

## **Teacher Salary and Turnover in the USA and China: A Systematic Review and Meta-Analysis**

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### Abstract

Teacher turnover influences students' performance in a negative way. Among all reasons, unsatisfying salary could be a main factor contributing to teachers leaving their profession. Yet, little is known about how contextual moderators affect this relationship and most past research focuses on the US context. This meta-analysis seeks to compare the relationship between turnover and salary in the US and China while differentiating turnover intention from real turnover rate. Applying a set of screening criteria, we identified 21 studies (five in China and 16 in the US), which produced a statistically significant relationship ( $OR = 0.99$ ,  $p < .05$ ). This result means that salary had a negative relationship with turnover - where more salary is related with a lower chance of teacher turnover. As for moderator analysis, we found a significant difference between urban schools as compared to rural and combined school types ( $p = 0.01$ ). There was no statistically significant difference in the relationship between salary and turnover in studies conducted in the US and China, or studies in public and private schools or studies in middle and primary schools. Our findings contribute to the field of research around teacher turnover by reinforcing the significant role that salary continues to play in teachers' decisions to stay in the classroom or leave. Additionally, this study expands the geographical scope of the research on teacher turnover and salary beyond the United States to include studies of Chinese teachers as well.

**Keywords:** *Teacher turnover, salary, China, US, meta-analysis*

## 1. Introduction

Teacher turnover negatively affects student achievement, disrupts teacher quality, and poses organizational and financial challenges to schools (Guin, 2004; Hanushek et al., 2016; Ronfeldt et al., 2013; Sorenson & Ladd, 2020). In the United States, teacher turnover is estimated to cost between \$3.4 and \$5 million per year for a mid-sized district but can amount up to \$86 million for a big district, putting extra financial burden on already constrained school budgets (Barnes et al., 2007; Synar & Maiden, 2012). Internationally, teacher turnover also concerns leadership around the world who continue to develop policies to alleviate this issue (European Commission, 2018; Yiu & Adams, 2013). Salary is consistently identified as a primary contributor to turnover, and in the wake of heightened teacher shortages from the COVID-19 pandemic, salary has become one of the most popular remedies to draw teachers back to the classroom (Diliberti et al., 2021; Nguyen & Springer, 2021). Additionally, salaries are a common focus for turnover prevention because they are one of the easiest aspects of a teacher's job to manipulate with policy interventions aimed at reducing teacher turnover (Murnane et al., 1989; Nguyen et al., 2020).

Prior systematic reviews and meta-analyses of teacher turnover have included salary as one of many factors in their analysis; however, no studies have yet deeply probed this relationship in particular (e.g., Borman & Dowling, 2008; Nguyen et al., 2020). Because of their broader focus on the many correlates of teacher turnover, prior reviews have yet to examine how the relationship between salary and turnover might vary across different school contexts (e.g., grade levels, school type, urbanicity). Additionally, prior reviews of turnover have noted the primary focus in the turnover literature on the U.S. context and the need for further investigation of more international settings (Craig, 2017; Nguyen et al., 2020).

This study seeks to fill these gaps in the field of teacher turnover research by contributing in three ways. First, we focus on the relationship between salary and teacher turnover, examining in depth the variability and moderators related to this popular policy lever for addressing teacher turnover. Specifically, we identify and test three contextual moderators based on the literature: urbanicity, school type, and grade level.

Second, this study expands our review beyond a single country and beyond the United States in particular. We examine the relationship between salary and teacher turnover in the United States and China to identify potential variation across international contexts. We chose the United States and China because of similarities between these two countries, despite their geographic distance and cultural differences. Both countries face growing concerns over high turnover rates among teachers; have a wide distribution of school locations, sizes, and types; and have started to advocate for merit payment in recent years. Comparisons across these two countries may help policymakers in both countries generate new ideas or insights.

Third, this study differentiates between turnover intentions and observed turnover behavior. Although much of the turnover literature, including prior reviews, groups these two outcomes together based on the assumption of their equivalency, prior research has shown that these outcomes may actually be quite distinct (Author et al., 2022; DeAngelis et al., 2013; Ladd, 2011). Thus, in the study we estimate the relationship between salary and both turnover intentions and observed turnover behavior.

## **2. Theoretical Considerations**

### ***2.1 Relationship between Salary and Teacher Turnover***

Teachers' salaries are positively linked to crucial school outcomes like instructional quality, student drop-out rates, and student achievement (Akiba et al., 2012; Hanushek & Rivkin, 2007; Loeb & Page, 2000). Although teachers are largely motivated by the intrinsic rewards of their work (such as helping their students to learn and grow), remunerative compensation has strong links to teacher satisfaction and burnout (Kelly & Northrop, 2015; Olsen & Huang, 2019). Salary is also one of the many external or policy factors that teachers consider when deciding to remain in their position (other external factors including hiring practices, unionization, and accountability policies; Nguyen & Spring, 2021). Separate from their own personal background or the specific school contextual factors, these external/policy factors shape how satisfied teachers are with their position, which in turn impacts teachers' decisions to remain in their current position or to seek an alternative job or field.

Labor market theory provides one of the most frequently cited reasons for this link between salary and turnover. It specifically posits that teachers, through the utility maximization process (and cost-benefit analysis), seek positions that have fewer costs, such as stress, and more benefits, like higher salaries. In theory, schools (and jobs outside of teaching) compete for teachers by offering higher salaries and other benefits. Related to this, the rational consumer assumption predicts that teachers who are unsatisfied with their salaries and can earn better compensation elsewhere will leave one school (or the profession) to pursue other jobs to reach a higher utility level, i.e., more reward for similar effort.

Beyond this purely numerical consideration, teachers may consider the symbolic value of their salary (Guarino et al., 2006). First, signaling theory suggests that salary has a symbolic meaning – how much teachers earn reflects on said teacher's labor quality, skills, and knowledge (Mitchell & Mickel, 1999; Guthrie, 2000). Consequently, low salaries can negatively impact teachers' sense of self and motivation through the negative perception of others. In a similar fashion, the low professional status of teaching (which is not unrelated to the lower salaries) similarly impacts teachers' self valuation and satisfaction. These factors are based more on teachers' sense of self as perceived by others (their reputation), but salaries

also work to construct and compare with teachers' internal sense of self. Discrepancy theory (Lawler, 1971) suggests that dissatisfactions arise among teachers when there is a mismatch between salaries and teachers' own self value or expectations.

This lower symbolic value associated with lower salaries also applies to how fairly teachers feel compensated for their work. According to equity theory and efficiency wage models, teachers are more motivated and productive when their contribution is acknowledged through higher salaries (Adams, 1963; Akerlof & Yellen, 1990; Solow, 1980; Taylor & Taylor, 2011; Westley & Schmidt, 2006). Accordingly, teachers might become frustrated if they feel that their wages do not adequately reflect their efforts or skills.

This meta-analysis reviews many studies which cite the above theories and test them empirically. In turn, we assume that one or more of these theories simultaneously help to explain the hypothesized negative relationship between salary and turnover for teachers. Synthesizing these labor economic theories, we hypothesize that quality teachers leave their positions due to dissatisfaction with their compensation and the opportunity of better offers in other schools or other industries outside education.

## 2.2 Country

In addition to these contextual factors, we also examine the role of countries in this study, specifically comparing the United States and China as teaching contexts. Most studies of turnover (and salary) have focused on the United States with the remaining studies focusing on other single country contexts. Cross-cultural comparison across more than one country context helps put data about specific countries in context; specifically in education, it helps the field acquire a better understanding of the education systems of other countries and possibly borrow ideas for improvement and innovation. For example, with teacher salary, its role may be more prescient in certain economic situations.

In this study, we compare two countries with different economic statuses: the United States as a solidly developed economy and China with its developing economy. Prior studies have shown that compensations have larger associations with teacher turnover in developing countries compared to developed countries (Evans & Olumid-Aluko, 2010; Zembylas & Papanastasiou, 2004). We specifically chose this comparison between the United States and China as they are two of the largest countries by GDP and economic power and both in the top three by population, together representing over 20% of the world's population. Additionally, no meta-analytical reviews have yet been done on the topic of teacher salary and turnover in China.

Table 1 compares some relevant features of these countries. Both countries have high teacher turnover rates (16 and 20%) and similar student-teacher ratios. China's teaching workforce is more male and less rural than in the United States. In 2019, the average teacher salary was 17% above the average salary in the United States but only 3% above the

average salary in China. The lower salary in China, overall and compared with other professions, suggests that salary may be more strongly associated with teacher attrition in China compared to the United States.

### **2.3 Moderating Factors**

In this study we look at three contextual factors related with teacher turnover that are also theoretically tied to teachers' salaries. First, regarding grade levels, primary teachers are less likely to leave the profession than middle or secondary school teachers (Borman & Dowling, 2008; Nguyen et al., 2020). The theory behind this trend is that teachers in higher grades have more alternative options outside teaching because of their advanced education and specialized skills (Dupriez et al, 2016). Coupled with their larger salaries to start (and thus larger variation in salary), secondary teachers' turnover decisions might be more sensitive to increases in salary.

A second possible moderator is the school sector, specifically comparing private and public schools. Private schools generally have higher turnover rates than public schools (Borman & Dowling, 2008; McGrath & Princiotta, 2005). This is generally attributed to the lower pay in private schools without the help of teachers' unions to advocate for more pay and given the limited budgets due to a reliance on student tuition (Tamir, 2013). Potentially in our analysis then, salary may have a larger impact on private school teachers' decision to stay, given their greater sensitivity to this factor.

Third, teachers in urban schools are generally more likely to leave their jobs than teachers in suburban or rural schools (Borman & Dowling, 2008). Once again, salary helps explain this relationship, as teachers in urban schools may have higher numeric salaries but also tend to be underpaid compared to the high cost of living in many urban areas (Han, 2021). They also have access to more alternative jobs in the local labor market given the density of the population.

### **2.4 Turnover Intention and Behavior**

The final moderating factor of our analysis is the comparison between outcome types: teachers' intentions to leave compared with their actual leaving behaviors. Both outcomes are common in the field, and generally, these outcomes have been assumed to operate similarly (see review in Author et al., 2023). However, recent studies have illustrated that these are actually distinct constructs with a weaker relationship than previously thought (Author et al, 2023; Nguyen et al, 2022). Turnover intentions have been shown to relate more to psychological constructs like commitment than teachers actual job-leaving decisions. Prior meta-analyses of teacher turnover and salary have excluded studies of turnover intentions. Thus, we examine how salary relates with each of these outcomes independently as this understanding could provide additional policy-relevant information.

## 2.5 Research Questions

Specifically, this paper synthesizes rigorous studies using a meta-analysis technique to answer three research questions about the relationship between salary and teacher turnover in the United States and China:

1. What is the association between salary and turnover?
2. What are the differences in characteristics between studies conducted in the US and those in China?
3. To what extent do countries (US or China), grade levels, school type (public or private), and geographical location (urban or rural) moderate the relationship between salary and teacher turnover in the US and China?
4. Is this relationship different for turnover intentions compared to observed turnover?

## 2. Data Sources

To locate relevant studies, a comprehensive and systematic search was conducted in the following computerized reference databases: Google Scholar, JSTOR, ScienceDirect, Scopus, EBSCO, and China National Knowledge Infrastructure (CNKI). Search keywords included different Boolean combinations of the following vocabulary: *teacher attrition turnover retention leav\* suppl\* career attitudes mobility commit\* persist\* switcher stayer retirer salary merit pay compensation satisfaction USA China odds ratio leave\* quit mover*. After database searches and the first round of article collection, we used a reference-chasing method to identify additional articles. This involved a manual screening of included articles in previous meta-analyses on the topic of teacher turnover (e.g. Borman & Dowling, 2008, Nguyen et al., 2020).

Apart from retrospective reference harvesting, we also conducted two rounds of complementary handsearching with a total of 32 journals relevant to teacher turnover or international comparison. Table 2 presents a list of these journals' names and ISSNs. This handsearching utilized the online tool, *Paperfetcher*, which automates hand searches and snowball-searches in the systematic review process (Pallath & Zhang, 2023). The handsearching process was completed in March 2021 and retrieved literature was uploaded into the Covidence systematic review software for screening. Covidence was chosen to screen both abstracts and features due to study authors' affiliated institutions' provision of free license (Zhang & Neitzel, 2023). Similarly, to locate more studies written in Chinese, we searched with keyword and journal filters in CNKI, which is a key national research and information publishing institution in China.

During the search period from August 2019 to June 2021, the searching strategies returned 17,100 results related to the USA and 16,100 results related to China. The following 10 inclusion and exclusion criteria guided article screening and selection:

- 1) Topic (Salary and Turnover): studies must analyze the relationship between salary and turnover. Studies must include teacher salary as a direct turnover moderator. For instance, Hu (2020) investigates turnover intentions but was excluded because it does not include salary as a predictor.
- 2) Outcome: only studies of teacher turnover or turnover intentions as the dependent variable are included. We excluded teacher satisfaction, commitment, or other related outcomes.
- 3) Methodology: studies must use quantitative methodologies to study the relationship between turnover and salary. Qualitative methodologies like interviews and focus groups were excluded. Surveys were included if the authors used regression to analyse salary's correlation with turnover rate.
- 4) Sufficient statistical reporting: Feasibility of using the methodology and available information to compute odds ratio. For example, Gilpin (2011) used a simultaneous probit-tobit system and structural equation modeling, the information provided in the publication cannot compute odds ratio. Studies that report hazard ratios and correlation coefficients between salary and teacher turnover are also excluded.
- 5) Time: we included literature published or uploaded in or after the year 2000 to represent more recent relationships between turnover and salary. For instance, Shen (1997) was excluded from meta-analysis because of its publication year.
- 6) Sample size: studies must analyse empirical data with a minimum sample size of 250 teachers. For example, Jeon (2018) only collected data from 84 teachers, and was therefore excluded from the analysis.
- 7) Sample location: geographically, studies must be either exclusively in the USA or in China. For example, Räsänen et al. (2020) and Falch (2011) were ruled out because the study took place in Norway and Finland respectively.
- 8) Sample grade level: samples must be from Pre-K-12 schools, not higher educational institutions. Teacher turnover research using higher education teachers, such as (□□□, 2005), was also excluded.
- 9) Population focus: We excluded studies on specific subgroups of teachers such as specific subject focus or gender focus. This is because teachers from particular subgroups of teachers might have different attrition rates and different salary expectations. We excluded Hahs-Vaughn and Scherff (2008) because they focus on first-year English teachers. For gender, both Stinebrickner (2002) only collected data from female teachers, and Imazeki (2005) who reported results for male and female teachers separately, and were both excluded.
- 10) Teachers, not leaders: this study focuses on the teacher population, so we exclude studies of principal or superintendent turnover. For instance, Akiba and Reichardt (2004) was excluded because of its focus on school principals instead of teachers.



We screened full-text of each article to check whether it meets the inclusion criteria. However, due to the large amount of studies, we did not conduct double screening for each article. The PRISMA diagram, Figure 1, summarizes the stages of our screening process. A total of 33,200 records were initially screened by reading their title and abstract, resulting in 268 studies retained for the full-text review phase. Applying the eligibility criteria to full-text review, 21 studies were considered eligible for inclusion in the qualitative synthesis.

### 3. Methods

Since the outcome of quitting and staying in the teaching profession can be viewed as dichotomous, we used odds ratio as a measuring instrument for the outcome variable (Fleiss, 1994; Lipsey & Wilson, 2001). For studies adopting regression analysis with independent variable salary and dependent variable teacher turnover, the coefficient is taken as logged odds ratio and the odds ratio is computed using the formula:

$$ES_{OR} = e^{ES_{LOR}}$$

where  $ES_{OR}$  refers to effect size using odds ratio, and  $ES_{LOR}$  refers to effect size using logged odds ratio (Lipsey & Wilson, 2001, Pg54, Eq 3.32). As for studies that did not report standard error, an estimation was calculated using standard deviation, sample size, and other provided information. In the result section and tables, we transformed results back to odds ratio for easier interpretation.

All analyses were conducted in Rstudio Version 1.4.1717 (RStudio Team, 2021) using the R project for statistical computing Version 4.1.1 (R Core Team, 2021). We cleaned data using *janitor* (Firke, 2021), *tidyr* (Wickham, 2021); estimated the average odds ratio using *metafor* package (Viechtbauer, 2010); and produced tables and figures with *flextable* (Gohel, 2021a), *officer* (Gohel, 2021b), *tableone* (Yoshida & Bartel, 2021), and *ggplot2* (Wickham, 2016).

Using the *qnorm()* function, two-sided *p*-values reported were turned into one-sided *p*-values first and transformed into the corresponding *z*-values. In cases where *p*-values were stated in the form of significance testing (e.g.,  $p < 0.1$ ), the value of the cutoff point was used (e.g.,  $p = 0.1$ ). The standard errors were derived from either logged odds ratio and *z*-values or reported confidence interval bounds. The sampling variance was computed from standard errors.

Finally, random-effects models were fitted into the data sets through the *rma()* function to estimate the average odds ratio, confidence interval lower bounds, and confidence interval upper bounds. We used the following equation to estimate the basic relationship between salary and teacher turnover :

Model 1 (null model): Odds ratio =  $\beta_0 + e$

Next, we incorporated our moderator variables to get the following equation:

Model 2: Odds ratio =  $\beta_0 + \beta_1 \text{USA} + \beta_2 \text{Urban} + \beta_3 \text{Public} + \beta_4 \text{Grade Levels} + e$

Finally, we tested an alternative moderator equation to examine whether real turnover compared with turnover intentions impacted the relationship. We replaced the country code because there was a large overlap between country and real turnover (all Chinese studies used turnover intentions).

Model 3: Odds ratio =  $\beta_0 + \beta_1 \text{Real Turnover} + \beta_2 \text{Urban} + \beta_3 \text{Public} + \beta_4 \text{Grade Levels} + e$

$e$  represents the error term, which would be reflected in the intercept in the meta-regression model. As for moderators, we coded information on urban or rural, public or private, grade levels, USA or China, and real turnover or turnover intention. When studies did not specifically report whether they recruited students from urban or rural settings, we coded them as both. When there is missing data on public or private school type, we coded them as combined. As for grade levels, we coded primary, middle, and combined. Combined grade levels refer to K-12 schools.

To make salaries comparable between USD and RMB, we transformed RMB out into USD using OECD's (2021) purchasing power parities. Some studies reported salaries in weekly salaries instead of annual salaries, we assumed that teachers work 39.8 hours per week according to Brookings's report (Startz, 2019). For monthly salaries, we transform them to annual salaries by multiplying 12. Since most studies reported salary in 1000 USD, we adopted this unit as the standard and transformed other reports to the same unit.

## 4. Results

### 4.1 Descriptive Characteristics of the Studies

In total, 21 studies (16 US and five Chinese studies) were included in the meta-regression and are listed in Table 3. In terms of methodology, all five Chinese studies collected data on teacher turnover intentions through quantitative surveys on relatively small numbers of teachers (range = 294~5825). This can be attributed to the lack of official archived data that report real turnover rate on a national level. Compared to China, the majority of US studies adopted state or nationally representative data from data sets such as the Schools and Staffing Survey (now the NTPS) and the Beginning Teacher Longitudinal Survey. Although most of the U.S. studies analyzed nationally representative data, the datasets they used were collected from the 1990s to 2000s. Only three US studies used data collected after 2010. Given the policy changes related to salary structure and changing trends in the teacher labor market, the results of these studies may not fully represent recent changes in the relationship between salary and turnover. In terms of grade levels, most studies in both countries

focused on primary and middle school teachers. Six studies included high school and four studies included pre-K or/and K.

## 4.2 Meta-regression Results

Table 4 provides the moderator-related characteristics of the 21 studies included in the meta-regression. In total, there were 15 studies from private and combined types of schools and six studies from public schools; two studies from middle schools, six studies from primary schools, and 13 from combined grades; 20 studies from rural and combined schools and one from urban schools. The combined categories and limited number of studies from particular samples made it difficult to estimate robust moderating effects. Following open science practices, we will make data and R coding publicly available upon publication.

Table 5 presents the meta-regression model results. Model 1, the null model which averaged the estimated relationship between salary and turnover across all included studies, the overall effect size of the relationship between salary and teacher turnover, using odds ratio, was 0.99, with a 95% confidence interval ranging from -2.36 to 7.48. This indicated that with every USD1000 of increase in teacher annual salary, teacher turnover rate would reduce by 1%. This relationship was statistically significant ( $p < .05$ ).

Next, Model 2, the first meta-regression model, includes the moderators of country, school type, grade level, and location. In this model, the relationship between salary and turnover is no longer significant (likely due to decreased power given the inclusion of the moderators and limited degrees of freedom). The only statistically significant moderator was location. We found a significant difference between urban schools as compared to rural and combined school types (including suburban;  $p = 0.01$ ). In the only study of urban schools included in our meta-analysis, the odds ratio of salary's impact on turnover is 1.09, indicating more salary increased turnover in this study's sample; this was significantly higher than the remainder of the studies.

Model 3, the second meta-regression, included the moderator comparing real teacher turnover and turnover intentions instead of country (since country was somewhat conflated with the intentions measure, given all Chinese studies used turnover intentions). Although prior studies have shown differences in these outcomes, our results did not show significant differences in the relationship between salary and the two outcomes.

In both models, moderators including country, schools type, and grade levels did not significantly moderate the relationship between salary and turnover. In other words, there was no statistically significant difference in the relationship between salary and turnover in studies conducted in the US and China, or studies in public and private schools or studies in middle and primary schools. Although the differences are not significant (as shown in Table 5), the marginal means in Table 6 show that the estimated odds ratios varied for each category besides country, where

both US studies and Chinese studies showed the same relationship between salary and turnover ( $OR = 0.99$ ). In studies using turnover intentions more salary related with more turnover ( $OR = 1.01$ ) compared to studies using real turnover which estimated a reduction in turnover with more salary ( $OR = 0.99$ ); a similar trend was observed for public schools where more salary was related with more turnover ( $OR = 1.01$ ) compared to private and combined schools ( $OR = 0.99$ ). Finally, the odds ratio was higher in primary schools ( $OR = 0.98$ ) compared to middle schools ( $OR = 0.87$ ). Potentially, in these situations where salary has the opposite relationship hypothesized, this is simply capturing a figure close to 0, and indeed, none of these differences were statistically significant.

## 5. Discussion

This meta-analysis of the relationship between teacher turnover and salary included five studies in China and 16 studies in the United States. We found that salary had a negative relationship with turnover - where more salary related with a lower chance of teacher turnover, which follows prior studies of teacher salary and turnover. In our investigation of differences by country, however, we found that there was no meaningful difference in the relationship between salary and teacher turnover between studies of teachers in the United States and China. The main finding from our moderator analysis is the need for more studies of salary and turnover to contribute to more powerful estimates in future meta-analyses.

Our findings contribute to the field of research around teacher turnover by reinforcing the significant role that salary continues to play in teachers' decisions to stay in the classroom or leave. Although our coefficient is small ( $OR = 0.99$ ), this statistically significant estimate is still substantively significant as well, showing a link between USD1000 and a 1% reduction in teacher turnover. Given that an annual salary increase of USD3000 is not uncommon, our finding suggests that it could be within school budgets to make decisions around teacher salary that help retain teachers. As teacher shortages and turnover remains a problem in both the United States and China, our study results suggest that salary is a lever which policymakers should continue to use to help retain teachers at their schools or in the field as a whole.

Additionally, this study expands the geographical scope of the research on teacher turnover and salary beyond the United States to include studies of Chinese teachers as well. Our finding about a lack of difference between teachers in the USA and China does not agree with Farrell and Oliveira's (1993) suggestion that teachers in developing countries tend to be more influenced by compensation as compared to developed countries. One possible factor contributing to this disagreement may be China's controversial categorization as a developing country. According to the World Bank's definition using gross national income per capita, China falls into the developing country category (Zhou, C., 2019). However, as the largest developing country and the world's second largest

economy, China is an atypical developing country. Therefore, Farrell and Oliveira's (1993) conclusion may not be applicable to China. Another reason may be that teacher absenteeism is not a significant problem in the USA and China. However, other developing countries struggle with teacher attendance. Another possible explanation is that both the USA and China have undergone teacher salary reforms at the district level and national level respectively in recent years. The nature of the reforms are essentially the same: changing the singular salary model to merit payment model. Therefore, it is not strange that the USA and China studies report converging results.

We examined several other potentially important moderators of the relationship between salary and turnover, including school grade level, school sector, school urbanicity, and turnover type. None of our moderators of interest significantly impacted the relationship between salary and turnover. However, these analyses were underpowered due to the few number of studies in each category and conclusions should not be drawn about the lack of impact of these moderators.

### **Limitations**

Readers should be aware of some limitations when interpreting the results. First, the meta-regression analysis for moderators has limited power. The degree of freedom should be larger than 4 to have enough power, but the moderator analysis has degrees of freedom ranging from 1 to 4 due to limited sample size. The lack of statistical power means that the moderation effects could be non-zero, but the insufficient statistical power failed to reject the null hypothesis. Secondly, data collected in China are mostly region-based samples collected from cities or provinces. The results drawn from these areas cannot represent the whole Chinese demographics. In comparison, most research in the US used national data, perhaps due to the research infrastructure and available national data sources. Third, the screening was handled by one author due to the multilingual nature of the study sample and human fatigue could have led to some errors. Future studies could conduct double screening according to best practices to protect against potential error. Lastly, the balance between different categories might be a bit skewed. For example, in the geographical location moderator, only 1 school is urban while 20 are rural and combined schools. Since this one urban school cannot represent all urban schools in the US and China, the unbalanced categorization and limited sample size might affect the generalizability of our results.

### **Future Directions**

Although the findings from our study help to reiterate the link between teacher salary and turnover, across country settings, our research also uncovered the need for more research in this area to fully understand the complexities of the relationship between these two constructs. In particular, the lack of power in our moderator analysis, highlighted the need for more studies of the relationships between salary and turnover. With further studies available to review across findings, future meta-

analyses could better understand how the impact of salary on turnover might vary by important school (or even teacher) characteristics. For example, the one study of urban schools estimated a positive relationship between salary and turnover (where higher salary was associated with greater teacher turnover), which would be interesting to probe further with future studies.

Practically, authors of studies of salary and turnover would aid future meta-analysis efforts by including the reporting of their results in odds ratio or log odds, so that their results might be compared to those from other studies and thus to identify trends across studies. Additionally, among researchers of teachers in China, studies could seek to collect more nationally representative data through sampling methods or collaborations with national institutions if possible. Moreover, many studies in China used only qualitative research methods, suggesting the need for more quantitative studies with empirical data about Chinese teachers' salary and turnover to identify trends.

Finally, in terms of grade levels, we observed that there were few studies focusing on pre-K, K, or high school teachers. Teachers in these grade levels might have unique relationships between salary and turnover given that pre-K and K have higher turnover, lower salaries, and more demanding working conditions, and that high school teachers have more alternative options in the workforce with their degrees. The paucity of studies analyzing pre-K, K, or high school teachers' salary and turnover highlights an area for future research.

## **Conclusion**

In conclusion, the current study contributes to our knowledge about salary as a predictor of teacher turnover by confirming the importance of higher salary as a factor associated with lower teacher turnover. This study provides updated evidence for policymakers designing evidence-based responses to retain more teachers and avoid teacher shortages. This study also shows that the relationship between salary and turnover is similar across our two country contexts, the United States and China. The conclusions from our moderator analysis investigating other factors affecting the relationship between salary and turnover were limited given the small sample size of studies in this area and highlight the need for more studies investigating the relationship between salary and turnover.

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**Table 1***US-China Background Comparison*

<b>Comparison Criteria</b>	<b>US</b>	<b>China</b>
Population (million)	3.2	1390
Annual Average Salary (USD Thousand)	52	12.79
Annual Average Salary for Teachers (USD Thousand)	61	13.2
Ratio for Teacher Salary over Average Salary	117%	103%
Average GDP Investment for Past Eight Years	3.39%	4.17%
Student Teacher Ratio	14.17	14.3
Total Teacher Number for Primary, Middle, and High Schools	3,892,610	7,820,000
Teacher Turnover Rate	16%	20%
Teacher Male Percentage	24%	38%
Teacher Older than 50 Years Old Proportion	30%	15%
Teachers in Rural Schools	19%	7%

*\*Source: (US Bureau of Labor Statistics, 2019) (World Bank Group, 2019) (National Center for Education Statistics, 2011-2019) (National Bureau of Statistics of China, 2011-2019)(Carver-Thomas, D., & Darling-Hammond, L., 2019)([1] & [2], 2019) ([3] et al., 2019)*

**Table 2***Journals Used for Handsearch*

<b>Journal Name</b>	<b>ISSN</b>
AERA Open	2332-8584
American Educational Research Journal	19351011
American Journal Of Education	1549-6511
Asia Pacific Education Review	1876-407X
Comparative Education Review	1545-701X
Economics of Education Review	0272-7757
Education Policy Analysis Archives	1068-2341
Educational Research Review	1747-938X
Education	2327-2619
Education Economics	1469-5782
Education Finance and Policy	15573079
Educational Evaluation and Policy Analysis	1935-1062
Educational Psychology	1469-5820
International Journal of Education Policy and Leadership	1555-5062
Journal of Teacher Education	15527816
Journal for Research in Mathematics Education	19452306

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Journal of Education Policy	1464-5106
Journal of Educational Psychology	1939-2176
Journal of Human Resources	1548-8004
Journal of Mathematics Teacher Education	1573-1820
Journal of Policy Analysis and Management	1520-6688
Journal of Public Economics	0047-2727
Public Personnel Management	19457421
Review of Educational Research	1935-1046
Southern Economic Journal	2325-8012
Teachers and Teaching: Theory & Practice	1470-1278
Teachers College Record	1467-9620
Teaching and Teacher Education	0742-051X
The American Economic Review	1944-7981
The Journal of Educational Research	1940-0675
The Journal of Experimental Education	1940-0683
Urban Education	1552-8340

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**Table 3***Characteristics of Studies Included in the Meta-analysis between Salary and Teacher Turnover*

Count ries	Studies	Publ ic/ Priv ate	<i>n</i>	Data level	Salary unit	Data Year	Design	Urban/ Rural	Grade level
China	Chen (2010)	Both	294	City: Jinzhou	RMB	NA	Exploratory Factor Analysis	Urban	Middle
China	Shujie Liu (2012)	Both	510	Province: Jilin (吉林)	RMB	NA	Hierarchical Multiple Regression Analysis	Both	Middle
China	王, 王, & 王 (2013)	Both	649	Province: 4 provinces	RMB	2011	Binary Logistic Regression	Both	K
China	Loerbroks et al. (2014)	Both	425	City: Wuhan	NA	2010	Logistic Regression models	Urban	Primary
China	McInerney et al.(2015)	Both	106 0	District: Hong Kong	HKD	NA	Hierarchical Multiple Regression Analysis	Urban	Primary , Middle
China	王, 王, & 王 (2019)	Public	582 5	Province: 9 provinces	10,00 0	NA	Logistic Regression Analysis	Rural	Primary , Middle
USA	Ingersoll (2001)	Both	673 3	National	1,000	1991~1 992	Logistic Multiple Regression	Both	Primary , Middle, High
USA	Smith & Ingersoll	Both	323 5	National: BTLS	1,000	1999~2 000	Multinomial Logistic	Both	Primary ,

USA	(2004) Sohn (2004)	Both	4,664	National: SASS	NA	1993~1995	Regression Multinomial Probit Model	Both	Middle Primary, Middle, High Primary
USA	Krieg (2006)	Public	2293	State: Washington	Annual salary \$1000s	1996~2004	Marginal logit estimate	Both	Primary, Middle
USA	Smith (2007)	Public	52000	National: SASS	School earning 1,000 USD	1999~2001	Two-level HGLM	Both	Primary, Middle
USA	Kukla-Acevedo (2009)	Public	2294	National: SASS	USD	1999~2001	Multinomial Logistic Regression	Both	Primary, Middle, High Primary
USA	Feng (2009)	Public	17935	State: Florida	USD	1997~2004	Multinomial Logit Hazard Estimations	Both	Middle, High Middle
USA	Hancock & Scherff (2010)	Public	4520	National: SASS	Categorical	2003~2004	Logistic Multiple Regression	Both	Middle
USA	Ingersoll & May (2012)	Public	34375	National: SASS	10,000	2003~2005	Logistic Multiple Regression	Both	Primary, Middle
USA	Kelly & Northrop (2015)	Both	1510	National level	1,000	2007~2010	Logistic Regression	Both	PreK to 12



USA	Choi & Chung (2016)	Both	108,506	State: New York	10,000	NA	Logit Models	Both	Primary, Middle, High
USA	Ingersoll et al. (2019)	Both	34375	National: SASS	10,000	1987~2012	Logistic Multiple Regression	Both	Primary, Middle, High
USA	Grant et al. (2019)	Both	1129	National	11 Categories	2014	Logistic & Multinomial Regression	Both	High PreK
USA	Caven et al. (2021)	Both	4916	National	Hourly wage	2012	Ordinal Logistic Regression Model	Both	PreK-K

*Note.*  $n$  = sample of teachers; K= kindergarten; HKD = Hong Kong Dollar; RMB = Renmingbi (Chinese yuan); USD = US Dollar; TFS = Teacher Following Surveys; SASS = School and Staffing Survey; BTLS = Beginning Teacher Longitudinal Survey; HGLM = Hierarchical Generalized Linear Model

**Table 4**

***Descriptive Statistics***

<b>Category</b>	<b>Level</b>	<b>Overall (%)</b>
<b>Study Level</b>		
Total Studies		21
Country	China	5 (23.8)
	USA	16 (76.2)
School Type	Private and Combined Schools	15 (71.4)
	Public Schools	6 (28.6)
Grade Levels	Combined	13 (61.9)
	Middle	2 (9.5)
	Primary	6 (28.6)
Location	Rural and Combined Schools	20 (95.2)
	Urban Schools	1 (4.8)
Turnover Type	Real Turnover	14 (66.7)
	Turnover Intention	7 (33.3)

**Table 5*****Meta-analysis Results***

<b>Coefficient</b>		<b><i>Odds Ratio</i></b>	<b><i>SE</i></b>	<b><i>t</i></b>	<b><i>df</i></b>	<b><i>p</i></b>
<b>Model 1 : Null</b>						
Intercept		0.99	0.00	-2.36	7.48	0.048
<b>Model 2: Meta-Regression with Country</b>						
<b>Coefficient</b>	<b>Referenc e group</b>					
Intercept		0.99	0.01	-1.44	2.21	0.28
USA	China	0.98	0.01	-1.88	2.15	0.19
Public	Private	1.01	0.01	0.83	3.33	0.46
Grade Middle	Combine d	0.89	0.05	-2.35	1.02	0.25
Grade Primary	Combine d	0.99	0.01	-1.15	2.14	0.36
Urban	Rural/ both	1.11	0.00	23.65	1.58	0.01
<b>Model 3: Meta-Regression with Intentions</b>						
Intercept		1.01	0.01	0.82	1.23	0.54
Real Turnover	Turnove r Intentio n	0.98	0.01	-1.79	1.62	0.24
Public	Private	1.01	0.01	0.83	3.26	0.46
Grade Middle	Combine	0.88	0.04	-3.2	1.05	0.18

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	d			1		
Grade Primary	Combine d	0.99	0.01	-1.1 4	1.70	0.39
Urban	<i>Rural/ both</i>	1.11	0.00	22.3 2	1.74	0.00

*Note.* SE = Standard Error; df = degree of freedom; t = t-test statistics; p = p value

**Table 6**  
Marginal Means

<b>Moderator</b>	<b>Groups</b>	<b>Odds Ratio</b>	<b>SE</b>	<b>t</b>	<b>p</b>	<b>df</b>
Turnover Type	Real Turnover	0.99	0.03	-0.31	0.802	1.13
	Turnover Intention	1.01	0.01	0.82	0.539	1.23
Country	China	0.99	0.03	-0.31	0.802	1.13
	USA	0.99	0.01	-2.00	0.177	2.10
School Type	Private and Combined Schools	0.99	0.03	-0.41	0.743	1.16
	Public Schools	1.00	0.03	-0.04	0.976	1.20
Grade Levels	Combined	0.99	0.03	-0.31	0.802	1.13
	Middle Schools	0.87	0.06	-2.35	0.246	1.05
	Primary Schools	0.98	0.03	-0.79	0.542	1.39
Location	Rural and Combined Schools	0.99	0.03	-0.31	0.802	1.13
	Urban Schools	1.09	0.03	3.76	0.152	1.07

*Note.* Marginal means are predicted with the reference group; the reference group in each category is listed first. SE = Standard Error; df = degree of freedom; t = t-test statistics; p = p value

**Figure 1**

*PRISMA Flow Diagram of Study Search and Review Process*

