2.03)
Number of sites * For profit status			
2 to 10 sites * For profit	1.811***	0.907***	3.564***
	(0.64)	(0.34)	(1.21)
More than 10 sites * For profit	2.489	1.014	6.446*
	(1.79)	(0.94)	(3.35)
N (center-year observations)	7579	6880	7411

*p<.01, **p<.05, ***p<.001

Note: Standard errors are shown in parentheses. The intercept represents the estimated average staff wage in the baseline year (FY 2022). Year is coded as 0 in FY 2022 and increases by one in each subsequent year. Models also include controls for region and licensed capacity.

Table A2. Fixed effect estimates from wage growth models with organization- and center-level covariates (2024 dollars), unrestricted correlation between random effects

	TEACHERS	ASSISTANT TEACHERS	DIRECTORS
Within-center variables			
Intercept (Baseline wage)	24.972***	19.551***	29.721***
	(0.44)	(0.28)	(1.01)
Year (Annual increase)	-0.075*	0.084**	-0.149*
	(0.04)	(0.03)	(0.09)
Center-level characteristics			
Any infant or toddler classroom	-0.479***	-0.115	0.347
	(0.15)	(0.10)	(0.33)
In a high-need community	-0.660***	-0.547***	-1.475***
	(0.17)	(0.11)	(0.43)
Serves subsidized children	-0.580***	-0.364***	-1.188***
	(0.11)	(0.08)	(0.23)
Infant toddler classroom * Year	0.195***	0.079**	0.172*
	(0.05)	(0.04)	(0.10)
Serves subsidized children * Year	0.066	-0.061*	0.088
	(0.04)	(0.03)	(0.09)
Center capacity (logs)	0.254***	-0.029	1.931***
	(0.09)	(0.06)	(0.20)
Organization-level characteristics			
For profit	-3.762***	-1.540***	-6.250***
	(0.30)	(0.17)	(0.59)
Number of sites			
2 to 10 sites	-1.656***	-0.755***	-2.557***
	(0.50)	(0.28)	(0.96)
More than 10 sites	-2.379**	-1.055*	-4.252**
	(1.15)	(0.62)	(2.13)
Number of sites * For profit status			
2 to 10 sites * For profit	1.733***	0.905**	3.487***
	(0.66)	(0.36)	(1.26)
More than 10 sites * For profit	2.359	0.944	5.889*
	(1.83)	(0.99)	(3.51)
N (center-year observations)	7579	6880	7411

*p<.01, **p<.05, ***p<.001

Note: Standard errors are shown in parentheses. The intercept represents the estimated average staff wage in the baseline year (FY 2022). Year is coded as 0 in FY 2022 and increases by one in each subsequent year. Models also include controls for region and licensed capacity.

ENDNOTES

1 For more information about C3 grants, see: www.mass.gov/info-details/commonwealth-cares-for-children-c3-grants

2 The category "teacher" includes lead teachers.

3 In Massachusetts, the state fiscal year starts on July 1 and ends on June 30 of the following year. For example, fiscal year 2022 started July 1, 2021 and ended on June 30, 2022.

4 Franchises that are independently owned are not considered part of multi-site organizations.

5 To estimate total variation at baseline, we sum the squares of the standard deviations for organization- and center-level intercepts reported in table 3. The square root of this value represents the total baseline standard deviation.

SUGGESTED CITATION

Caronongan, P., & Hyland, K. (2026). *Operational funding and early educator wage growth: Evidence from Massachusetts* (Working Paper 2026-2). Wheelock Educational Policy Center. Available at wheelockpolicycenter.org.

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