CROSS-NATIONAL ANALYSIS ON TEACHER QUALIFICATION DISTRIBUTION

ANDFACTORS RELATING TO TEACHER TURNOVER INTENTION: THREE STUDIES

A Dissertation

by

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ABSTRACT

Most of the teacher distribution and turnover studies have built on within-country analysis. The results from those studies, however, are often inconsistent. The purpose of my dissertation research is to investigate the distributions of teacher qualifications and to determine the factors contributing to the intention of teachers to leave their current workplace or profession by using the cross-national survey data TALIS 2013 and other databases administrated by international organizations.

The research is comprised of three separate studies and is developed in a journal article format. The first study examined how different measures of teacher qualifications were distributed across low-and high-SES classrooms and schools and the relationships between the national contexts and teacher distributions. The findings indicate that the magnitude of the exposure rates and gaps to less-qualified teachers between low-and high-SES classrooms and schools vary significantly across countries and governments play a critical role in narrowing the gaps of teacher distribution.

The second study provides in-depth analyses of how country contexts along with teacher and school variables might relate to teachers' turnover intentions by using a set of three-level HLM models. The findings reveal that the variation in teacher turnover intention across countries is a function of teacher-, school-, and country-level factors. Teacher salary and working condition are not the only important factors in teacher retention; the ability of countries to successfully recruit and retain quality teachers might also rely on the status of teaching profession. Furthermore, the country contexts have moderated the nature or strength of the relationships between working conditions and teacher turnover intention.

The third study is an attempt to understand the non-pecuniary factors contributing to the variations of teacher turnover intention across the U.S. lower secondary schools (grades 7-9). The results of HLM models indicate that the school attributes, especially the organizational conditions, have notably contributed to teachers' intention to change school. In addition, the study has revealed the moderation effect of disadvantaged schools on the relationships between the teacher characteristics and their intention to change school. The implications for teacher retention policies have been discussed as well.

DEDICATION

I dedicate this dissertation to my father, Qinglian Qin.

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Thanks to my friends Nahed and Van whose friendship, support and daily fun conversations have sustained me. I thank them for constantly telling me that I can do it. Lastly, thanks to many other friends and colleagues, who made this journey not just more bearable but also enjoyable.

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This work was supervised by a dissertation committee consisting of Professor Daniel Bowen and Vicente Lechuga of the Department of Education and Human Development, Professor Lori Taylor of the Bush School and Professor Oi-Man Kwok of the Department of Educational Psychology.

The first study of the dissertation was completed by the student, in collaboration with Dr. Daniel Bowen of the Department of Education and Human Development. The third study of the dissertation was completed by the student, under the advisement of Dr. Lori Taylor of the Bush School. All other work conducted for the dissertation was completed by the student independently.

Funding Sources

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1. INTRODUCTION

In the last two decades, the quality and stability concerns over teaching force has grown and become a focus for global teacher policy debate (OECD, 2014; Robertson, 2012). While policymakers around the world have paid increasing attention to attracting and retaining high quality teachers, many countries are struggling with high rates of turnover and unequal teacher distributions that disfavors disadvantaged students in public school systems (OCED, 2005, 2014; UNESCO Institute for Statistics, 2016).

In the United States, research shows that 95% of teacher demand is caused by teacher attrition and turnover, especially from the teachers with less than five-year experiences (Sutcher, Darling-Hammond, & Carver-Thomas, 2016). In the United Kingdom, there are around 50% of the teachers have left their profession after their first five years of teaching (Espinoza, 2015). In Australia, the turnover rates of range from 8% to 50% (Queensland College of Teachers, 2013) and the serious teacher shortage has been observed in nonmetropolitan areas (Mason & Matas, 2015). The UNESCO report on teachers (2016) has also documented high teacher turnover rates in many developing countries.

The high turnover rates in public schools, especially in those hard-to-staff schools, remains a growing problem and has become the largest component of teacher supply problems in the United States and throughout the world (Adnot, Dee, Katz, & Wyckoff, 2017). The Organization for Economic Co-operation and Development (OECD) has reported the teacher shortage across countries through the TALIS survey in 2013. On average, there were 38% of principals had believed that shortages/inadequacies of teachers were an issue in their schools, ranged from 13% in Poland to 80% to Japan (see Figure1). Similarly, some other international

reports have also suggested that many countries are dealing with shortages of teachers, especially

in some key subjects (e.g., UNESCO Institute for Statistics, 2016).
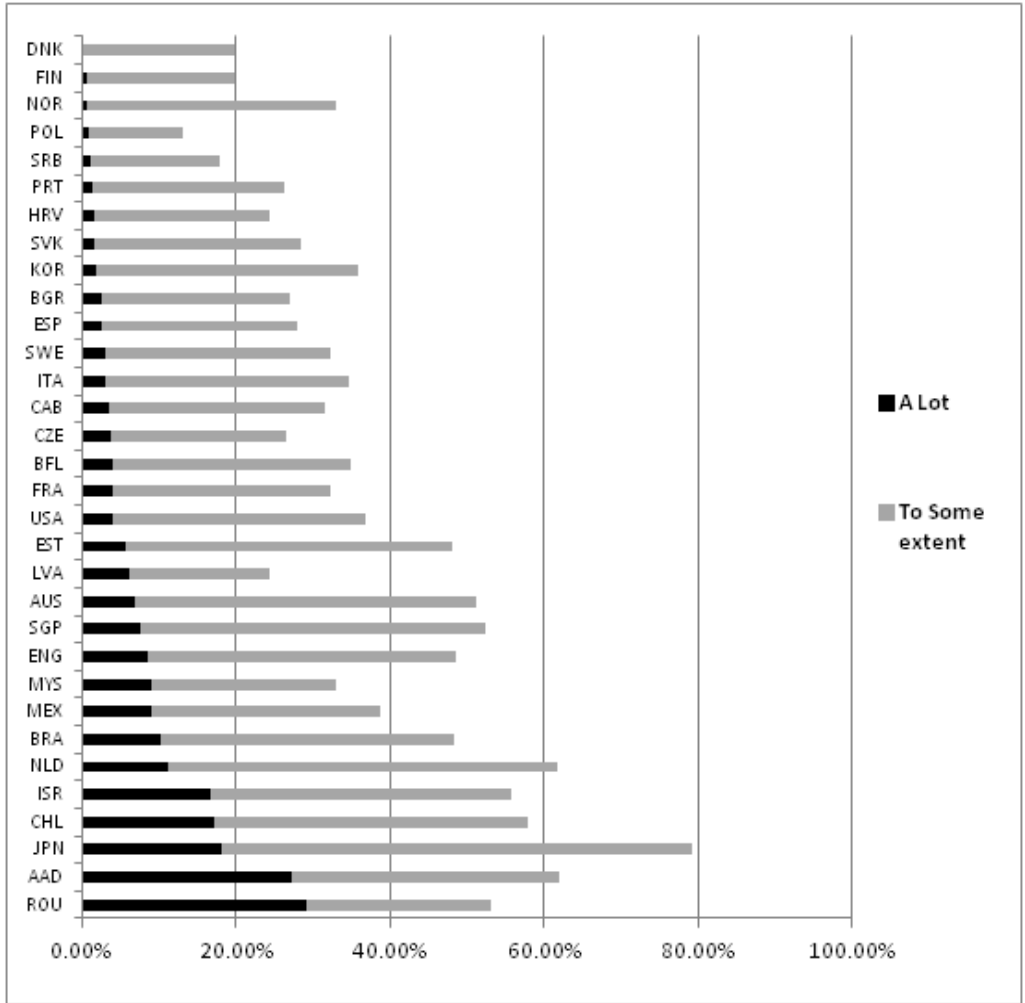
Figure 1 Teacher shortage by country

The high rates of teacher turnover and teacher shortage force many schools to either

lower the entry requirement, assign teachers to teach out-of-field subjects, or increase class sizes

(Sutcher, Darling-Hammond, & Carver-Thomas, 2016). Such policy responses, however, have

raised the concerns regarding teaching quality (Sutcher et al., 2016). Moreover, the schools with

low market attractiveness usually have to face more severe turnover and more challenges of staffing classrooms with high-quality teachers than other schools (Ingersoll & Perda, 2010).

In addition to high teacher turnover rates, the unequal distribution of quality teachers among students is another urgent issue in many countries (OECD, 2007, 2014; UNESCO Institute for Statistics, 2006). For example, the U.S. education system has been facing mounting concerns about student achievement gaps between low-income and high-income students (Kukla-Acevedo, 2009). One of the dominant policy responses to this disparity is to ensure a supply of high-quality teachers to high-poverty and high-need schools (Behrstock & Clifford, 2010). However, the findings from some large-scale studies indicate an inequitable distribution of teacher quality across students still remains (e.g., Clotfelter, Ladd, & Vigdor, 2005; Goldhaber, Quince, & Theobald, 2016).Teachers with less experience and poor academic records are more likely to teach in schools with a higher proportion of low-income, minority, and/or low-performing students (e.g., Allen, Burgess, & Mayo, 2018; Clotfelter, Ladd, & Vigdor, 2006; Kalogrides, Loeb, & Béteille, 2013). These findings are robust to a wide array of indicators and operational definitions of teacher quality, including student-based outcome measures (e.g., test scores) and inputs such as course-subject certification and years of experience (Goldhaber, Lavery, & Theobald, 2015). In addition to the US studies, research from other countries, such as Australian (Sharplin, 2014), Malaysia (Salleh & Darmawan, 2013), Brazil (Fischer, Fireman, & Gomes, 2013), have also addressed the similar concerns over the unequal teacher distribution across different student groups.

This inequality in students' access to quality teachers has led to a variety of teacher policies and programs in many countries that endeavor to more equally allocate teachers among students (Barbieri, Rossetti, & Sestito, 2011; Caena, 2014). Yet, whether teacher distributions

have become more equal between disadvantaged and advantaged students still remain unclear. More international evidence on access to highly qualified teachers is needed (Robertson & Sorensen, 2018).

The purpose of the dissertation research is to investigate the distributions of teacher qualifications and to determine the factors contributing to the intention of teachers to leave their current workplace or profession by using the cross-national survey data TALIS 2013 and other databases administrated by international organizations (e.g., OECD, the World Bank).

Firstly, substantial empirical research has documented the determinants and predictors of teacher turnover and mobility and a robust literature on the relevant topics has been built in the last 50 years. However, most of the studies have focused on within-country analysis and those issues have been mainly investigated at the school or district levels (e.g., Agasisti & Zoido, 2015). Figure 2 displays the amount of the teacher turnover studies, including journal articles and dissertations, conducted from 1950 to 2017. Compared to other countries, most of the teacher turnover studies, especially in dissertations, have mainly focused on the U.S. school system (see Figure 2).[1]

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[1] In terms of the literature searching，I followed the basic search procedures (Boote&Beile, 2005), which mainly included library searches in educational databases: Education Full Text (H.W. Wilson), Education Source, Educational Administration Abstracts, ERIC, Social Sciences Full Text (H.W. Wilson). The database for dissertation search is the ProQuest Dissertations & Theses Global.
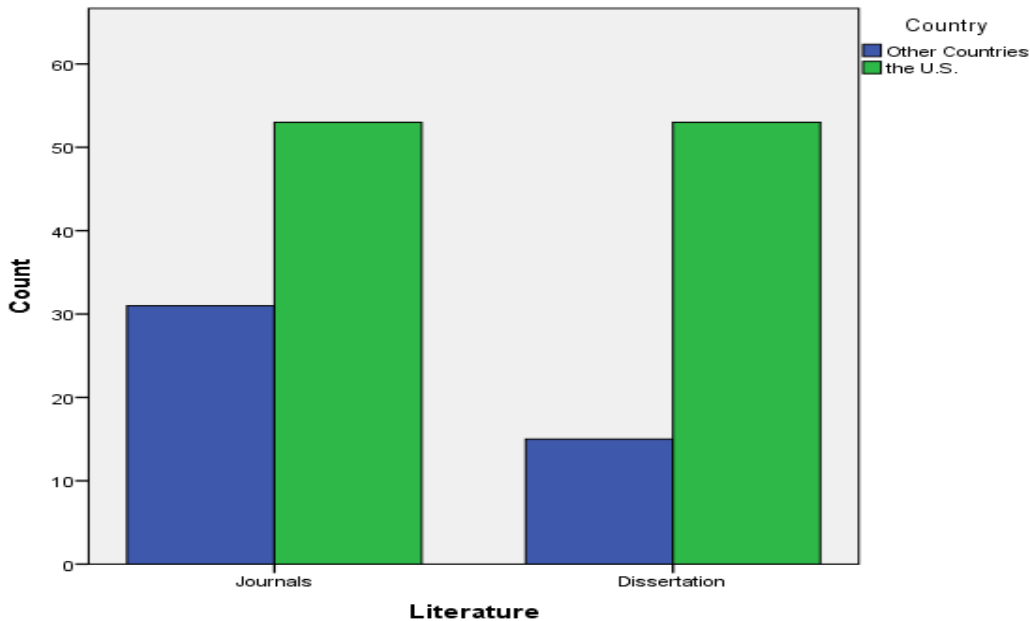
Figure 2 The teacher turnover studies of the U.S and other countries since 1950s

The results from those studies, however, are often inconsistent (Holtom, Mitchell, Lee, & Eberly, 2008).For example, whereas some studies have suggested teacher salary is an influential factor in teachers' career decisions (Goldhaber, Gross, & Player, 2007), others find the poor predictability of teacher payment (Hanushek & Rivkin, 2007). The inconsistency of the research findings may have implied the challenges for a within-country study to obtain an effective measure of salary-to-teacher turnover since most public school teachers in the same country are paid very similarly (Dolton & Marcenaro-Gutierrez, 2011).

The considerable differences have been observed across countries regarding the teacher labor market and related government policies (Ladd, 2007; Vegas, 2007). A variety of nation- and region-specific regulations and rules, such as wage schedule, job promotion scale, and the teacher personnel policies, are making the teaching forces various across countries (Hanushek & Rivkin, 2012). In addition, the social, cultural and economic contexts can also shape the teacher labor market and the extent teachers' career choices based on their own preferences (Ladd, 2007;

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OECD, 2005). One of the advantages of conducting international comparative approach is to detect some institutional variations that may not be captured through single-country study. Specifically, the cross-country study is very useful in 1) identifying whether the result is country-specific or more general, 2) revealing how effects systematically vary across different settings (Hanushek & Woessmann, 2017).

Researchers have warned that over-emphasis on intra-national studies may cause insularity that potentially could lead to insensitivity of teacher policies to various situations (Dolton & Marcenaro-Gutierrez, 2011). For example, in the countries where teachers have higher teaching status, the teacher workforce is usually more stable and more likely to attract high-qualified graduates (OECD, 2014). Theory suggests that opportunity wages outside of teaching field should have less of an influence on turnover intentions in countries where teaching is a high status job than they do in countries where teaching lacks prestige, and that working conditions should have more of an influence on turnover intentions in countries where wages are set at the national level than in countries where wage differentials can compensate for local characteristics (Falch & Strøm, 2005). Moreover, beside the direct effect, the national contexts may influence teachers' work attitude and turnover behavior indirectly through school practice. For instance, educational system and teacher policy might affect the level of school autonomy, which in turn may influence on teachers labor market decisions (Luschei & Chudgar, 2017). Thus, cross-country analysis could be useful in the investigation of institutional variation that is hard to be fully observed within a country.

Historically, the lack of wide-ranging coverage of large-scale, international studies, have led government policymakers to overlook international perspective when formulating policy positions (Meyer & Benavot, 2013). Since the 2000s, some major international organizations

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(e.g., OECD, UNESCO, the World Bank's SABER-Teachers) have correspondingly directed their attention to teachers as key actors in "knowledge economies" (Robertson & Sorensen, 2018, p.476). Among these policy initiatives, teaching and Learning International Survey (TALIS) administrated by OECD has emerged as one of the pinnacles (Robertson & Sorensen, 2018). As the part of Indicators of Education Systems (INES) project, the TALIS was developed to provide reliable indicators for OECD countries in terms of their educational systems and practices with a focus in teaching force (OECD, 2010). By adopting cross-national analysis, my research has provided the evidence internationally in the variation of student access to quality teachers between and within schools, and the country effects on teacher turnover intention.

Secondly, while research on teacher distribution and turnover focuses heavily on individual teacher characteristics (e.g., experience, education, age) (e.g., Boyd, Grossman, Lankford, Loeb, & Wyckoff, 2008; Whipp & Geronime, 2017), more recent work has expanded the research to school organizational characteristics that may affect teachers' decisions to leave their schools (e.g., Falch & Strøm, 2005; Newton, Rivero, Fuller, & Dauter, 2018). Limited work, however, has analyzed teacher turnover as an individual teacher decision nested within larger social contexts (Yang, Badri, Rashedi, & Almazroui, 2018).

Researchers from various disciplines are developing more complex understandings of phenomena by using multilevel lenses (e.g., Kozlowski & Klein, 2000). A multilevel lens may help us reveal the complexity and richness of individual behavior and "it draws our attention to the context in which behavior occurs and illuminates the multiple consequences of behavior traversing levels of social organization" (Hitt, Beamish, Jackson, & Mathieu, 2007, p.232). Solely examining one level may fail to understand teacher turnover in a more comprehensive perspective and overlook some crucial factors. The single school or district level approach may

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overlook the meaningful individual differences, while the single individual-level approach may ignore the contextual factors that may shape or constrain individuals' job decisions. Furthermore, shifting from individual to organizational and social context levels, researchers have recognized that individual-level turnover theories could not directly be synthesized to account for all higher-level processes and outcomes (Reilly, Nyberg, Maltarich, & Weller, 2014). Thus, rather than a "one size fits all" view of turnover, investigations of the contextual conditions of antecedent-turnover from both the individual and collective level have been encouraged (Hausknecht & Trevor, 2011).

The multilevel analysis in this dissertation research underscores the joint impact and the interactive effects of individual and situational factors on turnover intention. It bridges the individual and higher level perspectives and provides a more comprehensive picture of teacher and contextual characteristics (teachers, schools, and countries) that may together contribute to teacher turnover intention. Additionally, the cross-level interactions are considered in order to examine whether the impact of individual and school attributes on teacher turnover differed in various situations. As the findings of the second and third study suggested, whether or not a teacher decides to transfer to other school or quit job altogether is not solely determined by his or her own individual characteristics and the school they work for. Teachers' turnover intention is the outcome of multilevel effects. Even though the micro-level factors play a crucial role in predicting teacher turnover, the macro-level effects have also shaped teachers' turnover intention and there are significant cross-level interaction effects.

Thirdly, the empirical research that has documented the determinants and predictors of teacher turnover in the last 50 years can be divided into two main areas of focus. The first looks at pecuniary factors, such as teacher relative pay, as primary determinants of teacher labor

market (e.g., Cowan & Goldhaber, 2015). However, despite of the importance of salaries on teacher market and teaching quality, research often finds the positive relationship between salaries and teacher turnover fail to be robustly confirmed in some large cross-sectional data (e.g., Hanushek & Rivkin, 2007; Hanushek, Rivkin, Rothstein, & Podgursky, 2004). Existing evidences show that the significant rigidities in teacher labor markets, such as the fixed salary schedule, geographic constraints, and union restrictions, could all distort the wage impacts (Woessmann, 2011).

The second body of studies emphasizes the influence of non-pecuniary job attributes on the significant variation in teacher recruitment and retention rates between schools and districts (e.g., Falch & Strom, 2005; Feng & Sass, 2016). For example, research reveals that teachers' turnover and mobility can be driven by geographic locations, school and student characteristics, and to some extent they appear to be insensitive to salary levels, especially to teachers with strong qualifications (Hanushek, Kain, & Rivkin, 2004). Research across disciplines have shown that, in addition to individual and personal characteristics of employees, the overall organizational conditions also significantly affect employees' attachment of to the organization (e.g., Price 1977; Li et al., 2016). Empirical evidences indicate that teachers not only rationally weigh all of the objective factors, but also evaluate a school organization that meets their emotional and psychological needs while making career decisions (e.g., Johnson & Birkeland, 2003). Hence, despite the significance of salaries on teachers' career decisions, the non-pecuniary factors should also been carefully considered when designing and implementing teacher recruitment and retention policies, especially when it is challenging to attract and retain quality teachers through monetary measures. The third study of the dissertation has mainly

focuses on the non-pecuniary factors, especially the school organizational factors, relating to teacher turnover intentions.

Lastly, turnover intention is of interest because it has been seen as a strong predictor and an alternative measure of actual turnover behaviors (Cho & Lewis, 2012). In this study, teacher turnover intention refers to teachers' attitude favoring leaving their current workplace or profession (Tiplic, Brandmo, & Elstad, 2015). The relationship between turnover intention and actual turnover behavior vary across studies (Vandenberghe & Tremblay, 2008). Yet, consistent evidences indicate that turnover intention is significantly associated with turnover behaviors and has been seen as the last stage before the actual turnover emerge (Cho & Lewis, 2012; Griffeth, Hom, & Gaertner, 2000).

Researchers have incorporated turnover intention into many employee turnover models (Medina, 2012). A large amount of turnover intentions studies have been found in Psychology (e.g., George & Jones, 2008) and some have been found in the field of Economics (e.g., Markey, Ravenswood, & Webber, 2012; Sousa-Poza & Henneberger, 2004). Limited turnover intention research, especially under the international context, has been found in educational field (e.g., Duyar, Gumus, & SukruBellibas, 2013). Unlike the administration data used in longitudinal study for actual teacher turnover, the survey data for teacher turnover intention have their desirable statistical qualities. For example, they usually contain much more variables information than regular administration data (Cohen, Blake, & Goodman, 2015), and it's more economic than longitudinal data (Dalton, Johnson, & Daily, 1999).

Furthermore, studying teacher turnover intention can be very useful for identifying the "reluctant stayer" (Li et al., 2016). Even if a teacher is dissatisfied and wants to leave or quit, he/she may still choose to stay and keep the job, which means the actual turnover will not be

observed but the issue remains (Liu & Teddlie, 2009). Research shows that the reluctant stayers often appear as "bad apples" who feel trapped and disengaged in their schools (Felps, Mitchell, & Byington, 2006; Li, et al, 2016). Studying turnover intentions may be helpful in formulating targeted retention polices and strategies to teachers at risk of leaving or "reluctant stayers" (Boyd, Lankford, Loeb, Ronfeldt, & Wyckoff, 2011).

The dissertation research comprises of three separate studies and is developed in a journal article format. The first study examines how different measures of teacher qualifications are distributed across low-and high-SES classrooms and schools and the relationships between the national contexts and teacher distributions. The second study has focused on the country-effects on teacher turnover intentions across countries by controlling for teacher and school level factors. The third study is to investigate the effects of non-pecuniary factors, especially the school organizational factors, on teachers' intention to change school in the United States through multilevel analysis. The last section of the dissertation is the conclusion, implications, research limitation, and some suggestions for the future research.

The first study, "The Distributions of Teacher Qualification: A Cross-National Study", examines how different measures of teacher qualifications are distributed across low-and high-SES classrooms and schools and the relationships between the national contexts and teacher distributions. The findings indicate that the magnitude of the exposure rates and gaps to less-qualified teachers between low-and high-SES classrooms and schools vary significantly across 32 OECD countries. On average, within-school distribution accounts for a greater share of the total gaps than between-school distribution, especially when it comes to out-of-field teaching. The findings from this study support the notion that governments play a critical role in narrowing the gaps of teacher distribution. Specifically, equitable teacher distribution relies on government

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allocations of teachers more equally between and within schools to better ensure equitable distribution across student socioeconomic status.

The second study, "Country Effects on Teacher Turnover Intention: A Multilevel Cross-National Analysis", provides in-depth analyses of how country contexts along with teacher and school variables might relate to teachers' turnover intentions. Using a large sample of teachers and schools from 32 OECD countries, the study estimates a set of three-level HLM models of turnover intention. The findings reveal that teacher transfer intention and quit intention vary significantly across countries and across schools within countries. The variation in teacher turnover intention across 32 countries is a function of teacher-, school-, and country-level factors. The findings have also found that teachers across countries do respond to the differences of working conditions and the disadvantaged schools tend to have higher percentage of teachers with turnover intention than other schools. The analysis of cross-level interactions indicates that the country contexts might have moderated the nature or strength of the relationships between working conditions and teacher turnover intention. The study suggests that salaries and working conditions are not the only important factors in teacher retention; the ability of countries to successfully recruit and retain quality teachers might also rely on the status of teaching profession.

The third study, "Factors Relating to Teachers' Intention to Change School: A Multilevel Perspective", is an attempt to understand the non-pecuniary factors contributing to the variations of teacher turnover intention across the U.S. lower secondary schools (grades 7-9). Three models are estimated to test the integrative effects of individual and school characteristics as well as organizational conditions on teachers' transfer intention. The results of the multilevel analysis indicate that while substantial portion of the variance in teacher transfer intention is accounted

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for by the teacher characteristics, the school attributes, especially the organizational conditions, have also notably contributed to teachers' intention to change school. In addition, the study has revealed the moderation effect of disadvantaged schools on the relationships between the teacher characteristics and their intention to change school. The implications for teacher retention policies have been discussed as well.

References

Adnot, M., Dee, T., Katz, V., & Wyckoff, J. (2017). Teacher turnover, teacher quality, and student achievement in DCPS. *Educational Evaluation and Policy Analysis, 39*(1), 54-76.

Agasisti, T. & Zoido, P. (2015). The efficiency of secondary schools in an international perspective. Retrieved from https://aefpweb.org/sites/default/files/webform/41/OECD%20Working%20Paper%2004%2005%202015.pdf

Allen, R., Burgess, S., & Mayo, J. (2018). The teacher labour market, teacher turnover and disadvantaged schools: New evidence for England. *Education Economics, 26*(1), 4-23.

Barbieri, G., Rossetti, C., & Sestito, P. (2011). The determinants of teacher mobility: Evidence using italian teachers' transfer applications. *Economics of Education Review, 30*(6), 1430-1444.

Behrstock, E. & Clifford, M. (2010). Ensuring the equitable distribution of teachers: Strategies for school, district, and state leaders. TQ research, & policy brief. National Comprehensive Center for Teacher Quality. Retrieved from https://gtlcenter.org/sites/default/files/docs/EnsuringEquitableDistributionTeachers.pdf

Boyd, D., Lankford, H., Loeb, S., Ronfeldt, M., & Wyckoff, J. (2011). The role of teacher

    quality in retention and hiring: Using applications to transfer to uncover preferences of

    teachers and schools. *Journal of Policy Analysis and Management, 30*(1), 88-110.

Caena, F. (2014). Teacher competence frameworks in Europe: Policy as discourse and policy as

    practice. *European Journal of Education*, *49*(3), 311-331.

Cho, Y. J. & Lewis, G. B. (2012). Turnover intention and turnover behavior: Implications for

    retaining federal employees. *Review of Public Personnel Administration, 32*(1), 4-23.

Clotfelter, C. T., Ladd, H. F., & Vigdor, J. (2005). Who teaches whom? Race and the distribution

    of novice teachers. *Economics of Education Review*, *24*(4), 377-392.

Clotfelter, C. T., Ladd, H. F., & Vigdor, J. L. (2006). Teacher-student matching and the

    assessment of teacher effectiveness. *Journal of Human Resources, 41*(4), 778-820.

Cohen, G., Blake, R. S., & Goodman, D. (2015). Does turnover intention matter? Evaluating the

    usefulness of turnover intention rate as a predictor of actual turnover rate. *Review of*

    Public Personnel Administration, 36(3), 240-263.

Cowan, J. & Goldhaber, D. (2015). Do bonuses affect teacher staffing and student achievement

    in high-poverty schools? Evidence from an incentive for national board certified teachers

    in Washington State. *Center for Education Data and Research.* Retrieved from

    https://www.cedr.us/papers/working/CEDR%20WP%202015-4.pdf.

Dalton, D. R., Daily, C. M., Johnson, J. L., & Ellstrand, A. E. (1999) Number of Directors and

    Financial Performance: A Meta-analysis. *Academy of Management Journal, 42*, 674–686.

Dolton, P. & Marcenaro-Gutierrez, O. D. (2011). If you pay peanuts do you get monkeys? A

    cross-country analysis of teacher pay and pupil performance. *Economic Policy, 26*(65), 5-

    55.

Duyar, I., Gumus, S., & SukruBellibas, M. (2013). Multilevel analysis of teacher work attitudes: The influence of principal leadership and teacher collaboration. *International Journal of Educational Management, 27*(7), 700-719.

Falch, T. & Strøm, B. (2005). Teacher turnover and non-pecuniary factors. *Economics of Education Review, 24*(6), 611-631.

Felps, W., Mitchell, T. R., & Byington, E. (2006). How, when, and why bad apples spoil the barrel: Negative group members and dysfunctional groups. *Research in Organizational Behavior, 27*, 181-230.

Feng, L. & Sass, T. R. (2016). Teacher quality and teacher mobility. *Education Finance and Policy, 12*(3), 396-418.

Fischer, R., Fireman, E., & Gomes, J. R. (2013). Who teaches science in Alagoas? A quantitative analysis of non-specialist teaching at primary and secondary schools in Brazil. *ArXiv Preprint arXiv*, *1304.8055.*

Goldhaber, D., Gross, B., & Player, D. (2007). Are public schools really losing their best? Assessing the career transitions of teachers and their implications for the quality of the teacher workforce. Working paper 12. *National Center for Analysis of Longitudinal Data in Education Research*.

Goldhaber, D., Lavery, L., & Theobald, R. (2015). Uneven playing field? Assessing the teacher quality gap between advantaged and disadvantaged students. *Educational Researcher*, *44*(5), 293-307.

Goldhaber, D., Quince, V., & Theobald, R. (2016). Reconciling different estimates of teacher quality gaps based on value-added. *Washington, DC: National Center for the Analysis of*

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Longitudinal Data in Education Research (CALDER), American Institutes for Research.
Retrieved from https://caldercenter.org/sites/default/files/Full%20Text_0.pdf

Griffeth, R. W., Hom, P. W., & Gaertner, S. (2000). A meta-analysis of antecedents and correlates of employee turnover: Update, moderator tests, and research implications for the next millennium. *Journal of Management, 26*(3), 463-488.

Hanushek, E. A. & Rivkin, S. G. (2007). Pay, working conditions, and teacher quality. *The Future of Children*, 69-86.

Hanushek, E. A. & Woessmann, L. (2017). School resources and student achievement: A review of cross-country economic research. *Cognitive abilities and educational outcomes*, 149-171.

Hanushek, E. A., Kain, J. F., & Rivkin, S. G. (2004). Why public schools lose teachers. *Journal of Human Resources, 39*(2), 326-354.

Hanushek, E. A., Rivkin, S. G., Rothstein, R., & Podgursky, M. (2004). How to improve the supply of high-quality teachers. *Brookings Papers on Education Policy,* (7), 7-44.

Hausknecht, J. P. & Trevor, C. O. (2011). Collective turnover at the group, unit, and organizational levels: Evidence, issues, and implications. *Journal of Management, 37*(1), 352-388.

Hitt, M. A., Beamish, P. W., Jackson, S. E., & Mathieu, J. E. (2007). Building theoretical and empirical bridges across levels: Multilevel research in management. *Academy of Management Journal, 50*,1385–1399.

Holtom, B. C., Mitchell, T. R., Lee, T. W., & Eberly, M. B. (2008). 5 turnover and retention research: A glance at the past, a closer review of the present, and a venture into the future. *The Academy of Management Annals, 2*(1),231-274.

Ingersoll, R. M. & Perda, D. (2010). Is the Supply of Mathematics and Science Teachers

Sufficient? *American Educational Research Journal, 47*(3), 563–594.

Johnson, S. M. & Birkeland, S. E. (2003). Pursuing a "sense of success": New teachers explain

their career decisions. *American Educational Research Journal, 40*,581-617.

Kalogrides, D., Loeb, S., & Béteille, T. (2013). Systematic sorting: Teacher characteristics and

class assignments. *Sociology of Education*, *86*(2), 103-123.

Kozlowski, S. W. & Klein, K. J. (2000). A multilevel approach to theory and research in

organizations: Contextual, temporal, and emergent processes. In K. J. Klein & S. W.

Kozlowski (Eds.), Multilevel theory, research, and methods in organizations:

Foundations, extensions, and new directions (pp. 3–90). San Francisco, CA: Jossey-Bass.

Kukla-Acevedo, S. (2009). Leavers, movers, and stayers: The role of workplace conditions in

teacher mobility decisions. *The Journal of Educational Research, 102*(6), 443-452.

Ladd, H. F. (2007). Teacher labor markets in developed countries. *The Future of Children*, 201-

217.

Li, J. J., Lee, T. W., Mitchell, T. R., Hom, P. W., & Griffeth, R. W. (2016). The effects of

proximal withdrawal states on job attitudes, job searching, intent to leave, and employee

turnover. *Journal of Applied Psychology,101*(10), 14-36.

Liu, S. & Teddlie, C. (2009). Case studies of educational effectiveness in rural china. *Journal of

Education for Students Placed at Risk (JESPAR), 14*(4), 334-355.

Luschei, T. F. & Chudgar, A. (2017). Conceptual framework: Marginalized children and their

teachers. *In Teacher distribution in developing countries*, 13-23. New York, NY:

Springer.

Markey, R., Ravenswood, K., & Webber, D. J. (2012). The impact of the quality of the work environment on employees' intention to quit. *Economics Working Paper Series 1220.*Retrieved from https://pdfs.semanticscholar.org/7ff1/9008e64a232bcf9c37d8bcdbb2a054619cba.pdf

Mason, S. & Matas, C. P. (2015). Teacher attrition and retention research in Australia: Towards a new theoretical framework. *Australian Journal of Teacher Education (Online), 40*(11), 45.

Meyer, H. & Benavot, A. (2013). PISA, power, and policy: The emergence of global educational governance. *Oxford: Symposium Books*.

Newton, X. A., Rivero, R., Fuller, B., & Dauter, L. (2018). Teacher turnover in organizational context: Staffing stability in Los Angeles charter, magnet, and regular public schools. *Teachers College Record, 120*(3), 3.

OECD (2005). *Teachers matter: Attracting, developing and retaining effective teachers Organisation for Economic Co-operation and Development*. Retrieved from https://www.oecd.org/education/school/34990905.pdf

OECD (2007). *Education at a glance 2005: OECD indicators Organisation for Economic Co-operation and Development*. Retrieved from http://www.oecd.org/education/skills-beyond-school/39313286.pdf

OECD (2010). *PISA 2009 results: What students know and can Do–Student performance in reading, mathematics, and science (volume I) OECD Publishing Paris*. Retrieved from https://www.oecd.org/pisa/pisaproducts/48852548.pdf

OECD (2014), *New Insights from TALIS 2013: Teaching and Learning in Primary and Upper Secondary Education*. Retrieved from http://dx.doi.org/10.1787/9789264226319-en

Price, J. (1977). The study of turnover. Ames, IA: Iowa State University Press.

Queensland College of Teachers (2013), Annual Report Queensland College of Teachers, Retrieved from https://www.qct.edu.au/pdf/Retention_Research_Report_RP01.pdf

Reilly, G., Nyberg, A.J., Maltarich, M. & Weller, I. (2014). Human capital flows: Using context-emergent turnover (CET) theory to explore the process by which turnover, hiring, and job demands affect patient satisfaction. *Academy of Management Journal, 57*(3), 766-790.

Robertson, S. L. (2012). Placing teachers in global governance agendas. *Comparative Education Review, 56*(4), 584-607.

Robertson, S. L. & Sorensen, T. (2018). Global transformations of the state, governance and teachers' labour: Putting Bernstein's conceptual grammar to work. *European Educational Research Journal, 17*(4), 470-488.

Sharplin, E. D. (2014). Reconceptualising out-of-field teaching: Experiences of rural teachers in Western Australia. *Educational Research, 56*(1), 97-110.

Sousa-Poza, A. & Henneberger, F. (2004). Analyzing job mobility with job turnover intentions: An international comparative study. *Journal of Economic Issues, 38*(1), 113-137.

Tiplic, D., Brandmo, C., & Elstad, E. (2015). Antecedents of Norwegian beginning teachers' turnover intentions. *Cambridge Journal of Education, 45*(4), 451-474.

UNESCO (2016). The world needs almost 69 million new teachers to reach the 2030 education goals, http://unesdoc.unesco.org/images/0024/002461/246124e.pdf.

Vandenberghe, C. & Tremblay, M. (2008). The role of pay satisfaction and organizational commitment in turnover intentions: A two-sample study. *Journal of Business and Psychology, 22*(3), 275-286.

Vegas, E. (2007). Teacher labor markets in developing countries. *The Future of Children,* 219-232.

Whipp, J. L. & Geronime, L. (2017). Experiences that predict early career teacher commitment to and retention in high-poverty urban schools. *Urban Education, 52*(7), 799-828.

Woessmann, L. (2011). Cross-country evidence on teacher performance pay. *Economics of Education Review, 30*(3), 404-418.

Yang, G., Badri, M., Rashedi, A. A., & Almazroui, K. (2018). The social and organisational determinants of school commitment of expatriate teachers. *Journal of Research in International Education, 17*(1),33-48.

2. THE DISTRIBUTIONS OF TEACHER QUALIFICATION: A CROSS-NATIONAL STUDY

Introduction

Studies in various countries have documented the crucial effect of teacher quality on students' achievement (e.g., Darling-Hammond, 2006; Hanushek & Rivkin, 2010; OECD, 2007). Teacher quality, which is commonly defined as the professional and academic characteristics teachers demonstrate in the classroom, is a key input in producing academic achievement (Harris & Sass, 2011; Ladd & Sorensen, 2017). Well-prepared teachers can make up for some of the negative student achievement effects that are associated with background characteristics (Darling-Hammond, 2000). However, an unequal distribution of quality teachers, which typically disfavors disadvantaged students, continues to widely occur in public schools in the United States and throughout the world. Teachers with less experience and poor academic records are more likely to teach in schools with a higher proportion of low-income, minority, and/or low-performing students (Allen, Burgess, & Mayo, 2018; Clotfelter, Ladd, & Vigdor, 2006; Kalogrides, Loeb, & Béteille, 2013). These findings are robust to a wide array of indicators and operational definitions of teacher quality, including student-based outcome measures (e.g., test scores) and inputs such as course-subject certification and years of experience (Goldhaber, Lavery, & Theobald, 2015; Isenberg et al., 2013).

The unequal distribution of quality teachers is one of the most urgent problems facing educational systems around the world (OECD, 2007, 2014a; UNESCO Institute for Statistics, 2006), spurring education researchers to advocate for more equitable teacher allocations (Caena, 2014). These concerns have led to a variety of education reforms pertaining to teacher recruitment and retention over the past quarter century (OECD, 2014b). While education policy

researchers have struggled with identifying teacher credentials and inputs that are predictive of

student outcomes, policymakers have long been operating on assumptions that years of teaching

experience, sense of teaching efficacy, and subject matter expertise, are indicators of teacher

quality (Schleicher, 2012). Therefore, education reforms have often attempted to remediate

student achievement gaps by attempting to remediate the distribution of teachers, using these

indicators as proxies for quality. Such reforms have been implemented around the world and

have been shown to improve the distribution of teacher quality, at least according to these

measures, with schools disproportionately serving poor and low-performing students (Barbieri,

Rossetti, & Sestito, 2011).

Only a few cross-national studies have examined the gap in student access, by

socioeconomic status, to quality teachers by cross-national data; these include the TIMSS 2007

(Akiba & Liang, 2014) and TALIS 2013 (sample of 8 out of 32 countries) (Perry, Hawkins, &

Sealy, 2016).These studies, however, have only investigated the national level of teacher quality

distribution with aggregated data. The evidence, at least cross-nationally, on the variation of

student access, by socioeconomic status, to quality teachers between and within schools remains

unknown.

International assessment tests have not only shown differences in student performance

across countries, but also have revealed large performance variations between and within schools

(e.g., OECD, 2014b, 2016a). The PISA 2015 results demonstrated that, compared with 30

percent of variation explained by between-school variation in student performance, within-

school variation accounted for 69 percent of total variance across the 68 countries surveyed

(OECD, 2016a). Meanwhile, researchers have identified a positive correlation between the gap

in student access to high-quality teachers and the size of the performance gap (Akiba & Liang,

2014). Thus, it is important to analyze teacher distribution, more specifically, at the classroom, school, and country levels instead of solely assessing the overall differences to better understand sources of international differences in student performance.

To date most attempts to investigate the distribution of teacher quality have taken place at the school or district level (e.g., Clotfelter et al., 2005; Lankford, Loeb, & Wyckoff, 2002; Sass, Hannaway, Xu, Figlio, & Feng, 2012). Few studies have examined the extent to which teachers are sorted across classrooms within schools (Thiemann, 2017). With such a substantial proportion of the variation occurring within, rather than across schools, examining distributions of teacher qualification within schools may be as, if not more, important for assessing the extent of teacher quality distribution across student socioeconomic status. A study focusing on the relationship between sorting and inequality in U.S. public schools found that both between-and within-school sorting have contributed to inequality in student achievement (Thiemann, 2017). One study of teacher assignment and student disadvantage within schools found that the classrooms with higher proportions of low-income and minority students tended to be assigned to teachers with the least experience (Kalogrides, Loeb, & Béteille, 2013). Research has suggested some factors, such as official polices and social norms, may contribute to staffing inequities within schools (Behrstock & Clifford, 2010).

Policymakers tend to focus on teacher allocation between schools and fail to capture the unequal distribution of teachers within schools (Isenberg, et al., 2013). The policy implication of studying within-school teacher distribution is that it is usually more challenging for educational administrators to change the distribution of students across, as opposed to within, schools. Understanding the distinction of teacher qualifications between and within schools, therefore,

can help policymakers identify different sources of unequal access to quality teachers and create specific policy responses that address disparities at the state, school, and classroom levels.

In this study, we focus on a potentially important contributor to the student achievement gap: the differences between socioeconomically disadvantaged and non-disadvantaged students in their exposure to teachers regarded as being less-qualified. This study examines how different measures of teacher qualifications are distributed across low-SES schools and classrooms by decomposing teacher distribution levels between and within schools to identify sources of inequality across countries. To identify potential policy levers, this study also preliminarily examines the effects of macro-level variables on teacher distribution.

The dataset employed in the study is TALIS 2013, collected and managed by the OECD. This dataset enables the matching of teachers with groups of students, both across schools and across classrooms within schools, and permits an analysis of variations in the distribution of teachers across countries.

Three questions are addressed in this paper:

1. How much variation is there in teacher-qualification distributions across classrooms within schools, across schools within country, and across countries?

2. To what extent does student socioeconomic disadvantage explain variations in teacher qualification distribution?

3. How do national contexts account for the cross-country variation in teacher-qualification distributions?

We find that, on average, low-SES schools and classrooms are more likely to have what education policymakers have historically considered to be "less-qualified" teachers. The magnitude of the exposure rates and gaps with respect to these measures of teacher qualification

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varies remarkably across the32 OECD countries, with some countries much more successful in equalizing teacher distributions than others. Although the differences between the sources of exposure gaps varies across countries and with teacher qualification indicators, on average, within-school distribution accounts for a greater share of the total gaps, especially for measures out-of-field teaching. In terms of total exposure gap across countries, the results suggest that the between- and within-school gaps can strengthen or offset one another. Furthermore, the findings of this study suggest that income inequality was negatively associated with the within-school exposure gap to out-of-field reading teachers. The findings of the study suggest that teacher quality distribution throughout the world should not solely focus on the inequality of teacher quality as a whole but on both school and classroom variations. Furthermore, the significant differences in teacher distribution patterns may make the case for government's role in narrowing the gaps of teacher distribution especially in unequal and poor countries. Specifically, equitable teacher distribution relies on government allocations of teachers more equally between and within schools to better ensure equitable distribution across student socioeconomic status.

Literature Review

The literature review first focuses on the studies of teaching qualifications, which includes teacher experience and subject matter expertise. Based on the research purpose, we have also drawn on the literature of national contexts that may account for teacher qualification distribution.

Measures of Teacher Qualification

A challenge of studying teacher qualification cross-nationally is that defining teacher qualifications may vary across countries. In the last few decades, the OECD's cross-national comparative education indicators largely have been recognized around the world (Sellar, Lingard,

Meyer, & Benavot, 2013). As part of the Indicators of Education Systems (INES) project, TALIS was developed to provide reliable indicators for the educational systems in OECD countries and promote educational understanding internationally and comparatively (OECD, 2014a). We focus on the indicators of teacher qualification, in terms of input measures, that share a relatively common meaning across the various educational systems and cultural contexts (Boyd, Lankford, Loeb, Rockoff, & Wyckoff, 2008). Less-qualified teachers in this study refer to the teachers who have less than three years of teaching experience, self-report having lower levels of teaching efficacy, or are teaching outside of their field of training.

There is controversy surrounding the relationship between teacher qualifications and student outcomes (Feng & Sass, 2016).Evidence in multiple countries, such as the United States (Wayne & Youngs, 2003), Finland, France, Luxembourg (Teddlie & Reynolds, 2000), India, Mexico, and Tanzania (Luschei & Chudgar, 2016), and Kenya, South Africa, Swaziland (Zakharov, Tsheko, & Carnoy, 2016) indicate that teacher academic background and teaching experience are related to learning outcomes. However, some studies, including some non-US research, have not find any significant relationships between teacher qualifications and student achievement (Buddin & Zamarro, 2009; Koedel, 2007; Maphoso & Mahlo, 2015). Because these measures often do not capture variations in teacher quality, some researchers have attributed the variation in teachers' effectiveness at improving student performance to "unobserved" variables instead of teacher qualifications (Hanushek & Rivkin, 2012; Murnane & Steele, 2007). In spite of the mixed evidence of the effectiveness of teacher qualification, policymakers often rely on such credentials as proxies for teacher quality (Mead, Rotherham, & Brown, 2012). Therefore, while such a measure of teacher quality is controversial in terms of whether it is predictive of student outcomes, its use as a proxy (albeit, arguably a poor one) may still reflect variations in

policymaker successes with distributing teachers across and within schools by student socioeconomic status.

Teacher Experience

Teacher experience has been considered an important indicator of teacher quality in a wide range of literature including cross-national comparative studies (Akiba & LeTendre, 2009; Akiba, LeTendre, & Scribner, 2007; Goldhaber, Lavery, & Theobald, 2015). We define teacher "inexperience" as having three years or less experience. Empirical findings suggest that teachers at this early teaching stage are usually less effective than more-experienced teachers, even though less-experienced teachers tend to catch-up to their more-experienced colleagues (Clotfelter, Ladd, Vigdor, & Wheeler, 2006). In a study examining the variance of teacher effects, students with beginning teachers scored .17 standard deviations lower in reading achievement than students with the teachers who have ten or more years of experiences (Rockoff, 2004). In a longitudinal study on the effectiveness of teacher experience, middle-school teachers with more experience were more effective not only on raising student test scores, but also in improving their behavior. The findings suggested that the productivity of a teacher with five years of teaching experience is .13 higher than a first-year teacher (Ladd & Sorensen, 2017). Based on a systematic review of 30 U.S. studies, Kini and Podolsky (2016) concluded that there is a positive association between teaching experience and both student achievement and school attendance.

A number of studies from other countries, both developed and developing, have documented the particular challenges and issues that novice teachers have to face, most of which are associated with struggles in teaching and classroom management, such as Korea (Lee, 2017), Israel (Gavish & Friedman, 2010), Turkey (Sali & Kecik, 2018), Finland (Blomberg & Knight, 2015), Netherlands (Claessens, van Tartwijk, Pennings, van der Want, Verloop, den Brok, &

Wubbels, 2016), and Chile (Canales & Maldonado, 2018). In a comparison study between novice and experienced teachers in the Netherlands, Wolff et al. (2014) found that novice teachers were less effective in maintaining discipline and behavioral norms and predicting classroom management events than the teachers with more experiences. In a study of examining Malaysian novice teachers' challenges in their early experience of teaching, the authors suggested that, based on the findings from both qualitative and quantitative research, the novice teachers in Malaysia had been largely found not sufficiently prepared for various teaching challenges and issues compared with experienced teachers (Senom, Zakaria, & Ahmad Shah, 2013). It is important to note that more studies on the relationship between teaching experience and efficacy in developing countries is needed to further enrich knowledge in this field.

In addition to concerns regarding teaching effectiveness, novice teachers tend to have higher turnover rates than experienced teachers, and the rates are often particularly high in disadvantaged schools (Gagnon & Mattingly, 2012; OECD, 2005; Moon, 2007). Studies show that 95% of teacher demand is caused by teacher attrition and turnover, especially from the teachers with less than five-year experiences (Sutcher, et al., 2016). In the United Kingdom, there are around 50% of the teachers have left their profession after their first five years of teaching (Espinoza, 2015). The UNESCO report on teachers (2016)have also indicated that acute teacher shortages facing many developing countries has been worsened by the high attrition rates among new teachers. Numerous studies across countries have linked high teacher attrition and turnover rates with high teacher workforce instability (Lanas, 2017; Simon & Johnson, 2015; Watlington, Shockley, Guglielmino, & Felsher, 2010) and low student achievement (Allen, Burgess, & Mayo, 2012; Theobald & Michael, 2002).

Subject Matter Expertise

Researchers have underscored the importance of subject matter expertise for effective teaching (Boe, Shin, & Cook, 2007; Nixon, Luft, & Ross, 2017). Out-of-field teaching (OFT) refers to teachers who are not qualified in the subject matter that they instruct (du Plessis, 2015). Specifically, Ingersoll (2001) defined OFT as occurring when teachers do not possess an academic or education majors/ minors in the subject they are instructing. Research findings have suggested that subject-specific credentialing is related to students' mathematics and science scores. Students taught by out-of-field teachers have performed less well than those by in-field teachers (Darling-Hammond, 2000; Goldhaber & Brewer, 2000). Out-of-field teachers were found to be less-prepared than in-field teachers in several areas of teaching ability, and these teachers were also likely to exhibit lower morale and teaching commitment (Schueleretal., 2015).

A major contributing factor to OFT has been that many countries face a daunting challenge in the recruitment and retention of high-qualified teachers (OECD, 2014b). In Sweden, for example, the professional status of teachers has fallen since the beginning of the 1990s, as a result; the number of unqualified teachers has increased, especially in math and science (OECD Sweden, 2014). In the PISA 2009 assessment, around 20% of principals from lower-secondary schools reported the shortage of qualified math and science teachers and this number was as high as 80% in some countries (e.g., Luxembourg and Turkey) (Schleicher, 2012).

The shortage of qualified teachers has also been attributable to an increase of out-of-field teachers (OECD, 2016a). In order to meet demands for filling teaching positions, many countries have increased the practice of hiring more teachers by lowering requirements and minimum qualifications or assigning teachers to teach in subject areas in which they are not fully prepared (Weldon, 2016; Zhou, 2014). In addition to the studies from developed countries, such as

Australian (Sharplin, 2014) and the United States (Ingersoll, 2002), scholars have examined

these issues in developing countries, finding comparable results regarding out-of-field teaching,

such as in Malaysia (Salleh & Darmawan, 2013), Brazil (Fischer, Fireman, & Gomes, 2013) and

India (Chandra, 2015). Compared with the U.S. school system, out-of-field teaching is relatively

common in EU countries (e.g., Denmark, Sweden, Netherlands, & Bulgaria) where it is

acceptable, at least as a temporary measure (OECD, 2016c).

National Contexts that may Account for Teacher Qualification Distribution

A body of research has examined and uncovered micro-level considerations that

influence teacher distribution. That is, teachers' labor market decisions, specifically personal

preferences for advantaged schools, are associated with individual characteristics, such as gender,

age, and teaching experience, (e.g., Kukla-Acevedo, 2009). Varying levels of educational

inequality in different countries are also affected by the macro-level factors within those

countries (Kerckhoff, 2001). However, researchers have not extensively investigated macro-level

variables of the impact of national characteristics on teacher distribution. A few national

variables contributing to the differences in teacher quality distributions across countries have

been examined, including levels of socioeconomic equality (Mestry & Ndhlovu, 2014), the level

of teacher shortage (Luschei, Chudgar, & Rew, 2013), and centralized or localized educational

decision-making (Akiba et al., 2007).

A state with greater socioeconomic equality may be more-equally allocating its

educational resources (Chiu & Khoo, 2005; Chudgar & Luschei, 2013; Luschei & Chudgar,

2017); moreover, international evidence suggests positive association between the allocation of

educational recourses and student achievement (e.g., Chiu, 2007; PISA, 2012). Therefore, it is

plausible that the relationship between socioeconomic equality and student achievement maybe

attributable to a more-equitable distribution of teacher quality across student socioeconomic status (Luschei & Chudgar, 2016). In this study, we hypothesized that countries with higher income inequality have larger gaps of teacher distribution between economically disadvantaged and advantaged students.

Teacher shortages have been found to adversely influence economically-disadvantaged students' access to higher-quality teachers (Ingersoll, 2003; Schmidt, Zoido, & Cogan, 2013). Many countries constantly struggle to place quality teachers in schools where they are most needed (UNESCO Institute for Statistic, 2016). PISA 2009 results indicate that, with few exceptions, such as Turkey, Slovenia and Israel, low-SES schools in most OECD have teachers without a degree in their relevant subject (OECD, 2010). In this study, therefore, we hypothesize that teacher quality distribution gaps will be greater in countries where teacher shortage is a greater challenge.

The degree of centralization in educational decision-making can also be an influential factor in the differences of teacher distribution (Akiba et al., 2007).The movement toward more-localized school autonomy has become a global phenomenon (Gunnarsson, Orazem, Sanchez, & Verdisco, 2004). In some developed countries (e.g., Sweden, Netherlands, & New Zealand), there is no standard or regulation on teacher qualifications and evaluation at the national or state level. In recent years, some developing countries, such as Brazil, Chile, and India, have also gradually given more powers to some schools (OECD, 2013).

Studies have indicated that centralizing decision-making authority over teacher hiring and assignments can enhance the efficiency of public schools (Naper, 2010; Woessmann, 2001) and improve overall student performance (Fuchs & Woessmann, 2007). Conversely, more-localized

decision-making provide circumstances that may exacerbate inequalities in students' access to educational resources (Fuller, Elmore, & Orfield, 1996).

Empirical evidence supports the notion that centralized teacher-hiring systems result in more-equitable teacher allocations by placing a greater proportion of more-qualified teachers in historically-underserved communities (Luschei, Chudgar, & Rew, 2013). Therefore, in this study, we hypothesized that the countries with decentralized personnel recruitment and management may have greater disparities in teacher qualifications.

Data

The primary data source for this study is the 2013 Teaching and Learning International Survey (TALIS). The OECD (2014a) conducted the TALIS study with a focus on teacher work conditions and school learning environment. The data set contains rich information about school characteristics and demographic information on the teachers and principals across participating countries. In the current study, we have focused solely on the public schools in each country in an effort to identify policy levers that governments can plausibly influence since governments have much more authority to govern public schools.

The target population of TALIS 2013 is ordinary school International Standard Classification of Education (ISCED) Level 2 teachers (i.e., lower-secondary education) and the principals of those schools. Teachers working with children with special needs were included as long as they were in "regular schools". Substitute, emergency, or occasional teachers, and the teachers teaching adults were excluded from the survey. The teaching support staff, such as guidance counselors, librarians, other school support staff (e.g. nurses, psychologists and social workers) who are not considered to be teachers are excluded from the TALIS population (OECD, 2014b).

TALIS 2013 followed a stratified two-stage sampling probability design. For the first sampling stage, a minimum of 200 schools were the randomly selected within each country. In the second stage, a minimum of 20 teachers from the list of in-scope teachers were randomly selected from each participating school. In order to collect information on school-classrooms, surveyed teachers were instructed to use the first class taught in their school after 11 am on Tuesday, in order to maintain consistency in how teachers identified reference classrooms and more likely provide a representative sample of classrooms within a school. This random sampling and survey processes provide estimates that are representative for the participating countries' educational communities (OECD, 2014a). The total sample size of this study is 86,405 teachers in 5,242 schools across 32 countries; 43% of these teachers taught math or science, and 29% taught reading.

Furthermore, we used sampling weights to more-accurately estimate variance and standard errors and to account for the unequal probabilities of participant selection (OECD, 2014a). We employed the final teacher and school weights, along with the Balance Repeated Replicate weights in all analyses, using data files generated from the IDB (International Database) Analyzer. Specifically, the TALIS weights enable us to scale estimates from the individuals included in the study to the national population from which they were drawn. The final weight is the combination of many factors. The final school weights used in this study contain both school base weight (the design weight) and a non-response adjustment factor. The final teacher weights include the school base weight, non-response adjustments, incidental inclusion adjustment and multiplicity adjustment factor. Each teacher and school have been assigned a specific weight and the final weights reflect how many population schools/teachers are represented by a sampled school/teacher Because the school and teacher weights have been simultaneously used in the

study, the final teacher weight was divided by the school estimate weight to exclude the school estimate weight from the final teacher weight.

The use of weights depends on the research purpose, design, and the type of outcome (Thomas, Heck, & Bauer, 2005). The international data, such as TALIS, are used to examine characteristics and trends in the broader populations of schools and teachers and/or to draw comparisons between countries. Like many other cross-national comparative studies, this study focuses on the characteristics of the total underlying population rather than the samples and the results; for example, the totals, means and proportions should reflect the population values (Rutkowski, Gonzalez, Joncas, & von Davier, 2010). Weighting affects the scale of cases and the proportion of each case relative to others, which may differ from weighted estimates; however, weighted analysis yields more precise results (Ciol, Hoffman, Dudgeon, Shumway-Cook, Yorkston, & Chan, 2006; TALIS, 2013; Thomas & Heck, 2001).

For the measures of teacher qualification, the dataset includes variables that indicate teaching experience and whether the teacher instructs in his or her field of training. For teaching experience, teachers were asked "How many years of teaching experiences do you have in total?" Teachers' responses were then coded as being "novice teachers" if they reported that they had three years or less of teaching experience. For out-of-field teaching, the survey asked teachers to indicate the subjects included in their formal education or training, including his/her Bachelor's degree or above and the subject specialization as part of teacher education. In this study, if the courses they were currently teaching did not match with the academic background they had reported, then they were identified as having taught "out-of-field." (OFT) Because the proportion of OFT typically varies substantially across subjects, especially in science and math, which tend to have more out-of-field teachers (Nixon, Luft, & Ross, 2017), this study has disaggregated

OFT by subject matter. Similar to Zhou (2014), we restrict these analyses to math and science OFT and the subject of reading, writing and literature (which we simply refer to as "reading" herein).

We also considered teachers' education level as one of the qualification measures. However, this measure was not included due to the lack in variation of the highest level of formal education in so many countries. On average, across all 32 countries, 92% of the teachers reported the highest level of formal education they had received were ISCED Level 5A (the International Standard Classification of Education's rough equivalent to a bachelor's degree), 3% on ISCED Level 5B (roughly equivalent to Associate's degree), 2% on Below ISCED level 5 (roughly equivalent to a degree of high School) and 1% on ISCED level 6 (roughly equivalent to a degree of master). Of the 32 countries, there are 26 countries that have over 95% of teachers who have completed ISCED Level 5A, and there is a very small portion of teachers who have a degree below ISCED level 5 ($\leq 1\%$). To measure student disadvantage, TALIS 2013 defines "socio-economically disadvantaged homes" as those "lacking the basic necessities or advantages of life, such as adequate housing, nutrition or medical care." (OECD, 2014c, 95). These homes receive, or are eligible to receive, subsidies or other welfare benefits. In some countries, the disadvantaged homes may refer to those that are eligible for "free school meals, in others to those that get housing allowance, or other social assistance" (OECD, 2014c). One of the questions in TALIS 2013 asked principals to identify the proportion of students that come from high-needs groups. For students from socioeconomically disadvantaged homes, the response categories included none, 1% to 10%, 11% to 30%, 31% to 60%, and more than 60%. Because the proportion of schools reportedly had more than 60% of students from socioeconomically disadvantaged homes were very low in the most of the countries, TALIS combined the two top

categories (31% to 60%, and more than 60%) and classified this as a high-needs school (or low-SES schools in the current study) (OECD, 2016b).

Principals' responses indicate significant variation across countries; for example, some countries reported having no schools with more than 60% low-SES students (e.g., Poland, Netherlands, Korea, and Japan), and France reported not having schools without low-SES students. Based on the TALIS 2013 instruction and descriptive results, we created dummy variables on school status. We coded schools as "low SES schools" if the school fell either into the category of 31% to 60% or more than 60%, and we coded the schools in the category of none, 1% to 10%, 11% to 30% as "high SES schools".

Similarly, in the TALIS Teacher Questionnaire, teachers were asked to specify the percentage of high-needs students in their primary teaching classroom. Teachers were provided the same description of "socioeconomically disadvantaged homes" as principals (TALIS 2013 Principal Questionnaire, p. 8; TALIS 2013 Teacher Questionnaire, p. 21). Since teachers' response categories also ranged from none to more than 60%, and there was a relatively small portion of classrooms that had more than 60% of socio-economically disadvantaged students, the two categories, (31% to 60%, and more than 60%) were combined into the category of high socio-economically disadvantaged classroom (low-SES classroom in the current study). Regarding classroom-level student characteristics, TALIS 2013 asked teachers to respond to questions based on their personal perceptions and rough estimates (OECD, 2014c). Despite of the imperfect method, a correlation analysis confirms that the teachers from low-income schools were more likely to report teaching in low-income classrooms than teachers from high-income schools (Pearson r=.51, *p=.000*). Similarly, we coded the classrooms as "low SES classrooms,"

if the classroom fell into the category of 31% to 60% or more than 60%. We coded the classrooms in the category of none, 1% to 10%, 11% to 30% as "high SES classrooms".

For national context variables that plausibly pertain to the distribution of teacher quality, we use the OECD (2013) measures of teacher shortage and school autonomy measures and the World Bank's (2013) Gini-coefficient of inequality. The country-level control variables included in these analyses are the Human Development Index's (2015) gross domestic product (GDP) and Education at a Glance's (2014) educational expenditures.

To measure school autonomy, TALIS asked principals to indicate the extent to which they made school-level governing decisions, which included items about the extent to which they made staffing decisions. Regarding country-level teacher shortages in each country, TALIS survey collected data from principals about whether the shortage of qualified and/or high-performing teachers in their school had hindered their ability to provide quality instruction. Average country-level responses ranged from 77.5% in Japan to 12.9% in Poland in terms of the percentage of principals whom selected "to some extent" or "a lot". Although the principals' responses to this question cannot easily be taken at face value, especially principals across countries may have very different criteria or perceptions on what constitutes a teacher shortage, they can be at least viewed as valuable information reflecting the perception of teacher shortages taking place. The Gini coefficient of inequality is the most commonly used measure of income inequality around the world. A Gini coefficient of zero represents perfect income equality, while an index of 1 indicates complete income disparity among values. The data of Gini index were collected from the World Bank (2013). Table 1 presents the country-level data of these national-level predictors.

Table 1 Description of the national variables

Country	School Autonomy[a] (N=32)	Teacher Shortage[a] (N=32)	Gini coeff. of inequality[b] (N=30)	GDP 2012[b]	Government Expenditure (% of GDP) 2005-2014[c]
Australia	20.9	47.6	32.6	57, 045	4.0
Belgium	63.0	36.5	26.8	42, 278	5.1
Brazil	3.5	47.6	52.7	39, 498	6.5
Bulgaria	96.0	29.3	36.0	15, 738	3.5
Canada	24.5	30.5	32.0	14, 301	5.8
Chile	11.3	62.6	47.0	40, 588	5.3
Croatia	9.6	24.0	32.0	21, 099	4.6
Czech Republic	97.1	29.4	26.5	26, 733	4.5
Denmark	27.0	15.2	28.5	41, 524	8.7
England	24.5	42.7	33.2	34, 694	6.0
Estonia	55.7	47.0	35.1	31, 198	5.0
Finland	25.0	20.8	27.2	24, 195	5.2
France	1.9	27.3	32.5	38, 104	6.8
Israel	50.4	56.9	41.4	36, 074	5.7
Italy	26.7	40.7	34.9	19, 946	4.2
Japan	.9	77.5	32.1	30, 600	5.6
Korea	8.3	30.1	30.2	33, 668	4.3
Latvia	74.8	25.6	35.5	35, 006	3.8
Malaysia	.60	33.8	46.3	29, 495	4.9
Mexico	.00	61.4	45.4	21, 229	4.9
Netherlands	34.7	32.4	28.1	16, 144	5.1
Norway	36.6	45.7	26.2	21, 897	5.9
Poland	75.9	12.9	32.5	42, 453	5.9
Portugal	25.7	30.2	36.2	62, 858	7.4
Romania	.30	60.0	27.5	22, 143	4.9
Serbia	26.4	19.6	29.0	25, 096	5.3
Singapore	6.7	50.5		17, 234	3.1
Slovak Republic	91	31.8	28.1	71, 475	2.9
Spain	.0	39.1	36.2	11, 587	.10
Sweden	67.9	33.7	27.8	25, 537	4.1
United Arab Emirates	1.2	63.9		41, 840	6.8
United States	27.4	32.3	41.0	50, 859	5.2
MEAN	31.7	38.7	34.0	32, 566.7	5.0
(SD)	(30.6)	(15.5)	(6.9)	(14276.8)	(1.5)

a. Data collected from TALIS 2013;
b. Data collected from the World Bank (2013);
c. Data collected from the OECD Education at A Glance (2015).

Methods

This study mirrors the approach of Goldhaber et al. (2015). We first focus on the differences between low-SES and high-SES groups in the probability of being taught by a less-qualified teacher in each country. We have separated each country's exposure gaps into classroom and school levels. The reported total exposure gap by country is the sum of the between- and within-school levels.

We calculate the "exposure rate" of low-SES classrooms and school to less-qualified teachers for each measure of teacher quality. The probability that a low-SES classroom and school is taught by a less-qualified teacher can be expressed as follows:

$$E_{LS}(\bar{T}_{jk}) = \frac{\Sigma_j \Sigma_k LS_{jk} T_{jk}}{\Sigma_j \Sigma_k LS_{jk}}$$

Where LS_{jk} is the indicator for low social-economic status of classroom j within school k; T_{jk} is an indicator of a less-qualified teacher; the numerator of $E_{LS}(T_{jk})$ is the total number of low-SES classrooms with a less-qualified teacher, and in the denominator is the total number of low-SES classrooms. In each combination of teacher qualification indicator and social-economic status of classroom, $E_{LS}(T_{jk})$ is the percentage of low-SES classrooms that are assigned to a less-qualified teacher within school.

The comparable exposure rate for high-SES classroom is calculated as follows:

$$E_{HS}(\bar{T}_{jk}) = \frac{\Sigma_j \Sigma_k HS_{jk} T_{jk}}{\Sigma_j \Sigma_k HS_{jk}}$$

Where HS_{jk} is the indicator for high social-economic status of classroom j within school k, and $E_{HS}(T_{jk})$, therefore, is the percentage of high-SES classrooms that are assigned to a less-qualified teacher. The overall exposure gap is defined to show the total difference in exposure rates to less-qualified teachers between low and high SES classrooms.

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We categorize the overall teacher qualification gap into two effects for each country:

$$\text{Gap}_{\text{overall}} \equiv E_{LS}(\overline{T}_{jk}) - E_{HS}(\overline{T}_{jk})$$
$$= [E_{LS}(\overline{T}_k) - E_{HS}(\overline{T}_k)] + \{[E_{LS}(\overline{T}_{jk}) - E_{HS}(\overline{T}_{jk})] - [E_{LS}(\overline{T}_k) - E_{HS}(\overline{T}_k)]\}$$
$$\equiv \text{Gap}_{\text{school}} + \text{Gap}_{\text{class}}$$

School effect:

$$\text{Gap}_{\text{school}} \equiv [E_{LS}(\overline{T}_k) - E_{HS}(\overline{T}_k)]$$

The school effect indicates the average difference in school-level exposure rates to less-qualified teachers between low-SES and high-SES schools.

Classroom effect:

$$[E_{LS}(\overline{T}_{jk}) - E_{HS}(\overline{T}_{jk})] - [E_{LS}(\overline{T}_k) - E_{HS}(\overline{T}_k)]$$

The classroom effect demonstrates the difference in exposure rates to less-qualified teachers between low-SES and high-SES classrooms, subtracting out the effect in average school-level exposure gaps. The effect indicates the gaps due to the differential assignments of low-SES and high-SES students across classrooms within schools. Thus, a positive classroom effect means that the classrooms with a high proportion of low-SES students are more likely to be assigned a less-qualified teacher than are the classrooms with low proportion of low-SES students within the same school. After computing all of the exposure gaps at the classroom and school level for each country, across the teacher qualification measures, we tested the correlations between the national predictors and the variations of teacher distribution between and within schools across countries using multiple regression.

After calculating differences in teacher distribution, we conduct regression analyses to predict relationships between national contexts and teacher distribution across countries. The variables of interest for these analyses are school autonomy, teacher shortage and income inequality at the country level. To improve the precision of these estimates, we also include

control for per capita GDP and government expenditures (% of GDP). Prior to this analysis, we constructed a correlation matrix to test multicollinearity (Field, 2009). The results of which indicated no serious issue regarding multicollinearity among the predictors as all the correlations were less than the criterion limit .80 (ranging from .01 to .49) (Field, 2009).

Results

Descriptive Evidence on Exposure Rates across Countries

Table 2 provides the proportions of low-SES classroom, schools and less-qualified teachers, by country. For each measure of out-of-field teaching, we have calculated the percentage of the OFT teachers of the total teacher population in that subject by country. There is substantial between-country variation in the percentage of low-SES schools and classrooms (Mean $_{classroom}$=18.3, SD=14.1; Mean $_{school}$=26.5, SD=22.9). The surveyed countries also vary significantly with our measures of teacher quality, the share of novice teachers ranged from 0.7% in Portugal to 28.6 % in Singapore, OFT teaching in math and science ranged from 4.9% in Portugal to 42.5% in Belgium, and OFT teaching in reading ranged from 3.7% in Chile to 43.9% in Belgium. It is worth noting that all of the countries, to some extent, have out-of-field teachers in the studied subjects and the out-of-teaching were more pervasive in some countries (E.g., Denmark, Korea, and Belgium) than others (e.g., Portugal, Israel and the United States). These descriptive statistics also indicate that, on average, there is no relationship between low-SES status and teacher qualification indicators across the participating countries. In other words, the countries with a high proportion of low-SES schools and classrooms do not necessarily have a high proportion of less-qualified teachers (e.g., Chile, Portugal and the United States).

Table 2 The proportions of low-SES schools and classroom by country (%)

Country	Low-SES Schools	Low-SES Classrooms	OFT Math & Sci. Teachers	OFT Reading Teachers	OFT Novice Teachers
Australia	37.12	29.12	15.77	26.88	11.56
Belgium	34.19	24.33	42.49	43.99	13.86
Brazil	44.79	44.1	17.65	16.24	8.58
Bulgaria	28.21	17.56	19.83	15.26	4.09
Canada	24.57	19.66	17.69	9.69	12.82
Chile	84.45	51.07	6.01	3.74	14.22
Croatia	8.09	5.70	27.31	16.78	9.49
Czech Republic	4.66	5.37	13.84	8.53	8.22
Denmark	1.17	7.35	27.33	32.88	5.32
England	29.86	28.76	15.93	19.73	14.98
Estonia	14.06	9.21	14.93	14.95	5.95
Finland	2.13	6.79	12.09	16.01	9.85
France	57.83	26.78	7.44	11.34	5.35
Israel	48.29	18.28	15.04	17.7	11.53
Italy	6.88	7.54	18.85	12.56	2.43
Japan	5.98	4.62	15.29	15.58	11.39
Korea	11.62	6.86	27.56	35.71	10.93
Latvia	26.09	7.65	14.23	14.22	2.77
Malaysia	58.21	35.89	13.79	18.56	11.81
Mexico	57.53	45.61	20.94	22.45	5.99
Netherlands	11.74	9.43	23.92	22.48	15.67
Norway	4.53	2.85	12.13	17.39	13.64
Poland	21.48	11.45	8.92	13.26	4.22
Portugal	48.96	29.96	4.96	5.59	0.70
Romania	30.51	23.45	14.52	8.57	8.52
Serbia	5.85	8.14	23.95	12.04	9.41
Singapore	8.49	15.49	8.49	7.47	28.58
Slovak Republic	12.55	12.18	17.59	21.84	9.16
Spain	14.87	11.50	7.33	7.42	1.94
Sweden	8.43	8.02	17.06	23.99	5.33
United Arab Emirates	13.62	3.26	9.32	9.31	2.11
United States	80.9	47.04	7.03	4.85	13.81

Figures 3 and 4 report the large variations across countries in their exposure rates to less-qualified teachers. For both low- and high-SES classrooms and schools, some countries have relatively large exposure rates in comparison with others. For example, the exposure rates to

novice teachers ranged from 27.7 % in Singapore to .6 % in Portugal for low-SES schools, and

from 29.2 % in Singapore to .8 % in Portugal for high-SES schools. Secondly, some countries

showed significant disparities in exposure rates between low- and high-income groups,

especially at classroom level. For example, in Denmark, students in low-SES classrooms are

more likely to experience math and science OFT (with an OFT rate of 34.65%) than those in

high-SES schools (16.5%). In addition, some countries, such as United Arab Emirate and

Norway, had relatively wider confidence intervals than other countries did due to the small

sample size at their low-income groups.
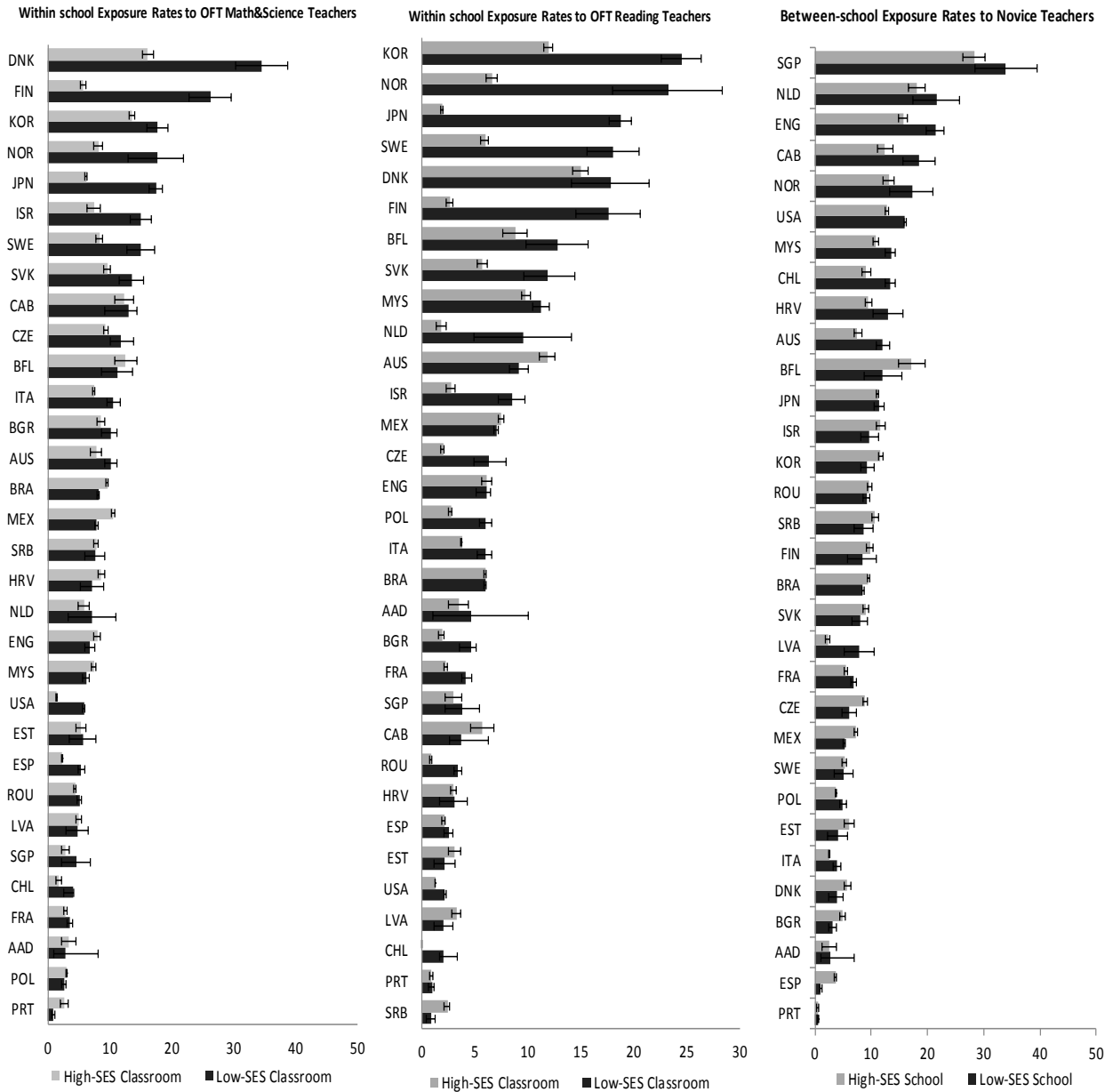
Figure 3 Exposure rates to less-qualified teachers within school by country
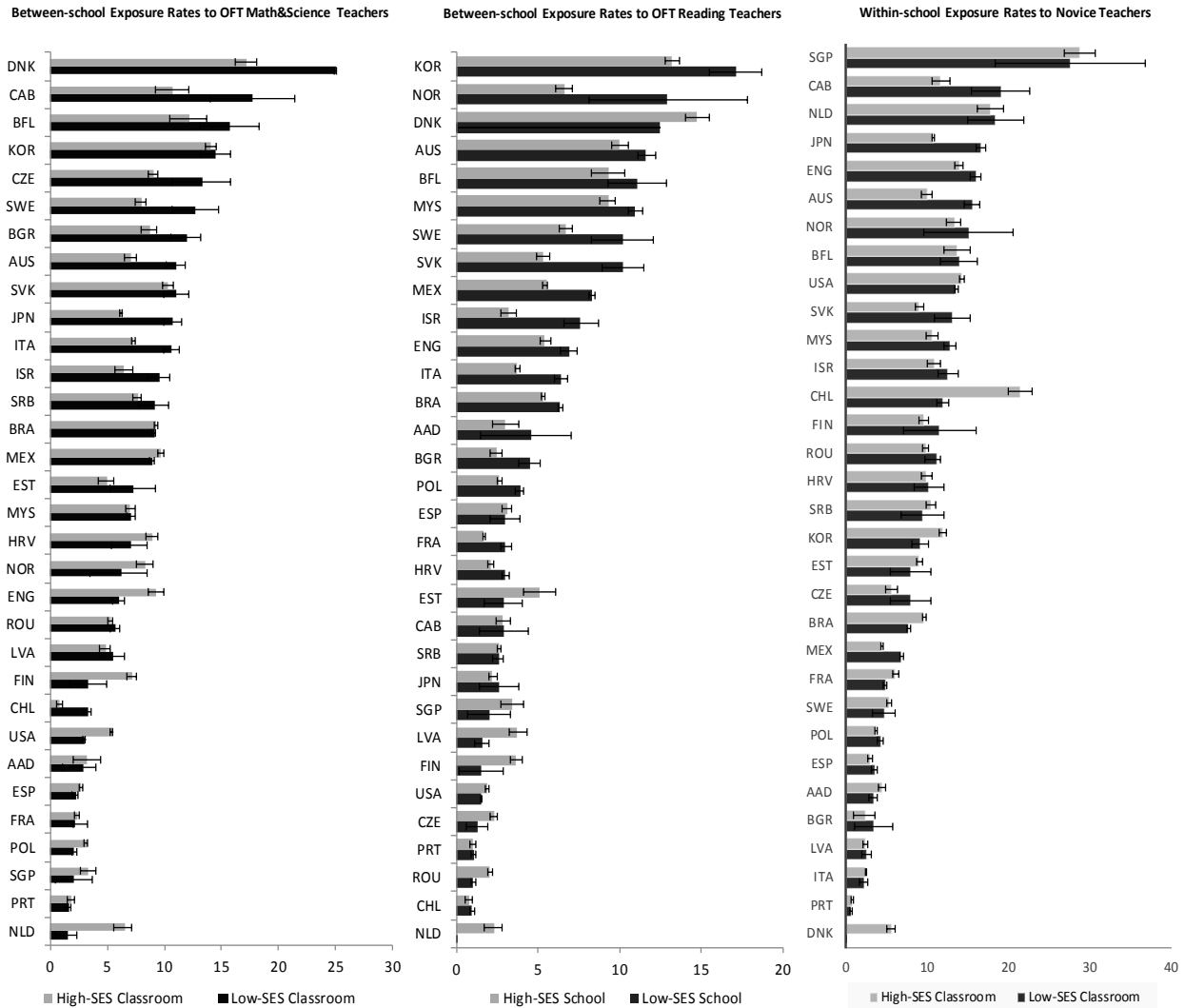
Figure 4 Exposure rates to less-qualified teachers between schools by country

The overall exposure rates at both classroom and school level across all 32 countries and for all the measures of teacher qualifications are presented in Figure 5. On average, students attending classrooms and schools with higher proportions of low-income students are more likely to have less-qualified teachers. The differences at classroom level are larger than those at school level, especially with math and science and reading OFT.
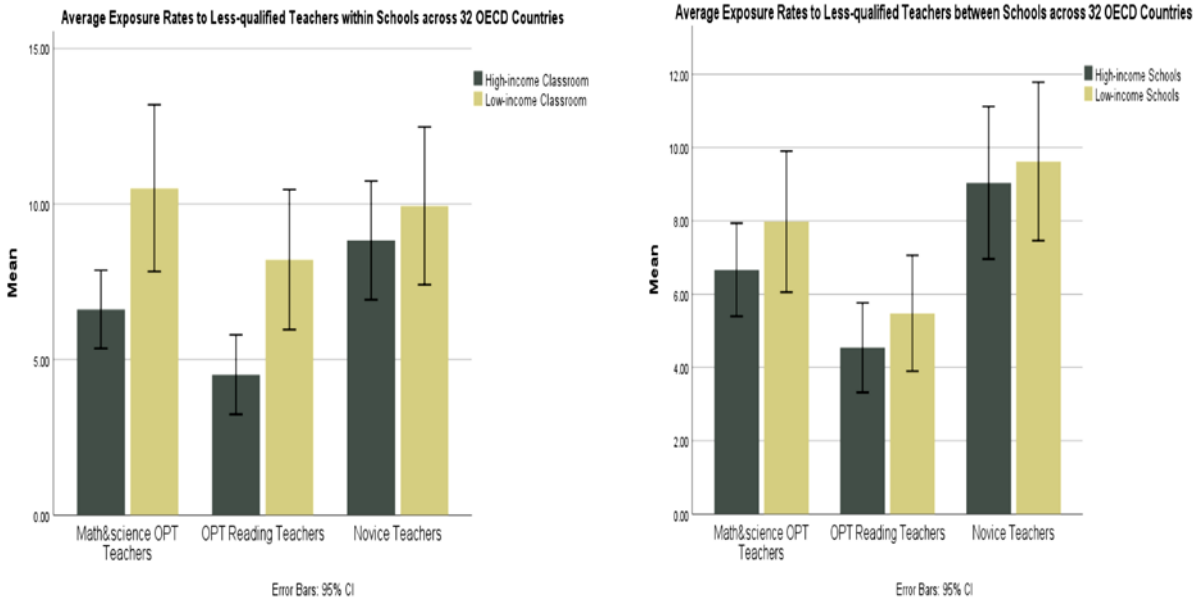
Figure 5 The total exposure rates to less-qualified teachers across 32 countries

Between-Exposure and Within-Exposure gaps

Figure 6 illustrates the exposure gap for both low-SES and high-SES classrooms and schools for each country (the left side of the graph), as well as the mean values of total exposure gaps across countries (the right side of the graph). The figure shows the differences in percentage of low-SES and high-SES classrooms and schools with less-qualified teachers. The positive exposure gap means that the classrooms and schools with a high proportion of low-SES students are more likely to have a less-qualified teacher. On average and across most countries, the exposure gaps in OFT are larger than for novice teacher distribution.

For many countries, the sizable positive gaps persisted between low-and high-SES schools and classrooms. In addition, the exposure gaps vary significantly with the measures of teacher qualifications, across countries. We have also broken down the total exposure gaps into classroom- and school-level for each teacher indicator. The light blue bar represents the exposure gap attributable to student and teacher sorting across classrooms within school, while the dark

blue bar represents the exposure gap due to student and teacher sorting across schools within the country. As shown in Figure 6, a distinction is made between the variance attributable to the differences in total exposure gaps associated with between-school differences and within-school differences for each country. The longer bar at the school level indicates greater between-school effect while longer bars at classroom level indicate greater within-school effect. On average, within-school distribution accounts for a greater share of the total gaps for the measures of OFT. For many countries, the exposure gaps to out-of-field teachers at classroom level (i.e., within school) are larger than the gaps at school level (i.e., between schools).

While the OECD averages on the between-school exposure gaps are relatively small, each of the gaps appears to have been larger for some countries (e.g., Norway and Slovak Republic for reading OFT, Canada for math and science OFT, Canada and Japan for novice teachers), and smaller for others (e.g., Mexico and Portugal for math and science OFT; Chile and Denmark for novice teachers; Denmark and Latvia for reading OFT). Furthermore, there is no statistically significant relationship between the exposure gaps across and within schools (Pearson r=.22, *p=.23*for math and science OFT; Pearson r=.14, *p=.43* for reading OFT; Pearson r=-.03, *p=0.88* for novice teachers*),* meaning that countries with smaller exposure gaps across schools do not necessarily have a smaller gap within schools.

The results from this analysis also suggest that the between- and within-school gaps can strengthen or offset one another. Gaps appear to reinforce one another if both the low-income classrooms and schools have more less-qualified teachers in a country (both the classroom and school bar are positive as shown in the Figures 6). For example, the between-school gap to OFT reading teachers in Norway is 6.32% and the within-school gap is 10.32, then the total gap becomes 16.63. On the other hand, the between- and within-school gaps could also offset one

another. For instance, while Japan's between-school gap to novice teachers was 5.7%, its within-school gap was -5.45 and the total exposure gap was .25 %. That is, the low-SES schools were 5.7% more likely than high-income schools to be taught by a novice teacher, while the low-SES classrooms in those schools tend to be assigned to more-qualified teachers than high-SES classrooms.

It is worth noting that the countries with a smaller percentage of less-qualified teachers do not necessarily guarantee a smaller exposure gap. The correlation analysis indicates no significant relationships between a country's proportion of less-qualified teachers and its exposure gaps (see Table 3.). Some countries with a small proportion of less-qualified teachers still have relatively large exposure gaps between low-SES and high-SES students. For example, the percentage of math and science OFT teachers in the United States is 7% (OECD $_{mean}$=16.2, SD=7.87), while its within-school exposure gap is 8.01 % (OECD $_{mea}$=2.23, SD=4.55). Singapore, by contrast, has 28.6 % of novice teachers, while its exposure gap of .02 % indicated that low-SES schools were not more likely to have a novice teacher than high-SES schools are. This might imply the potential contextual effects on teachers' distribution across students.

Table 3 The correlations between the percentages of less-qualified teachers and exposure gaps

	Within-school Gaps		Between-school Gaps	
	Person r	P	Person r	P
OFT math & science teachers	-.11	.57	.38	.14
OFT reading teachers (%)	.14	.43	.30	.11
Novice teachers (%)	.31	.09	.00	.99

Exposure Gaps to OFT Math & science Teachers by Country
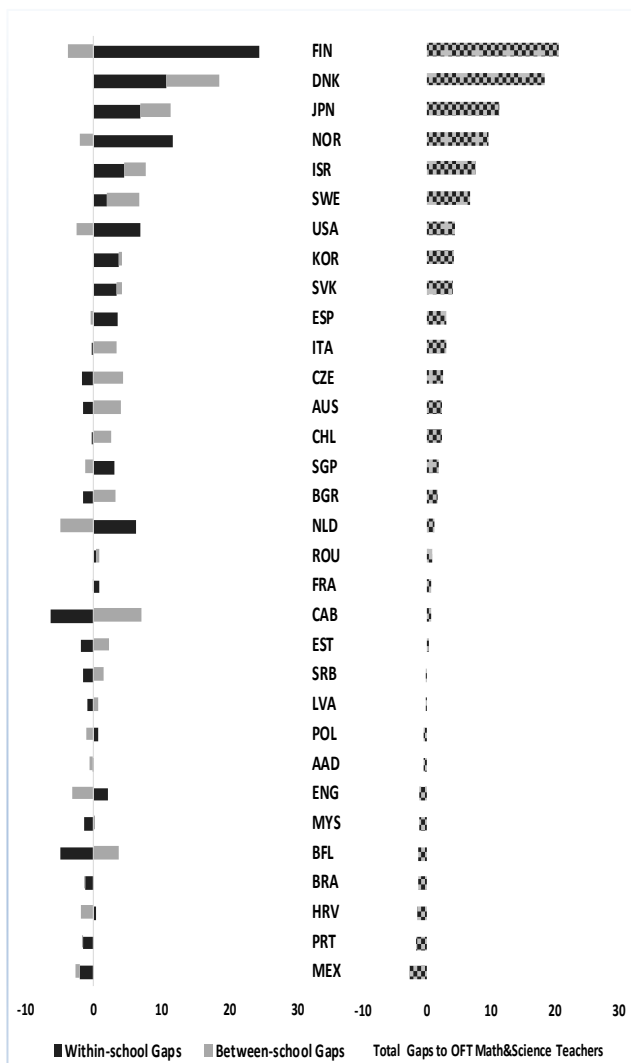
Exposure Gaps to OFT Reading Teachers by Country
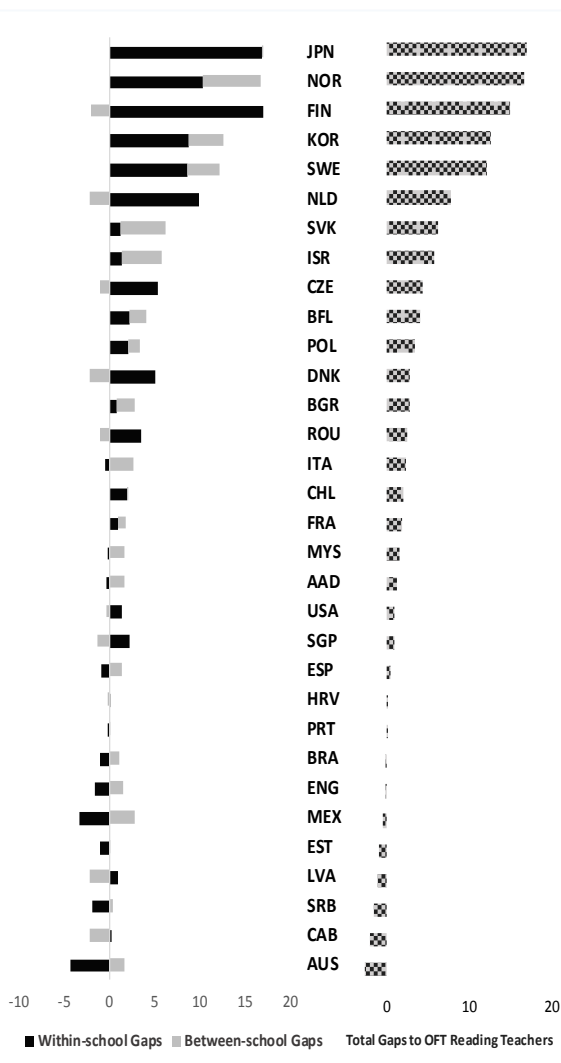
Exposure Gaps to Novice Teachers by Country
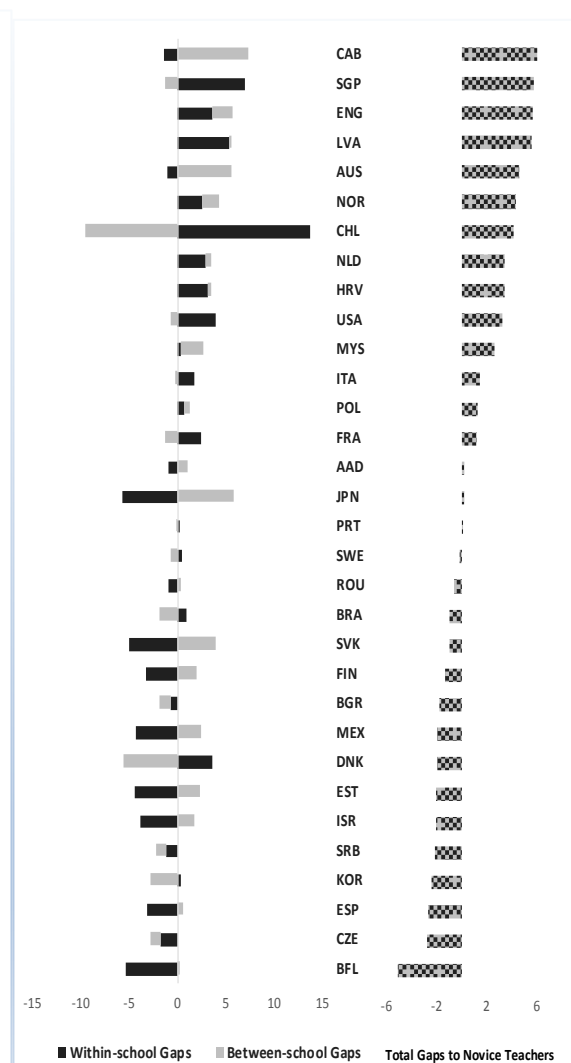
Figure 6 Exposure gaps to less-qualified teachers by country

Teacher Distributions and National Contexts

As shown in Table 4, there was a significant correlation between income inequality and the exposure gaps to OFT reading teachers at the classroom level. The exposure gaps to OFT reading teachers at classroom level are smaller in the countries with a higher level of income inequality. In other words, it appears as though OFT reading teachers sorting within schools tend to be more equal in the countries with high income inequality.

Table 4 Relationship between exposure gaps to less-qualified teachers and national contexts

		Between-school Gap			Within-school Gap		
		OFT math & science teachers	OFT reading teachers	Novice teachers	OFT math & science teachers	OFT reading teachers	Novice teachers
School Autonomy(N=32)	Beta (SE)	-.21(.03)	.17(1.2)	-.12(1.5)	.31(0.3)	.33(2.3)	.09(.02)
Teacher Shortage(N=32)	Beta (SE)	-.04(.08)	-.04(.04)	-.15(.05)	.32(.10)	.08(.81)	.05(.05)
Gini-coefficient of Inequality(N=30)	Beta (SE)	-.32(.21)	-.33(.10)	-.02(.16)	-.17(.23)	-.51(.17)**	-.23(.12)
GDP Per Capital (N=32)	Beta (SE)	.21(.00)	.67(.00)	.54(.00)*	.22(.00)	-.11(.00)	.43(.00)
Government Expenditure (% of GDP) (N=32)	Beta (SE)	.19(1.01)	-.23(.44)	-.44(.55)*	.19(1.03)	.26(.86)	-.37(.55)

*p<0.1; ** p<0.05

Note: there is no information for Gini-coefficient for Singapore and United Arab Emirates.

Limitations

This study involves some limitations. First, there are concerns regarding this study's socioeconomic status variable. The socioeconomic status of school and classroom relies on the information provided by principals and teachers. Therefore, the precision of the estimate depends on their knowledge regarding their students' socioeconomic statuses. The concern with this

approach is that inaccurate measurement of student SES could result in biased estimates of the distribution of low-SES students (Chudgar & Luschei, 2009). Furthermore, even though the TALIS 2013 survey provided a consistent definition of "socio-economically disadvantaged homes" to all of the OECD countries, different countries, as well as the respondents, might have different understandings and benchmarks when applying this SES description. Thus, caution is required in interpreting these results.

Our study is also limited to the measures of teacher qualifications (teaching experiences and out-of-field teaching) available in the TALIS 2013. Ideally, we would be able to corroborate these measures of teacher quality with student outcomes, such as standardized test-score achievement, but such data are not available in TALIS 2013.

There are also lingering concerns regarding the fact that classroom-level data were collected from a sample constructed at the teacher level. Teachers at these grade levels often provide instruction with different students, which may significantly and substantially alter the composition of classroom students that a given teacher instructs. In order to ensure the representativeness of the samples, the teacher population has been sampled within the more-narrowly defined TALIS's scope. According to the TALIS scope of teachers, the sampled teachers should teach in regular schools and regular classrooms. Moreover, teachers were provided fairly clear, straightforward instruction about identifying a particular reference classroom, which should reduce bias that may stem from how teachers might other identify a reference classroom for when they provide school-classroom data. However, the representativeness of the studied classrooms for the population of interest remains subject to some concern. We assume that the classrooms the sampled teachers were teaching should fairly represent the whole classrooms of the school after applying the sampling weights to the analysis.

Another limitation of the study is the national predictors to teacher distributions. The lack of differentiation between- and within-school effects on teacher distribution in the previous literature has limited the analysis of national predictors. That said, compared with research on contributors of between-school distribution inequality, there is a dearth of research on how contextual factors relating to within-school sorting are different from the factors associated with between-school sorting. Regarding the within-school inequality of teacher distribution, more research should be conducted in terms of the prevalence of non-random student assignment and how it potentially creates inequity teacher distribution within school.

Discussion

This cross-national study has investigated how different measures of teacher quality, as determined by qualifications, are distributed across student socioeconomic status. The magnitude of the exposure rates and gaps with respect to the measures of teacher qualifications vary remarkably across countries. While some countries are more successful in equalizing teacher distributions than others (e.g., Portugal, Bulgaria and Singapore), others have relatively large exposure gaps between low-SES and high-SES schools and classrooms. That is, every measure of teacher qualification is inequitably distributed across social economic status at both the classroom and school level across many participating countries. In addition, both some high-performing countries (e.g., Finland, Japan, and Netherlands,) and low-performing countries (e.g., Abu Dhabi, Brazil, and Chile) could have relatively large exposure gaps at classroom or school level. However, it is worth noting that there are few countries, such as Bulgaria, Portugal and Serbia, the magnitude of the exposure gaps with respect to all teacher measures across both the school and classroom level is consistently low or even negative.

We separated the effect into between-school and within-school components to examine the extent to which the exposure gap is due to the sorting of students and teachers across schools or to the assignment of students and teachers within schools. Although the magnitudes of the effects (classroom and school) vary significantly by country and by measures of teacher qualification, in general the within-school exposure gaps are larger than between-school exposure gaps, especially for OFT. These findings suggest that the unequal exposure to less-qualified teachers in some countries depends more on less-qualified teachers being assigned to classrooms with high proportion of low-SES students than on less-qualified teachers teaching low-income schools.

It is noteworthy that, some, though not all, high-income and high performing countries (e.g., Finland, Sweden, Norway and Korea) have relatively large exposure gaps to the measures of OFT within schools, even though most of them had relatively low or negative exposure gaps at school level. In contrast, while Belgium ranked highest in the proportion of OFT, its exposure gaps, especially within-school exposure gaps were markedly small. This finding may signal specific issues surrounding the sorting of OFT across classrooms, within schools, in these countries. Additional studies are needed to further assess how a country's teacher policies and/or other related contextual factors might influence OFT sorting within schools.

A potential reason for the relatively large within-school gaps in some countries might be due to non-random student and/or teacher assignment practices which have been documented (Burns & Mason, 1998; Rothstein, 2010). Research has confirmed that school accountability requirements often pressure schools to assign effective teachers to low-achieving students, a category usually correlated with socioeconomically disadvantaged students (Grissom, Kalogrides, & Loeb, 2015; Kalogrides, Loeb, & Béteille, 2013). The findings of this the study has also

suggested that the less-experienced or out-of-field teachers are seemingly more likely to be assigned to teach the classrooms with high concentrations of low-income students.

Similar to some US studies, this study found that the inequities in teacher distribution existed between schools within some countries (e.g., Clotfelter, Ladd, & Vigdor, 2005). Low-SES schools were more likely than affluent schools to have higher percentages of less-qualified teachers. Different from within-school gaps, the school level inequality of teacher distribution suggest that the less-qualified teachers may be disproportionately assigned to disadvantaged schools, which can be a systematic issue requiring larger policy attention and intervention.

Nonetheless, non-random student and/or teacher assignments appear to systematically disadvantage high-needs students (Clotfelter, Ladd, & Vigdor, 2005). The PISA results have consistently documented large within-school variance as a proportion of average OECD total variance for math performance, ranging from 67% in 2003, 63% in 2012, to 69% in 2015 and the performance variation in higher-performing countries are greater than in the lower-performing countries (PISA, 2003, 2012, 2015). In addition to individual teacher characteristics, the unequal teacher distribution across classrooms, within schools, may also contribute to the substantial performance differences observed within schools. We tentatively linked the within-school exposure gap to math and science OFT to the within-school variance of math performance in PISA 2012. The result showed statistically significant relationship between them (Pearson r=.30, $p < .001$, 95% CI [54.1, 66.0]), some countries with large within-school variance in PISA math performance also have large within-school exposure gaps, such as Finland, Denmark, Norway and the United States (see Figure 7).
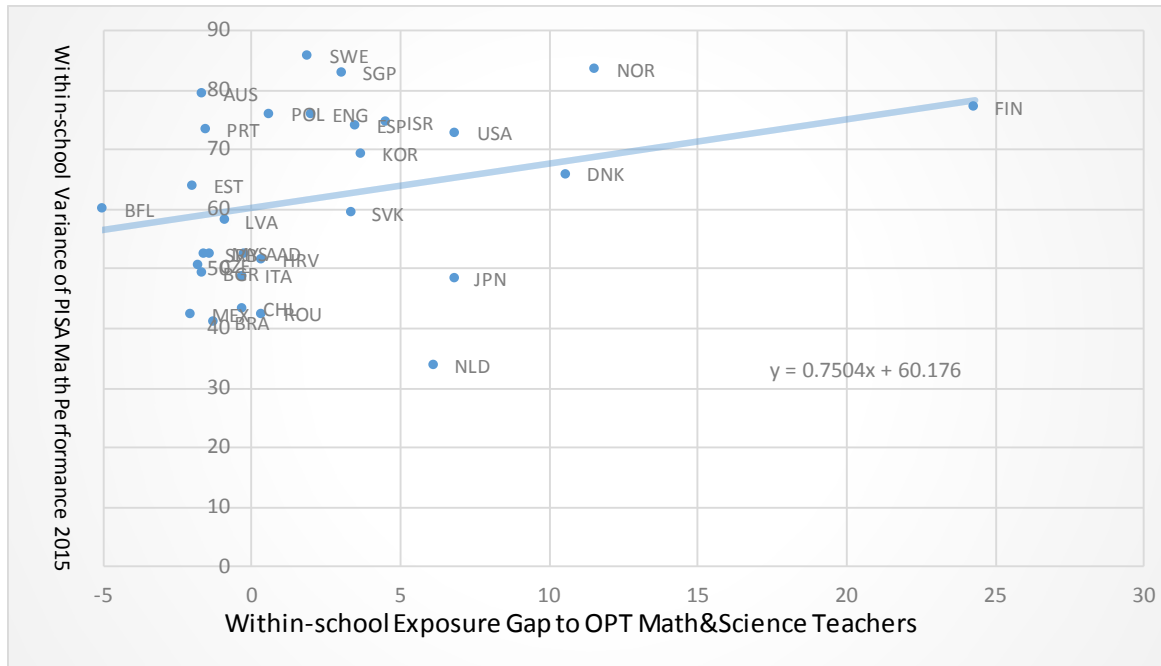
Figure 7 Correlation between within-school exposure gap to math & science OFT and within-school variance of math performance in 2012 PISA

A policy implication from these findings is that solely examining between-school exposure gaps may overlook critical within-school variation in teacher distribution. Additionally, when within-and between-school exposure gaps are positive, only focusing on between-school gaps may underestimate the overall total exposure gaps between low-income and high-income students. Many students may have to face the double drawback of coming from a low-income classroom and attending a disadvantaged school with lower-quality resources. Accordingly, the disparities of student achievement might be magnified by the variations in access to qualified teachers at both the school and classroom levels. Improving teacher distribution relies on both allocating teachers more-equally between, as well as within schools. In other words, policies that affect teacher sorting between schools might prove insufficient with regard to teacher sorting within schools (Thiemann, 2017). Consequently, more research focus should examine means for remedying within-school teaching distribution.

Country contexts may have contributed to the wide variations of the teacher distribution patterns across countries. The preliminary results of this study indicate that only income inequality was associated with OFT reading teacher distribution at classroom level. We find no significantly relationship between the distribution of teacher qualification by student SES and school autonomy and teacher shortage. A country's within-school exposure gap to novice teachers was negatively associated with a country's income inequality. The countries ranking high on income inequality have relatively lower levels of unequal teacher distribution at classroom level for the measure of reading OFT (e.g., Brazil, Mexico, and Israel). In these cases, low-SES students may benefit from more equal teacher distribution in terms of in-subject qualification. Conversely, in some more-disparate countries, the exposure gaps were relatively large compared with other unequal countries (e.g., Chile for within-school exposure gap to novice teachers). Low-income students under this circumstance may experience more disadvantages as limited high-quality teachers are skewed toward wealthier schools and classrooms (Chiu & Khoo, 2005; Chudgar & Luschei, 2009).

Conclusion

This study provides a comprehensive analysis of the inequitable distribution of input measures of teacher qualifications at the country, school, and classroom levels for OECD countries. The findings of this study suggest that the unequal teacher quality distribution is a widespread issue of public schools across countries.

The findings of the study suggest that teacher quality distribution throughout the world should not solely focus on the inequality of teacher quality as a whole but on both school and classroom variations. More investigation, however, is necessary to better identify how between- and within-school teacher-distribution variations across countries have contributed to the cross-

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national differences of student performance at both school and classroom level. Doing so may help us understand the relationship between student performance and teacher distribution across countries.

The significant differences in teacher distribution patterns may make the case for government's role in narrowing the gaps of teacher distribution especially in unequal and poor countries. While our preliminary analyses do not consistently identify national context variables that are predictive of variations in teacher distribution, the manner in which teachers are allocated to schools within country and to classroom within schools still have implications for the research and policy efforts on how to link positive teaching and learning conditions with educational outcomes. Understanding why some countries show narrow exposure gaps between social-economical groups can serve as an important key to educational equity. It requires an analysis that examines, in each country, the effects of factors on both exposure gaps within schools and across schools. Nevertheless, this study adds knowledge to the field through its unique, cross-national perspective.

References

Akiba, M. & LeTendre, G. (2009). *Improving teacher quality: The US teaching force in global context* .Teachers College Press.

Akiba, M. & Liang, G. (2014). Teacher qualification and the achievement gap: A cross-national analysis of 50 countries. *In closing the achievement gap from an international perspective*, 21-40. New York, NY: Springer.

Akiba, M., LeTendre, G. K., & Scribner, J. P. (2007). Teacher quality, opportunity gap, and national achievement in 46 countries. *Educational Researcher, 36*(7), 369-387.

Allen, R., Burgess, S. M., & Mayo, J. (2012). *The teacher labour market, teacher turnover and disadvantaged schools: New evidence for England CMPO*, Bristol Institute of Public Affairs, University of Bristol.

Allen, R., Burgess, S., & Mayo, J. (2018). The teacher labor market, teacher turnover and disadvantaged schools: New evidence for England. *Education Economics, 26*(1), 4-23.

Barbieri, G., Rossetti, C., & Sestito, P. (2011). The determinants of teacher mobility: Evidence using Italian teachers' transfer applications. *Economics of Education Review*, 30, 1430-1444.

Behrstock, E. & Clifford, M. (2010). Ensuring the equitable distribution of teachers: Strategies for school, district, and state leaders. TQ research, & policy brief. *National Comprehensive Center for Teacher Quality.* Retrieved from https://gtlcenter.org/sites/default/files/docs/EnsuringEquitableDistributionTeachers.pdf

Blomberg, S. & Knight, B. A. (2015). Investigating novice teacher experiences of the teaching dynamics operating in selected school communities in Finland. *Improving Schools, 18*(2), 157-170.

Boe, E., Shin, S., & Cook, L. (2007). Does teacher preparation matter for beginning teachers in either special or general education? *The Journal of Special Education*, *41*(3), 158-170.

Boyd, D., Lankford, H., Loeb, S., Rockoff, J., & Wyckoff, J. (2008). The narrowing gap in New York City teacher qualifications and its implications for student achievement in high-poverty schools. *Journal of Policy Analysis and Management, 27*(4), 793-818.

Buddin, R. & Zamarro, G. (2009). Teacher qualifications and student achievement in urban elementary schools. *Journal of Urban Economics, 66*(2), 103-115.

Burns, R. B. & Mason, D. A. (1998). Class formation and composition in elementary schools. *American Educational Research Journal, 35*(4), 739-772.

Caena, F. (2014). Teacher competence frameworks in Europe: Policy as discourse and policy as practice. *European Journal of Education*, *49*(3), 311-331.

Canales, A. & Maldonado, L. (2018). Teacher quality and student achievement in Chile: Linking teachers' contribution and observable characteristics. *International Journal of Educational Development, 60*, 33-50.

Chandra, M. (2015). The implications of contract teaching in India: A review. *Policy Futures in Education, 13*(2), 247-259.

Chiu, M. M. & Khoo, L. (2005). Effects of resources, inequality, and privilege bias on achievement: Country, school, and student level analyses. *American Educational Research Journal, 42*(4), 575-603.

Chudgar, A. & Luschei, T. F. (2009). National income, income inequality, and the importance of schools: A hierarchical cross-national comparison. *American Educational Research Journal, 46*(3), 626-658.

Chudgar, A. & Luschei, T. F. (2013). Study of teachers for children marginalized by social origin, economic status, or location. Retrieved from http://www.teachersforefa.unesco.org/v2/index.php/en/ressources/file/33-chudgar-and-mannathoko-presentation

Ciol, M. A., Hoffman, J. M., Dudgeon, B. J., Shumway-Cook, A., Yorkston, K. M., & Chan, L. (2006). Understanding the use of weights in the analysis of data from multistage surveys. *Archives of Physical Medicine and Rehabilitation, 87*(2), 299-303.

Claessens, L., van Tartwijk, J., Pennings, H., van der Want, A., Verloop, N., den Brok, P., & Wubbels, T. (2016). Beginning and experienced secondary school teachers' self-and student

schema in positive and problematic teacher–student relationships. *Teaching and Teacher Education, 55*, 88-99.

Clotfelter, C. T., Ladd, H. F., & Vigdor, J. (2005). Who teaches whom? Race and the distribution of novice teachers. *Economics of Education Review*, *24*(4), 377-392.

Clotfelter, C. T., Ladd, H. F., & Vigdor, J. L. (2006) Teacher-student matching and the assessment of teacher effectiveness. *The Journal of Human Resources*, *41*(4), 778-820.

Clotfelter, C., Ladd, H. F., Vigdor, J., & Wheeler, J. (2006). High-poverty schools and the distribution of teachers and principals. *NCL Rev., 85*,1345.

Darling-Hammond, L. (2000). Teacher quality and student achievement. *Education Policy Analysis Archives, 8*,1.

Darling-Hammond, L. (2006). Constructing 21st-century teacher education. *Journal of Teacher Education, 57*(3), 300-314.

du Plessis, A. E. (2015). Effective education: Conceptualizing the meaning of out-of-field teaching practices for teachers, teacher quality and school leaders. *International Journal of Educational Research, 72*,89-102.

Espinoza, J. (2015). Four in ten new teachers quit in first year, union warns. Retrieved from https://www.telegraph.co.uk/education/educationnews/11505837/Four-in-10-new-teachers-quit-within-a-year-union-warns.html

Feng, L. & Sass, T. R. (2016). Teacher quality and teacher mobility. *Education Finance and Policy, 12*(3), 396-418.

Fischer, R., Fireman, E., & Gomes, J. R. (2013). Who teaches science in Alagoas? A quantitative analysis of non-specialist teaching at primary and secondary schools in Brazil. *ArXiv Preprint arXiv,1304.8055.*

Fuchs, T. & Woessmann, L. (2007) 'What Accounts for International Differences in Student Performance? A Re-Examination Using PISA Data', *Empirical Economics, 32*, 433-464.

Gagnon, D. J. & Mattingly, M. J. (2012). Beginning teachers are more common in rural, high-poverty, and racially diverse schools. Retrieved from https://scholars.unh.edu/cgi/viewcontent.cgi?article=1172&context=carsey

Goldhaber, D. & Brewer, D. J. (2000). Does teacher certification matter? High school teacher certification status and student achievement. *Educational Evaluation and Policy Analysis*, *22*(2), 129-145.

Goldhaber, D., Lavery, L., & Theobald, R. (2015). Uneven playing field? Assessing the teacher quality gap between advantaged and disadvantaged students. *Educational Researcher*, *44*(5), 293-307.

Grissom, J. A., Kalogrides, D., & Loeb, S. (2015). The micro politics of educational inequality: The case of teacher–student assignments. *Peabody Journal of Education, 90*(5), 601-614.

Gunnarsson, V., Orazem, P. F., Sanchez, M., & Verdisco, A. (2004). Does school decentralization raise student outcomes? theory and evidence on the roles of school autonomy and community participation. *Unpublished Manuscript, Iowa State University, Ames.*

Hanushek, E. A. & Rivkin, S. G. (2010). Generalizations about using value-added measures of teacher quality. *The American Economic Review, 100*(2), 267-271.

Hanushek, E. A. & Rivkin, S. G. (2012). The distribution of teacher quality and implications for policy. *Annual Review of Economics, 4*(1), 131-157.

Harris, D. N. & Sass, T. R. (2011). Teacher training, teacher quality and student achievement. *Journal of Public Economics, 95*(7), 798-812.

Ingersoll, R. (2001). Teacher turnover and teacher shortages: An organizational analysis. *Philadelphia: Graduate School of Education*, Working Paper 9-1-01. University of Pennsylvania.

Ingersoll, R. (2002). Out-of-field teaching, educational inequality, and the organization of schools: An exploratory analysis. Retrieved from https://repository.upenn.edu/cgi/viewcontent.cgi?article=1057&context=cpre_researchreports

Isenberg, E., Max, J., Gleason, P., Potamites, L., Santillano, R., Hock, H., & Hansen, M. (2013). *Access to effective teaching for disadvantaged students: Executive summary.* Washington, D.C.: National Center for Education Evaluation and Regional Assistance.

Kalogrides, D., Loeb, S., & Béteille, T. (2013). Systematic sorting: Teacher characteristics and class assignments. *Sociology of Education*, *86*(2), 103-123.

Kerckhoff, A. C. (2001). Education and social stratification processes in comparative perspective. *Sociology of Education,* 3-18.

Kini, T. & Podolsky, A. (2016). Does teaching experience increase teacher effectiveness. A Review of the Research, retrieved from https://learningpolicyinstitute.org/sites/default/files/product-files/Teaching_Experience_Report_June_2016.pdf

Koedel C 2007. Re-Examining the Role of Teacher Quality in the Educational Production Function Study Provided by Department of Economics, University of Missouri in its series Working Studys with number 0708.

Kukla-Acevedo, S. (2009). Do teacher characteristics matter? New results on the effects of teacher preparation on student achievement. *Economics of Education Review*, *28*(1), 49-57.

Ladd, H. F. & Sorensen, L. C. (2017). Returns to teacher experience: Student achievement and
motivation in middle school. *Education Finance and Policy,(12)*2,241-279.

Lanas, M. (2017). Giving up the lottery ticket: Finnish beginning teacher turnover as a question
of discursive boundaries. *Teaching and Teacher Education, 68*, 68-76.

Lankford, H., Loeb, S., & Wyckoff, J. (2002). Teacher sorting and the plight of urban schools: A
descriptive analysis. *Educational Evaluation and Policy Analysis, 24*(1), 37-62.

Lee, J. S. J. (2017). Hidden challenges of novice English teachers in a Korean independent
school: Through an ethnographic lens. *The Qualitative Report, 22*(6), 1637-1652.

Luschei, T. F. & Chudgar, A. (2016). *Teacher distribution in developing countries: Teachers of
marginalized students in India, Mexico, and Tanzania*. New York, NY: Springer.

Luschei, T. F. & Chudgar, A. (2017). Conceptual framework: Marginalized children and their
teachers. In *Teacher distribution in developing countries* (pp. 13-23). New York, NY:
Springer.

Luschei, T. F., Chudgar, A., & Rew, J. (2013). Exploring differences in the distribution of
teacher qualifications across Mexico and South Korea: Evidence from the teaching and
learning international survey. *Teachers College Record, 115*(5), n5.

Maphoso, L. & Mahlo, D. (2015). Teacher qualifications and pupil academic
achievement. *Journal of Social Sciences, 42*(1-2), 51-58.

Mead, S., Rotherham, A., & Brown, R. (2012). The hangover: Thinking about the unintended
consequences of the nation's teacher evaluation binge. Teacher quality 2.0. Special report
2. American Enterprise Institute for Public Policy Research, Retrieved from
https://bellwethereducation.org/sites/default/files/TeacherQuality_TheHangover_0.pdf

Mestry, R. & Ndhlovu, R. (2014). The implications of the national norms and standards for school funding policy on equity in South African public schools. *South African Journal of Education, 34*(3), 1-11.

Moon, B. (2007). Research analysis: Attracting, developing and retaining effective teachers: A global overview of current policies and practices. Paris, France: United Nations Educational, Scientific, and Cultural Organization.

Murnane, R. J. & Steele, J. L. (2007). What is the problem? The challenge of providing effective teachers for all children. *The Future of Children,* 15-43.

Naper, R. (2010) 'Teacher Hiring Practices and Educational Efficiency', *Economics of Education Review*, *29*, 658–68.

Nixon, R. S., Luft, J. A., & Ross, R. J. (2017). Prevalence and predictors of out-of-field teaching in the first five years. *Journal of Research in Science Teaching, 54*(9), 1197-1218.

OECD (2005). *Teachers matter: Attracting, developing and retaining effective teachers Organisation for Economic Co-operation and Development*. Retrieved from https://www.oecd.org/education/school/34990905.pdf

OECD (2007). *Education at a glance 2005: OECD indicators Organisation for Economic Co-operation and Development*. Retrieved from http://www.oecd.org/education/skills-beyond-school/39313286.pdf

OECD (2010). *PISA 2009 results: What students know and can Do–Student performance in reading, mathematics, and science (volume I) OECD Publishing Paris*. Retrieved from https://www.oecd.org/pisa/pisaproducts/48852548.pdf

OECD (2013), *School Governance, Assessments and Accountability, What Makes Schools Successful? Resources, Policies and Practices – Volume IV*. Retrieved from https://www.oecd.org/pisa/keyfindings/Vol4Ch4.pdf

OECD (2014a), *New Insights from TALIS 2013: Teaching and Learning in Primary and Upper Secondary Education*. Retrieved from http://dx.doi.org/10.1787/9789264226319-en

OECD (2014b). TALIS 2013 Technical Report. Retrieved from http://www.oecd.org/education/school/TALIS-technical-report-2013.pdf

OECD (2016a), *PISA 2015 Results (Volume I): Excellence and Equity in Education*. Retrieved from http://dx.doi.org/10.1787/9789264266490-en

OECD (2016b), *PISA 2015 Results (Volume II): Policies and Practices for Successful Schools*. Retrieved from http://dx.doi.org/10.1787/9789264267510-en

Perry, S. M., Hawkins, R. J., & Sealy, K. M. (2016). Opportunity to learn and students from economically disadvantaged homes: Implications for school leaders through an examination of TALIS 2013. Retrieved from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2717054.

PISA (2003), *How Student Performance Varies between Schools and the Role that Socio-economic Background Plays in This*. Retrieved from http://www.oecd.org/education/school/programmeforinternationalstudentassessmentpisa/33918016.pdf

PISA (2013). *PISA 2012 results: What makes schools successful? Resources, policies and practices (volume IV), OECD, Paris, France.*

Rockoff, J. E., 2004. The impact of individual teachers on student achievement: Evidence from panel data. *American Economic Review*, *94*(2), 247-252.

Rothstein, J. (2010). Teacher quality in educational production: Tracking, decay, and student achievement. *The Quarterly Journal of Economics, 125*(1), 175-214.

Rutkowski, L., Gonzalez, E., Joncas, M., & von Davier, M. (2010). International large-scale assessment data: Issues in secondary analysis and reporting. *Educational Researcher, 39*(2), 142-151.

Sali, P. & Kecik, I. (2018). Challenges of first years of teaching in Turkey: Voices of novice EFL teachers. *English Language Teaching, 11*(4), 117.

Salleh, U. K. M. & Darmawan, I. G. N. (2013). Differences between in-field and out-of-field history teachers influence on students learning experience in Malaysian secondary schools. *Creative Education, 4*(09), 5.

Sass, T. R., Hannaway, J., Xu, Z., Figlio, D. N., & Feng, L. (2012). Value added of teachers in high-poverty schools and lower poverty schools. *Journal of Urban Economics, 72*(2), 104-122.

Schmidt, W., Zoido, P., & Cogan, L. (2013). Schooling matters: Opportunity to learn in PISA 2012. *Education Working Papers, 95*. Retrieved from http://dx.doi.org.ezproxy.library.tamu.edu/10.1787/5k3v0hldmchl-en

Schueler, S., Roesken-Winter, B., Weißenrieder, J., Lambert, A., & Römer, M. (2015). Characteristics of out-of-field teaching: Teacher beliefs and competencies. *The CERME 9-Ninth Congress of the European Society for Research in Mathematics Education,* 3254-3261.

Sellar, S., Lingard, B., Meyer, H., & Benavot, A. (2013). PISA and the expanding role of the OECD in global educational governance. *PISA, Power, and Policy: The Emergence of Global Educational Governance,* 185-206.

Senom, F., Zakaria, A. R., & Ahmad Shah, S. (2013). Novice teachers' challenges and survival: Where do Malaysian ESL teachers stand? *American Journal of Educational Research, 1*(4), 119-125.

Simon, N. S. & Johnson, S. M. (2015). Teacher turnover in high-poverty schools: What we know and can do. *Teachers College Record, 117*(3), 1-36.

Sutcher, L., Darling-Hammond, L., & Carver-Thomas, D. (2016). A coming crisis in teaching? Teacher supply, demand, and shortages in the U.S. Palo Alto, *CA: Learning Policy Institute*. Retrieved from https://learningpolicyinstitute.org/sites/default/files/product- fi les/A_Coming_Crisis_in_Teaching_REPORT.pdf

Teddlie, C. & Reynolds, D. (2000). The international handbook of school effectiveness research. London, UK: Falmer.

Theobald, N. D. & Michael, R. S. (2002). Reducing novice teacher attrition in urban districts. *Research in Education Fiscal Policy and Practice, 1*, 137-152.

Thiemann, P, (2017). Does teacher sorting across and within schools explain inequality in education outcomes? Retrieved from http://www.unicreditanduniversities.eu/uploads/assets/No_99_Petra_Thiemann.pdf.

Thomas, S. L. & Heck, R. H. (2001). Analysis of large-scale secondary data in higher education research: Potential perils associated with complex sampling designs. *Research in Higher Education, 42*(5), 517-540.

Thomas, S. L., Heck, R. H., & Bauer, K. W. (2005). Weighting and adjusting for design effects in secondary data analyses. *New Directions for Institutional Research, 2005*(127), 51-72.

UNESCO (2016). The world needs almost 69 million new teachers to reach the 2030 education goals, Retrieved from http://unesdoc.unesco.org/images/0024/002461/246124e.pdf.

UNESCO Institute for Statistics. (2006). *Teachers and educational quality: Monitoring global needs for 2015*. Retrieved from

http://unesdoc.unesco.org/images/0014/001457/145754e.pdf.

Watlington, E., Shockley, R., Guglielmino, P., & Felsher, R. (2010). The high cost of leaving: An analysis of the cost of teacher turnover. *Journal of Education Finance*, 22-37.

Wayne, A., and Youngs, P. (2003). Teacher characteristics and student achievement gains: A review. *Review of Educational Research*, *73*(1), 89-122.

Weldon, P. R. (2016). Out-of-field teaching in Australian secondary schools. Retrieved from

https://research.acer.edu.au/cgi/viewcontent.cgi?article=1005&context=policyinsights

Woessmann, L. (2001) 'Why Students in Some Countries Do Better: International Evidence on the Importance of Education Policy', *Education Matters1*, 67-74.

Wolff, C. E., van den Bogert, N., Jarodzka, H., & Boshuizen, H. P. A. (2014). Keeping an eye on learning: Differences between expert and novice teachers' representations of classroom management events. *Journal of Teacher Education, 66*, 68-85. Retrieved from

https://doi:10.1177/0022487114549810

Zakharov, A., Tsheko, G., & Carnoy, M. (2016). Do "better" teachers and classroom resources improve student achievement? A causal comparative approach in Kenya, south Africa, and Swaziland. *International Journal of Educational Development, 50*, 108-124.

Zhou, Y. (2014). The relationship between school organizational characteristics and reliance on out-of-field teachers in mathematics and science: Cross-national evidence from TALIS 2008. *The Asia-Pacific Education Researcher, 23*(3), 483-497.

3. COUNTRY EFFECTS ON TEACHER TURNOVER INTENTION: A MULTILEVEL,

CROSS-NATIONAL ANALYSIS

Introduction

While many countries around the world, both developed and developing, struggle with teacher shortages and high turnover rates, the similar concerns are seemingly smaller in other countries (OECD, 2005, 2014). For example, the teacher attrition rate in the United States was eight percent in 2013 while it was around three percent in Finland and Singapore (Learning Policy Institute, 2016). As policy makers across countries have paid increasing attention to attracting and retaining quality teacher (UNESCO Institute for Statistics, 2016; OCED, 2014), do the differences in the way countries treat their teachers influence on teachers' turnover intentions? Also, do teachers in the countries (e.g., Chile and Korea) leave for the same reasons suggested by the research conducted in the United States?

All societies develop teacher status attitudes. Some societies value and respect their teachers and they recruit teachers from the most-qualified graduates. In contrast, other societies see teaching as an under-paid and unattractive occupation (Hilton, 2017). The Global Teacher Status Index (GTSI) 2018 established by the Varkey Foundation has demonstrated a wide cross-national variation in teacher status and suggested that significant differences might have mirrored who are the teachers in each country and how they are treated by their societies (GTSI, 2018). The report defined the high status of teaching profession as a combination of higher standards for entry, better payment, greater school and teacher autonomy, and better working conditions than their peers in non-teaching positions (GTSI, 2018).

Among the measures of improving teacher status, raising their salaries has received substantial policy attention and scholarly debate *(*Iliya & Ifeoma, 2015; GTSI, 2018*).* While some studies in the United States have reported that teacher salary is an influential factor in teachers' job decisions (e.g, Goldhaber, Gross, & Player, 2007; Britton, & Propper, 2016), others indicate its poor predictability (Hanushek & Rivkin, 2007; Podgursky, Monroe, & Watson, 2004) and the results depend on the different contexts *(*Figlio, 2002; Lazear, 2003). Similarly, the research from other countries has also presented the mixed findings. For instance, some studies from Australia (Leigh, 2012), Brazil (Brooke, 2016), Chile (Contreras & Rau, 2012) and Israel (Shenkar & Shenkar, 2011) found positive effects of relative salaries on teachers' career decisions and teachers do respond to the salary variation, whereas others from Korea (Kim, Han, & Park, 2008). Indonesia (de Ree, Muralidharan, Pradhan, & Rogers, 2017) found no or very limited effects of teachers' pay.

The inconsistency of the research findings may have implied the challenges for a within-country study to obtain an effective measure of salary-to-teacher turnover since most public school teachers in the same country are paid very similarly (Dolton & Marcenaro-Gutierrez, 2011). Furthermore, although there have been policy efforts in the reform of teacher salaries in some countries and cross-national studies have shown the positive effects of teacher performance pay on student achievement (Akiba, Chiu, Shimizu, & Liang, 2012; Ali, 2009), for a large pool of teachers, greatly raising salary can present as a financial challenge, especially for the developing countries in which teacher salaries make up a big share of total educational spending (OECD, 2016; Saha & Dworkin, 2009). Moreover, research has not reached a consensus about the measurement and evaluation of teachers' quality and effectiveness (Hanushek & Rivkin, 2010; Slater, Davies, & Burgess, 2012). Also, salary differentials might have more positive

effects for retaining teachers in disadvantaged schools, but do little to equal distribution of high-quality teachers across schools (Clotfelter, Ladd, & Vigdor, 2011). Therefore, due to various reasons, many countries still practice or mainly practice a single salary structure in which teachers' pay only depends on their experience and degree level (Education at a Glance, 2017).

If the average wages differ little, the differences across working conditions for teachers can be substantial (Hanushek & Rivkin, 2007). The theory of compensation and wage differentials indicates wage premiums compensate employees for working in undesirable conditions since negative job attributes demands higher compensation for attracting people to the job (Rosen, 1974), and teachers also respond to these differences (Hanushek & Rivkin, 2007). Like other professionals, teachers are rational actors who have their own preferences for salaries, working conditions, and other factors. Research reveals that teachers' turnover and mobility can be driven by geographic locations, school and student characteristics and other working conditions (Clotfelter, Ladd, & Vigdor, 2011; Hanushek, Kain, & Rivkin, 2004). As a result, challenging schools tend to face more severe teacher turnover (Burke, Schuck, Aubusson, Buchanan, Louviere, & Prescott, 2013; Matsuoka, 2015).

The research to date analyzing teacher turnover intention as an individual teacher decision nested within the context of country is limited (Duyar, Gumus, & SukruBellibas, 2013). Accounting for the impact of national contexts is important because whether or not a teacher decides to transfer to another school or quit teaching altogether is not determined solely by the individual's rational choices but also the social forces that may drive or constrain their decisions (Haltiwanger, Scarpetta, & Schweiger, 2014). For example, previous studies have shown that how much teachers will be paid has only been partially driven by the economic forces; how

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much a country's government emphasizes on the quality of education and how much a society values their teachers may have also played a role (Hanushek, 2011; Park & Byun, 2015).

We conceptualize the drivers of teacher turnover intention as having a multilevel structure. The differences in outcomes reflect the differences in the effects of country-specific features and the characteristics of the school and individual (Bryan & Jenkins, 2015). Furthermore, researchers have suggested that in order to more accurately estimate the large social contextual effects, it is important to control for lower level variables (e.g., individual and organizational characteristics) (Hausknecht & Trevor, 2011). Based on multilevel perspective, this study focuses on the cross-national antecedents of teacher turnover intentions in 32 OECD countries including both developed and developing and Western and non-Western societies.

In addition to detect whether the national differences matter for teacher turnover intentions, the study is also set to examine whether the effects of disadvantaged schools on teacher turnover intention differ by country. While the bulk of evidences have suggested that teachers tend to leave schools with high proportions of low-income and minority students (e.g., Hanushek et al., 2004; Imazeki, 2002; Scafidi, Sjoquist, & Stinebrickner, 2007), whether the strength of the relationship between disadvantaged schools and teacher turnover intention differ depending on the characteristics of a country still remains unknown. For instance, will teachers be less likely to consider leaving high-poverty schools if they come from a country with high teacher status? Moreover, working conditions should have more of an influence on turnover intentions in countries where wages are set by higher-level authorities than in countries where wage differentials can compensate for local characteristics such as school-level salary decisions. Analysis of these interactions can indicate the extent to which the effects of disadvantaged school is increased or decreased by particular country contexts.

This study employs multilevel statistical models to understand cross-national variation in teacher turnover intention. Survey data from the Organisation for Economic Co-operation and Development (OECD) are utilized to describe teachers' quit and transfer intention across countries. The OECD has become the authoritative, international source for comparative information about educational outcomes, policies, and practices (Sellar & Lingard, 2013). The primary data come from the 2013 Teaching and Learning International Survey (TALIS) conducted by the OECD. The study merges the TALIS surveys with other international data on national context to gain insight into, and a better understanding of, factors contributing to teacher turnover intentions within lower secondary schools (grades 7-9) across countries.

This paper has two main objectives: first, to investigate the direct effects of country contexts and working conditions on teacher turnover intention by controlling for the lower-level factors (teacher and school characteristics) and second, to analyze the moderation effects of country variables on the relationships between the different dimensions of working conditions and turnover intentions via cross-level interaction analysis. Moreover, the study has separately examined teachers' transfer intention and quit intention.

Hypothesis 1: The differences in teacher turnover intentions will be explained by country-level variables after controlling for teacher and school factors.

Hypothesis 2: Teachers across countries respond to the differences of the working conditions.

Hypothesis 3: The country contexts have moderation effects on the relationships between the working conditions and teacher turnover intention.

Literature Review

Based on the research purposes, the study first reviews the literature of general teacher turnover with a focus on the studies of teachers who leave the profession altogether and the teachers who move to another school or district. The second part of the literature review is the predictors of turnover intention. We focus on the variables at teacher and school level, such as teachers' characteristics and working conditions, and the country contexts that might link to teachers' turnover intention. The last part of the literature review is the moderation effects of country contexts on the outcomes.

"Leaver" and "Mover"

In this study, the phrase "turnover intentions" refers to teachers' attitude favoring leaving their current workplace or profession (Tiplic, Brandmo & Elstad, 2015). Much of the teacher turnover research has focused only on those who leave teaching, whereas teachers who move to another school or district have been understudied since in general, this shift does not affect the overall number of teachers and both of them have been viewed to have same effect on the schools (Boe, Bobbitt, Cook, Barkanic, & Mailsin, 1998; Grissom, Viano, & Selin, 2016).

"Movers" are those who transfer to another school but still stay in the teaching profession and "leavers" quit teaching altogether (Ingersoll, 2001).Studies that separately examined teacher turnover revealed the factors that impact teacher decisions to transfer or quit are not necessarily the same (Kukla-Acevedo, 2009). Research reveals that different factors may have impacted on teachers' job decisions: quit or move to other school. For example, teachers who exit school system tend to be more sensitive to salary changes (Imazeki, 2005; Theobald & Gritz, 1996). Some findings have shown that the teachers who exit are relatively more competitive than and those who still stay in teaching profession, and they are more likely to have

a competitive education background (Loeb & Reininger, 2004). Moreover, literature across countries has documented that young or beginning teachers were more likely to leave teaching positions (Hanushek, Kain, & Rivkin, 2004; Moon, 2007). Some studies found female teachers tended to leave their job due to childbearing and childrearing (Scafidi, Sjoquist, & Stinebrickner, 2007). Math and science teachers have higher exit rates than other teachers because they usually have more alternative opportunities outside of teaching profession (Ingersoll & May, 2012).

On the other hand, research found that the teachers who decided to move to another schools were more sensitive to student characteristics and working conditions than to salary differentials, especially for the female teachers (Luczak & Loeb, 2013; Scafidi, Sjoquist, & Stinebrickner, 2007). Some transferred to schools serving higher-achieving students (Allensworth, Ponisciak, & Mazzeo, 2009). After reviewing six studies examining teacher turnover, Simon and Johnson (2015) suggested that poor working conditions was the main factor that had driven teachers away from their current school. However, among the indicators of working conditions, students' behavioral issues were significantly related to novice teachers' decisions to quit their jobs (Kukla-Acevedo, 2009). Thus, distinguishing between leavers and movers can have policy implications. For instance, if the differences between them are small, policymakers can have more confidence in state-wide policies that affect all districts in similar ways (Imazeki, 2005).

Teacher- and School-Level Factors of Teacher Turnover Intention

Under the multilevel perspective, we have included three main effects to explore the factors relating to teacher turnover intention across countries. The first is the compositional effect that specifies that cross-country differences arise from the unequal distribution of lower-level characteristics (teacher and school factors in this study). In other words, if individual and

school characteristics explain, to some extent, a teacher's turnover intention and if these characteristics vary across nations, then they also can explain the cross-country differences in turnover intention.

Scholars in numerous countries have identified a variety of reasons why teachers transfer to a different school or leave the teaching profession. Those reasons can be categorized mainly into teacher and school attributes. Teacher characteristics include teacher demographics, teaching experience, and education. For example, consistent empirical findings have revealed that attrition is more common among young teachers (Hanushek et al., 2004; Ingersoll, 2001) and novice teachers are more likely to leave the profession in the early stages of their career (Ingersoll & Smith, 2003; Tiplic, Brandmo, & Elstad, 2015). The literature on gender differences in teacher turnover shows mixed results. Some scholars find that female teachers are more likely to quit than their male counterparts (Gritz & Theobald, 1996), while others observe the opposite (Ingersoll, 2003). In addition, teacher education also contributes to the variance in teacher turnover. Teachers with more extensive teacher education backgrounds tend to persist in the teaching field (Lankford et al., 2002; Ahn, 2015).

Components relating to school attributes, the working conditions, are identified in the research as student demographics (e.g., Hanushek, Kain, O'Brien, & Rivkin, 2005; Bonhomme, Jolivet, & Leuven, 2016), school size (Brill & McCartney, 2008), school location (Feng, 2014), and student disciplines (e.g., Borman & Dowling, 2006). Teacher turnover rates tend to be significantly higher in schools serving disadvantaged students (Bonhomme, Jolivet, & Leuven, 2016; Hanushek, Kain, & Rivkin, 2004). Similar findings have been reported in countries such as Sweden (Karbownik, 2016) and Norway (Falch & Strom, 2005) and some low-and middle-income countries (Evans & Yuan, 2018). A school's geographic location also has been found to

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impact teachers' choices. For example, teachers tend to leave urban schools for suburban districts (Feng, 2014). School size is also associated with teacher turnover. Some findings reported higher attrition in large, urban schools (e.g., Brill & McCartney, 2008; Lankford et al., 2002). A considerable amount of research has demonstrated that smaller schools provide a more collegial environment and are less likely to lose teachers (e.g., Newmann & Wehlage, 1995).

In addition, student discipline is one of the most-cited working condition reasons for teachers' decisions to quit (e.g., Borman & Dowling, 2006; Brill & McCartney, 2008). Research has found significant correlation between student misbehavior and teacher attrition (Kelly, 2004). The issue is even more significant among beginning teachers, who say they experience more pressure regarding their relationship with students and their ability to manage student behavior (e.g., Lukens, Lyter, & Fox, 2004).We have also included working hours and the teacher-student ratio as the indicators of working conditions. Working hours and teacher-student ratio are two of the most important factors shaping teachers' working conditions (Hargreaves & Flutter, 2013).

Country-Level Predictors of Teacher Turnover Intentions

In this study, the contextual effect occurs when national variables directly contribute to the differences in teacher turnover intention across countries. The multilevel modeling approach helps us determine whether the country differences in teacher turnover intentions are due to the characteristics of the individuals who live in these countries (compositional effects) or due to factors that relate to the countries themselves (contextual effects). In this study, we hypothesize that cross-national differences in teacher status and economic condition would be significantly related to between-country differences in teacher turnover intention.

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Perceived Teacher Status

The first country context in this study is perceived teacher status. We hypothesize that the cross-national variation in the perceived teacher status can explain the differences in teacher turnover intention. This study also partially responds to the call for investigating how status of the teaching profession in a country influences on teacher's career decision (Tiplic, Brandmo, & Elstad, 2015). Teaching is one of the most challenging professions even though it is of lower status than many other professions (e.g., medicine, law, and engineering) (Liu & Onwuegbuzie, 2014; Wolman, 2010). Research revealed that teachers' status, such as social recognition, salaries and working conditions, has declined across the world in the last few decades (Dolton & Marcenaro-Gutierrez, 2011; Keuren, Silova et al. 2015).

People around the world choose to teach for a variety of reasons, but all teachers need to be recognized and respected for their profession (MacBeath, 2012). One of important factors that have significantly improved teachers' job satisfiers is that their work has been recognized and respected by the society (MacBeath, 2012). Teachers' positive perception of their status is closely related to their continuous professional development and teaching engagement (Hargreaves & Flutter, 2013). Furthermore, how teachers perceive their status in society will also have an effect on the quality of teacher candidates (Thomson, Turner, & Nietfeld, 2012).

Teacher status varies significantly cross countries (GTSI, 2018). The social status of teachers in some East Asian countries, such as Japan and South Korea, are relatively high (Kim & Han, 2002). In the societies where the teaching profession is highly valued, students seem to be more academically successful (Burns & Darling-Hammond, 2014), and the teacher workforce is usually more stable and more likely to attract highly qualified graduates (OECD, 2014; Symeonidis, 2015). In contrast, teachers' commitment to their job decreases in countries where

teaching is a low-status profession (Symeonidis, 2015; Vegas, Loeb, Romaguera, Paglayan, & Goldstein, 2010).

Relative Teacher Salaries

This study focused on whether the variation of teacher relative salaries accounts for the differences of teacher turnover intention across countries. The available international evidence shows that teacher pay has declined over the last 30 years and has not kept up with salaries of other occupations in some countries, especially in low-income countries (e.g., Leigh & Ryan, 2008). Findings from the Teacher Status Index indicate that respondents in many of the participating countries considered their teachers to be underpaid (GTSI, 2013). A study of teacher salaries from 1999 to 2013 demonstrated a significant cross-country difference regarding changes in the relative earnings of teachers (Varga, 2017).

Empirical evidences across countries suggest that the significant variation in teacher pay not only is reflected in educational outcomes but also impacts teachers' job satisfaction and attrition (Imazeki, 2005; Stockard & Lehman, 2004). The negative correlation between salaries and teacher turnover has been identified across the scholarly literature (e.g., Goldhaber, Gross, & Player, 2007; Hendricks, 2014). Based on the data of American Community Survey for 2009–2011, researchers found the relative salaries had the largest effect on males majoring in math, science, and computer education (Rickman, Wang, & Winters, 2016). In a fixed-effect framework, Falch (2011) found that the wage premium can reduce teachers' possibility of quit by around 6 % points in Norway teachers. In an investigation of Queensland teachers quit and transfer decisions, the authors suggested that the higher salaries significantly reduce teacher turnover rates, especially to the experienced female teachers. The results showed locality

allowances significantly contributed to the teacher retention for the schools where non-pecuniary

factors were unattractive to teachers (Bradley, Green, & Leeves, 2006).

Some cross-country studies have also suggested that teachers respond to the variation of

salaries (Dolton & Marcenaro-Gutierrez, 2011; Liang, 2000; Woessmann, 2011). In the countries

where teachers are paid well (e.g., Germany, Japan, and Korea), the percentages of less-qualified

teachers are much lower than the countries where teachers' salaries are low relative to many

other non-teaching positions (Ladd, 2007). In a study exploring the effect of the variation in

average pay on the decision to choose teaching profession, the author suggested that with one

percent increase in beginning teachers' salary, there was 0.6 percentile ranks increase in the

average aptitude of teacher candidates (Leigh, 2012). After controlling for GDP per capita and

educational expenditure as percentage of GDP, the math and science achievement are higher in

the countries that invested more in teacher salaries (Akiba, Chiu, Shimizu, & Liang, 2012). In

this study, we predict that the larger the ratio of teaching salary to comparable nonteaching salary,

the more likely a teacher would stay.

Career Prospects

Besides relative salary, career prospect is another important factor at the system-level

conditions that is linked to the attractiveness of teaching job (Dolton & Klaauw, 1999; Van

Amelsvoort & Scheerens, 1996). An efficient wage profile that reflect teacher' career prospects

plays an important role in retaining teachers and the likely growth in their earnings has been

found to relate to teachers' recruitment and retention (OECD, 2014). Research has shown that

the range of teacher salary increases at different points in their careers can have a significant

impact on how long someone will remain a teacher (Imazeki, 2005; Varga, 2017). If salary

increase is too low at the top end of the career structure, it might be challenging to keep experienced teachers in the job (Dolton & Klaauw, 1999).

Ratio of salary at top of scale to starting salary represents the rewards for teachers staying in teaching profession and for meeting certain performance criteria (Educational at a Glance, 2015). In OECD countries, the salary at the top of the scale (after teachers reach around 15 years of experience) increased by 35% over starting salaries, on average. However, the between-country variation is significant. For example, some countries (e.g., Denmark and Iceland), have relatively flat salary scales (the ratio of salary at the top of scale to starting salary is less than 25%), whereas in Luxembourg and Korea, the difference is an average of 80% (Education at a Glance, 2015). This study examines whether the cross-country variation in teachers' career prospects influence on their teacher turnover intention.

The Degree of Local Wage Flexibility

One of the main differences between teacher market and general labor markets is in the decisions and implementation of salary schedules (Goldhaber, Destler, & Player, 2010). Teachers' salaries across countries are usually determined by local or national governments, the public or teacher unions (OECD, 2014). Thus, the variation in teacher salaries may not be large enough to compensate for teaching in unattractive schools and neighborhoods (Falch & Strøm, 2005; Feng, 2014). In the countries with centralized wage decision, for instance, working conditions may account for more turnover variation than pecuniary considerations (Falch & Strøm, 2005). Research suggests that single salary structure across subjects and across geographic locations can lead to quit decisions and cause teacher shortages, especially in math and science, and in urban and rural areas (Hanushek & Rivkin, 2007). Additionally, many high-quality teachers who contribute to better learning for students are not sufficiently rewarded

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because salary schedules only reward experiences and level of degree (Ehrenberg & Smith, 2002). We hypothesize that the cross-national variation in the degree of local wage flexibility will account for the variation of teacher turnover intention.

General Economic Conditions

In addition to teachers' social and economic status, another country context that may have an influence on teacher turnover is the country's general economic conditions. The differences in economic conditions, such as overall economic level and unemployment rates, may explain part of the variation in teacher turnover intentions.

The Change of Unemployment Rates

Research findings show that turnover rates of workers in countries with low unemployment rates are expected to be higher than in a country where jobs are scarce (Chew, Ng, & Fan, 2016; Hulin, Roznowski, & Hachiya, 1985). Some studies, within the US and internationally, have outlined a number of contextual factors that have been shaping teaching forces (e.g., Dolton & van der Klaauw, 1999; Hargreaves & Flutter, 2013; Ingersoll, Merrill, & Stuckey, 2014). They argue that the economic conditions have partially contributed to the stability of teaching force. In a study examining the relationship between economic cycles and teacher supply in England, the authors found that teachers were responsive to the changes of economic conditions. A strong economy with low unemployment rates tended to make teaching less attractive (Dolton, Tremayne, & Chung, 2003). Chung, Dolton and Tremayne (2004) found that graduates were more likely to enter teacher profession when the graduate unemployment rate was high and the effect was stronger for male than for female teachers.

Sound economic conditions may offer job opportunities or alternative labor market opportunities for teachers and are linked to increased teacher turnover and a decline in teacher

quality (Roberts, Clifton, & Ferguson, 2005). Scholars have noted that the overall academic aptitude of teachers has declined relative to other workers with college degrees in recent decades due to increased opportunities in other fields (Hoxby & Leigh, 2004; Leigh & Ryan, 2008). The change of unemployment rates in each country can be used to represent the conditions of its labor market (Dolton, Tremayne, & Chung, 2003).

GDP per Capita

Additionally, wealth of the country, measured as per capita GDP was adopted in order to more accurately capture the country contexts on turnover intention. Research showed mixed findings regarding the effects of per capita GDP on teacher labor market. Some have found no relationship between the GDP growth and teacher supply (Dolton, Tremayne, & Chung, 2003), others showed negative correlation between the economic development and teacher quality (Goldhaber & Walch, 2013; Nagler, Piopiunik, & West, 2015). Research findings indicate that wealthy nations are more willing to invest in education and Per capita GDP is related to government's educational expenditures. (Busemeyer, 2007). Researchers have found a positive link between spending per student and per capita GDP (Hanushek & Luque, 2003). This study is looking at whether the level of Per capita GDP is associated with teachers' turnover intentions.

Cross-Level Interactions (Moderation Effects)

According to multilevel theories, when individuals share the contexts and experiences, dependence of observations may occur (Hausknecht & Trevor, 2011).Teacher may be dependent because they belong to different countries. The teachers came from the same country should be affected by similar social and cultural background and thereafter share some common feature. Cross-level interaction occurs when higher-level variables impact the nature and strength of the relationship between lower-level characteristics and outcome (Raudenbush & Bryk, 2002). In

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this study, national contexts may influence teachers' work attitude and turnover behavior indirectly through individual and school characteristics and practices. We focus on the extent to which a country's teacher status and the degree of wage flexibility impact teachers' tolerance for working conditions and work demand (Ruiter & Van Tubergen, 2009).

Numerous studies in various countries have revealed that teachers are more likely to leave disadvantaged schools. In addition to the US studies (Feng, 2014; Hanushek & Rivkin, 2007), literature from other countries, such as England (Allen, Burgess, & Mayo, 2018), Italy (Barbieri, Rossetti, & Sestito, 2011), Australia (Plunkett & Dyson, 2011), Japan (Matsuoka, 2015), Chile (Ávalos & Valenzuela, 2016) and Netherlands (Bonhomme, Jolivet, & Leuven, 2016) have documented similar pattern. However, whether the relationship between student disadvantage and teacher turnover intention varies across countries remains unknown.

In this study, we are interested in whether teachers' status, both social and economic status, affects teachers' sensitivity to school disadvantages (e.g., high-poverty schools). Some studies revealed that status did matter to teachers. The teachers who felt trusted, appreciated and rewarded by parents and communities tended to stay in their workplace (Hargreaves, Cunningham, Hansen, McIntyre, Oliver, & Pell, 2007; Symeonidis, 2015). Hence, on the basis of the extant literature, we predict that working conditions have more effects on teacher turnover intention in the countries where teachers' social and economic status are relatively low.

Another important indicator that has been used in the cross-level interaction analysis is the flexibilityof local wage. Under rigid wage setting it is challenging for wages to quickly respond to teacher supply and demand and job attributes (Falch & Strom, 2005). Therefore, teachers might be more sensitive to working conditions in the countries with uniform salary system. For example, research has shown teachers are 12 percentage points more likely to be

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dissatisfied with long working hours than other graduates (Chevalier, Harmon, Walker, & Zhu, 2004). This study explores whether the flexibility of local wage moderates the associations between working conditions and turnover intentions.

Methods

Figure 8 provides the study's conceptual framework. The model consists of three main conditions, with individual variables shown as level one; school-specific variables as level two; and country variables as level three. The solid arrows reflect the fixed effects of predictors at levels 1, 2, and 3 on the outcome. The dotted arrows represent predictors of slopes as outcomes and reflect cross-level moderate effects, which can maximize the potential of hierarchical, linear modeling. The analysis tests the joint effect of individual and school-level variables (compositional effects) and country-level variables (contextual and cross-level interaction effects) on teacher turnover intentions.
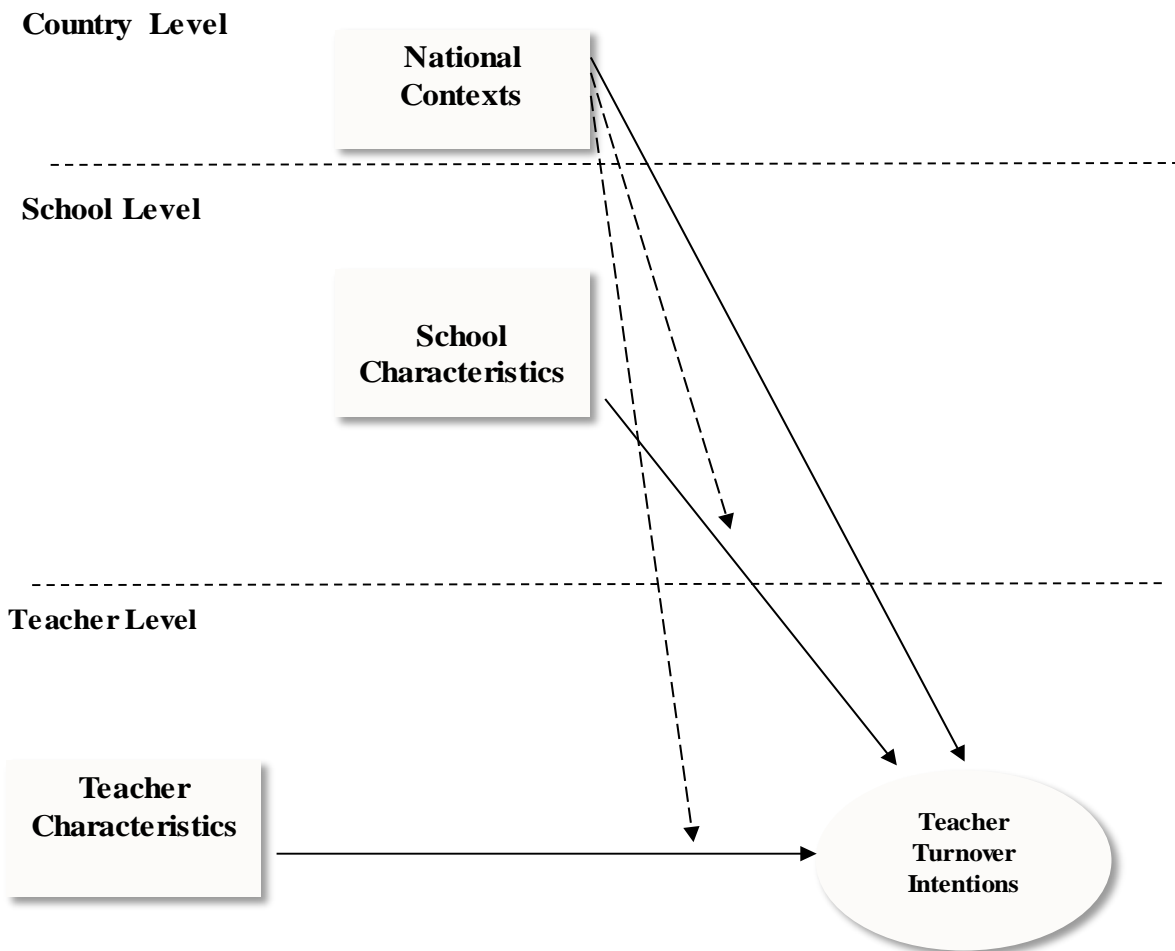
Figure 8 Conceptual model examining the factors relating to teacher turnover intentions across countries

We first examined the univariate histograms and bivariate scatterplots of all variables to identify potential threats to the assumptions of normality of predictor variables. In this study, all of the variables are approximately normally distributed. A two-stage stratified probability sampling design was employed in the TALIS. Due to unequal probability of selection for the stratified sampling method, the weightings were specified the sample at teacher and school level, respectively. Moreover, a correlation matrix was performed to check for multicollinearity for the variables (Field, 2009). As the correlation coefficients among the predictors ranged from 0.01 to

0.49 and were all less than the criterion limit of .80 (Field, 2009), multicollinearity was considered not to be an issue in the current study.

A three-level, hierarchical linear modeling was used to analyze the extent to which differences in outcomes reflect the effects of country, school, and individual-specific features. In the first step, a null model was built for both transfer intention and quit intention to establish a baseline model from which subsequent models could be compared, and also to capture the intraclass correlation coefficient (ICC). The second step was to build intercept-and-slope-as-outcome models to capture the both lower and higher-level effects on the outcomes and to test the cross-level interaction effects (moderation effects) of country variables on teacher turnover intention.

We separately built a quit intention model and transfer intention model to capture different aspects of turnover intention. For each model, we focused on the effects of country variables: teaching status (perceived teaching social status, working hours, teacher-student ratio and teacher salaries), alternative job opportunities (satisfaction with the local labor market, unemployment rate) to teachers' turnover intentions. While teacher salary is one of the major predictors in the study, the data in OECD are only available for 21 countries. Thus, we built two sets of models: models (N=32) without salary variables and models (N=21) with salary variables. Meanwhile, based on the second model (N=21), we built a separate model (N=21) that excluded salary variables in order to test whether the differences are due to the salary variables or to the change in the sample.

Since the maximum likelihood estimation method was used in the study, we used deviances to test whether a more general model fits better than a simpler model (Hox, 2002).The

model deviance that indicates how well the model fits the data and the estimated number of parameters has also been reported for each model.

Data File and Sample

TALIS 2013 data permit a detailed description of teacher and principal demographics and school and organizational characteristics and provide robust, policy-relevant indicators (OECD, 2014). The total sample includes 104,358 teachers in 6,455 schools across 32 countries and economies. Due to the missing data, especially at the school level, around 90 to 100 teachers and 5,482 schools across 32 countries were included into the final analyses (participating countries are described in Appendix A). A set of teacher and school characteristics was identified as lower-level independent variables. Meanwhile, a set of country-level measures that potentially related to the teacher labor market in general and teacher turnover in particular also were included (see Appendix B). For both analyses, the same set of predictor variables was incorporated. Based on the study's purpose, we centered level-1 continuous predictors with group mean for the quantification of direct effects. The grant-mean method has been used for the level 2 and 3 estimates in order to quantify the contextual effects of the variables.

Dependent Variables

The TALIS has measured teachers' attitudes toward their working environment and profession. Based on the responses, a CFA model was examined to create the index for teacher transfer intention and quit intention. Two scales, formed separately, described the two dimensionalities (See Table 5.). The two scales together accounted for approximately 67.7 % of the total variance. Table 5 displays the values of Cronbach's alpha for two dimensions. Most of the items had a relatively high loading (i.e. > 0.70) on the factors. The latent scales had weak positive associations across countries.

Table 5 Reliability coefficient alpha for the quit intention and transfer intention

	Component	
	Quit Intention	Transfer Intention
The advantages of being a teacher clearly outweigh the disadvantages. (reverse coded)	.680	
If I could decide again, I would still choose to work as a teacher. (reverse coded)	.831	
I regret that I decided to become a teacher.	.788	
I wonder whether it would have been better to choose another profession.	.822	
I would recommend my school as a good place to work (reverse coded)		.839
I enjoy working at this school. (reverse coded)		.813
I would like to change to another school if that were possible.		.744

In order to test the comparability of the variables among those countries, we have conducted the cross-cultural measurement invariance analysis across countries. We first averaged the two scaled scores into composite scores to represent the overall teacher turnover intention. Then we used configural metric scalar to examine the invariance of the variables across countries. As shown in Table 6, the difference between the configural and metric models was small, meaning the same factor structure was found in all the countries. However, because the difference between the scalar and metric was relatively large, the mean score comparisons should be interpreted with cautious although the cross-country comparisons were acceptable (Van de Schoot, Lugtig, & Hox, 2012).

Table 6 Cross-country measurement invariance

Invariance Level	CFI	TLI	RMSEA	SRMR	ΔCFI	ΔTLI	ΔRMSEA	ΔSRMR
Configural	0.912	0.871	0.091	0.068				
Metric	0.894	0.894	0.087	0.093	0.008	0.031	0.009	0.028
Scalar	0.806	0.820	0.098	0.115	0.096	0.067	0.021	0.036

*model=configural metric scalar

The result revealed a large between-country variation in both transfer and intention of the teachers. For the transfer intention (M=20.1, SD=7.11), most countries have a relatively large proportion of teachers who tend to move to other schools. For example, over 36% of teachers in Malaysia expressed an intent to transfer. Similarly, there was a large variation across countries regarding teachers' quit intention(M=27, SD=8.16). At 4.5 %, Mexico had the smallest proportion, while Sweden, with 41%, had the largest.

<center>*Independent Variable*</center>

TALIS 2013 asked the principals to estimate the question identifying the proportion of high-need students the categories included none, 1% to 10%, 11% to 30%, 31% to 60%, and more than 60%. According to the TALIS 2013, schools will be classified as more challenging if the school was made up of more than 30% of low-income students, more than 10% of minority students, or more than 10% of students with special needs (OECD, 2014). TALIS has combined the two top categories (31% to 60%, and more than 60%) and classified this as a high-needs school because the proportion of schools with more than 60% of high-need students were very low in the most of the countries (OECD, 2016).

TALIS 2013 defines the low-income students as those from "socio-economically disadvantaged homes" and "lacking the basic necessities or advantages of life, such as adequate housing, nutrition or medical care" (OECD, 2014, p95). It is important to note that different countries may have different standards in terms of disadvantaged homes. Some countries refer to the homes receive "free school meals, in others to those that get housing allowance, or other social assistance" (OECD, 2014, 96). The students with special needs refer to "those for whom a special learning need has been formally identified due to specific mental, physical, or emotional characteristics." (OECD, 2014). The proportion of students with special needs varied

<center>90</center>

significantly across countries, from 67% of schools in England that have more than 10% students

with special needs to 1.3% in Singapore. Countries differ in the time and methods of diagnosing

special needs and the high proportions of special-needs students in some countries may due to

the inclusion in their educational systems (OECD, 2014).Language minorities in this study are

the students whose first language is not the official language used in school (OECD, 2014).The

percentage of schools with more than 10% of language minority students varied from 78% in

Singapore to 0.5% in Poland. For the purpose of the analysis, we have created the dummy

variables for the percentage of low-income students, minority students and students with special

needs (see Table 7)

Table 7 Definitions of predictors

Level 1
Teacher characteristics:

- Gender: a dichotomous variable where 1=male teacher and 0=female teacher.
- Age (grand mean centered).
- Math: 1=primarily teaching secondary math and 0=all other teachers.
- Science: 1=primarily teaching secondary science and 0=all other teachers.
- Experience: Years of full-time teaching experience in schools (grand mean centered).
- Education level: What is the highest level of formal education you have completed?
  1= high school and/or some college courses, 2= associate's degree,
  3= bachelor's degree, 4= master's degree and above.
- % of students with behavioral issues in the targeted classroom.
- % of low academic achievers in the targeted classroom.

Level 2
School characteristics:

- School size: Total school enrollment (grand mean centered).
- Rural: a dichotomous variable where 1=rural and 0=other schools.
- Urban: a dichotomous variable where 1=urban and 0=other schools.
- % of minority students:
        Minority_1 1= 1%-10% and 0=others

        Minority_2 1= 11% to 30% and 0=others

Table 7 Continued

Level 2

        Minority_3 1= more than 31% and 0=others

- of students with special needs:
  SpecialEd_1 1= 1%-10% and 0=others

  SpecialEd_2 1= 11% to 30% and 0=others

  SpecialEd_3 1= more than 31% and 0=others

- % of low-SES students:
  Low-SES_1 1=1% to 10% and 0=others

  Low-SES_2 1=11% to 30% and 0=others

  Low-SES_3 1= more than 31% and 0=others

- Working hours: How many 60-minute hours did you spend on teaching and other tasks related to your job (per calendar week) (grand mean centered).
- Teacher-student ratio (grand mean centered).
- School discipline: Index from TALIS Principal data file.

Level 3

Country variables:

- Perceived teaching status: I think that the teaching profession is valued in society Disagree=1 to strongly agree=4 (TALIS 2013).
- The change of unemployment rates (World Bank).
- Relative salary: teachers' actual salaries relative to the wages of similarly educated workers (2013) (Education at A Glance 2015).
- Career prospects: Starting/maximum teachers' statutory salaries, based on typical/maximum qualifications (2013) (Education at A Glance 2015).
- The degree of local wage flexibility: Regarding this school, the school has a significant responsibility for establishing teachers' starting salaries, including setting pay scales (%) (TALIS, 2013)
- GDP per capita 2012 (World Bank 2013).

In addition to the school disadvantages, TALIS 2013 has defined the rural schools as those located in areas with less than 3,000 people and the urban schools were the ones located in areas with more than 100,000 people. On average across TALIS countries, the school size is 546 students. The countries with the average school size more than 1000 are Malaysia, Portugal and Singapore.

TALIS has also measured teachers' classroom contexts. Based on the research purpose, we have selected the indicators of disciplinary climate and low achievement. Students with behavioral problems appear to make up a large part of teachers' classes in the United States, Mexico and Brazil. More than 50% of teachers from those countries reported that there were 10% or more of the students in their classroom had behavioral problems while there were only around 10% of teachers in Norway and Japan had similar problem. The countries also varied significantly on the percentage of teachers reporting high proportion of low academic achievers in their classroom levels, ranging from 6.92% in Korea to 34.6% in the United States.

The average student-teacher ratio is 15 students per teacher across the 32 countries, varying from 8 in Estonia, Iceland, Norway, Poland and 22 in Chile and Japan. Also, TALIS 2013 asked teacher to estimate how much time they spent on teaching and other tasks related to their job per calendar week. Teachers' working hours ranged from 52 hours in Japan and 31 hours in Finland. Teachers in the United reported 45 hours per week while the TALIS average was 38 hours.

To measure how teachers view the status of their field, we chose teachers' responses to the question: "I think that the teaching profession is valued in society" (TALIS 2013). Based on the results, we calculated the value of perceived teaching status for each participating country. The results suggested that countries varied significantly in terms of perceived teaching status, with Malaysia, Finland and Korea scoring highest and Slovakia, France, Sweden scoring lowest. The United States ranked 21st out of the 32 countries and there were only 34% of teachers believed that their job had been valued by the society. We have compared this result with the outcomes of Global Teacher Status Index (GTSI) created by the nonprofit Varkey GEMS Foundation in 2018, which is the first comparison of teacher status across 20 countries. Adults

ages 16–70 in each country were asked questions regarding the teacher status in their countries, such as whether teachers were paid fairly, how much students respected their teachers, and they perceive teaching as a sought-after profession. By using the statistical technique CFA (Principal Component Analysis), an index based on the status, pay, and agency of teachers for each country was calculated. The index represents the extent to which the public in each participating country respects and values teachers. We compared the GTSI countries with the countries in this study. Seventeen countries overlapped in both studies. Among those 17 countries, the regression analysis showed that teachers in the countries with higher GTSI value were more likely to consider their teaching profession as valued in their society ($r = 0.75$, $p < .001$), a finding that, at a certain level, validated the reliability of the indicator of the perceived status of teaching.

We use the relative salary information offered by OECD (Education at a Glance, 2015). The relative salary indicator is calculated based on teachers' salaries relative to earnings for full-time, full-year workers with tertiary education in each country. The indicator has been adjusted for inflation using the deflators for private consumption. The data showed that teachers' relative salaries varied significantly across countries. Korea, Portugal, and Spain have highest relative salaries. Teacher salaries in those countries are at least 20% higher than those of workers with tertiary education. The Czech Republic and Slovak Republic have the lowest relative salaries (on average, less than 50% of those of workers with a tertiary education) (Education at a Glance, 2015). In order to see whether a larger salary increase would retain teachers, the second salary variable for this study was the ratio of salary at the top of the scale to starting salary. This indicator also comes from the Education at Glance administrated by OECD in 2014.

In terms of the degree of wage flexibility, TALIS surveyed principals about who had significant responsibility for establishing teachers' starting salaries, including setting pay scales.

The results showed that in some countries, teacher pay was largely decided at the school level (e.g., the Czech Republic, England, Estonia, the Netherlands, and Sweden), whereas in many other countries, salary decisions have been mainly made at the state level or by central administrators. Less than 40% of teachers across all 32 countries came from the schools where the school makes decisions on teachers' starting salaries, pay scales and salary increases. In those schools, teachers' salaries are decided by either school principal, other members of the school management team, teachers or the school governing board. This study focuses on to which extent the degree of wage flexibility is associated with teachers' turnover intentions.

To measure the economic conditions, in addition to the unemployment rate in 2013, we examined how the changes of the unemployment rate in each country were associated with teachers' turnover intention. We first calculated the mean of unemployment rate from 2000 to 2013 for each country and then calculated the deviation of unemployment rate in 2013 from the mean. We hypothesized that significant increase of unemployment rate in 2013 to the average may reduce teachers' turnover intention.

Results

Table 8 is the descriptive statistics of the variables calculated with respect to their means for the whole set of the sample, as well as the standard deviation, minimum and maximum of the values.

Table 8 Description of the Variables

Variable Name	Mean	SD	Min	Max
Teacher Level (N=91800)				
Gender	0.32	0.47	0	1
Age	42.00	10.66	18	76
Math	0.20	0.40	0	1

Table 8 Continued

Variable Name	Mean	SD	Min	Max
Science	0.21	0.41	0	1
Education	2.91	0.39	1	4
Experience	16	20	0	58
% of students with low academic achievers in classroom	2.50	1.09	1	5
% of students with behavioral issues in classroom	2.33	0.94	1	5
School Level (N=5482)				
School size	664.51	496.66	0	4335
Minority_1 (1%-10%)	0.36	0.48	0	1
Minority_2 (11% to 30%)	0.08	0.27	0	1
Minority_3 (more than 31%)	0.08	0.27	0	1
SpecialEd_1 (1%-10%)	0.62	0.48	0	1
SpecialEd_2 (11% to 30%)	0.17	0.38	0	1
SpecialEd_3 (more than 31%)	0.03	0.17	0	1
Low-SES_1 (1%-10%)	0.34	0.47	0	1
Low-SES_2 (11% to 30%)	0.29	0.45	0	1
Low-SES_3 (more than 31%)	0.23	0.48	0	1
Rural	0.19	0.39	0	1
Urban	0.33	0.47	0	1
Working hours	38.72	5.68	29.29	54.17
Teacher-student ratio	13.35	3.80	7.24	23.23
Country Level (N=32)				
Perceived teacher status	2.08	0.41	1.43	3.09
The change of unemployment rate	0.85	2.91	-3.77	11.47
Relative salary	0.81	0.13	0.52	1.01
Career prospects	1.57	0.30	1.16	2.21
The degree of wage flexibility	37.6	34.59	0	98
GDP	32566.75	14276.83	11587	71475

In order to ensure valid multilevel analyses, the first step of the HLM analysis was to create an unconditional model to partition the total variance in the outcome variable into each level of the data. Level-1, level-2, and level-3 unconditional models, which did not include any

predictors at any level, were developed. The results suggested that significant variation existed among teachers within schools, across schools within countries, and across countries in both models. The intra-class correlation (ICC), which represents the proportion of the variance in the transfer intention model, was 0.05 and 0.15 at the country and school level. This shows that 5% and 15 % of the total variance in transfer intention was accounted for by country and school level differences, respectively. The rest of the variance 80 % $[1- (0.05+0.15)]$ was due to within-school differences. In the quit intention model, the ICC values at the country and school level were 0.09 and 0.12. This shows that 9 % and 12 % of the total variance in quit intention was accounted for by country and school level differences, respectively. The rest of the variance of 79% $[1- (0.09+0.12)]$ was due to within-school differences. Even though some ICC values were relatively small, the multilevel models utilized for them still had a substantial impact on the inferences (Hayes, 2006).

The Effect of Individual and School Characteristics (Compositional Effects)

As shown in Table 9, individual characteristics captured a substantial portion of cross-country variance in teacher turnover intentions. For example, regarding demographic variables, younger, male teachers were significantly more likely to consider tended to leave their teaching position. While science teachers and those with higher educational attainment showed a significantly higher intention to quit. In contrast, math teachers seemed to be more stable than other teachers. Teaching experiences had different effects on teachers' transfer intention and quit intention. The teachers with more experiences were less likely to have intent to change school while they were more likely to consider quitting. In addition, the teachers who reported more classroom discipline issues were more likely to intend to transfer or quit. High proportion of low-performing students in the classroom also had a positive impact on teachers 'turnover intention.

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Table 9 Three-level effects on teachers' transfer intention and quit intention

Fixed Effects	Transfer Intention Model (N=32)	Transfer Intention Model with Salary (N=21)	Transfer Intention Model without Salary (N=21)	Quit Intention (N=32)	Quit Intention with Salary (N=21)	Quit Intention Model without Salary (N=21)
INTRCPT	1.89** (0.61)	1.90** (0.62)	1.90** (0.62)	1.93*** (0.63)	1.92*** (0.61)	1.93*** (0.61)
Gender	0.06 (0.05)	0.05 (0.09)	0.05 (0.07)	0.17** (0.06)	0.19** (0.07)	0.16** (0.05)
Age	-0.008 (0.005)	-0.004 (0.007)	-0.005 (0.002)	-0.15** (0.002)	-0.16** (0.007)	-0.12** (0.004)
Math	-0.33** (0.08)	-0.35** (0.06)	-0.34** (0.06)	-0.18* (0.08)	-0.16* (0.11)	-0.15* (0.09)
Science	0.17* (0.07)	0.19* (0.05)	0.19* (0.06)	0.14* (0.06)	0.16 (0.04)	0.15* (0.04)
Education	0.13* (0.08)	0.14* (0.05)	0.12* (0.04)	0.12* (0.08)	0.11* (0.05)	0.13* (0.05)
Experience	-0.003* (0.007)	-0.006* (0.007)	-0.005* (0.004)	0.04* (0.006)	0.03* (0.007)	0.03* (0.005)
% of students with low-achievement in classroom	0.07** (0.04)	0.09*** (0.04)	0.07** (0.05)	0.03* (0.005)	0.07* (0.004)	0.04* (0.007)
% of students with behavioral issues in classroom	0.19*** (0.04)	0.21*** (0.05)	0.18*** (0.04)	0.20*** (0.03)	0.18*** (0.05)	0.21*** (0.04)
School Predictors						
School size	-0.00009* (0.000)	-0.000041 (0.000)	-0.00008* (0.000)	0.0002 (0.006)	0.0006* (0.000)	0.0006 (0.000)
Minority_1 (1%-10%)	0.02 (0.07)	0.07 (0.06)	0.01 (0.01)	-0.11* (0.06)	0.09* (0.06)	-0.10* (0.05)
Minority_2 (11% to 30%)	0.01 (0.05)	0.05 (0.05)	0.02 (0.05)	-0.02 (0.006)	-0.06 (0.06)	-0.02 (0.005)
Minority_3 (more than 31%)	0.12* (0.03)	0.03 (0.008)	0.09* (0.04)	-0.02 (0.006)	-0.01 (0.06)	-0.02 (0.005)
SpecialEd_1 (1%-10%)	0.08 (0.01)	0.05 (0.04)	0.07 (0.08)	0.005 (0.007)	-0.002 (0.008)	0.003 (0.005)
SpecialEd_2 (11% to 30%)	0.01 (0.09)	0.04 (0.02)	-0.01 (0.08)	0.005 (0.007)	-0.002 (0.008)	0.003 (0.005)
SpecialEd_3 (more than 31%)	0.13* (0.005)	0.12* (0.007)	0.10* (0.003)	0.007 (0.004)	-0.001 (0.005)	0.005 (0.01)
Low-SES_1 (1%-10%)	0.01 (0.04)	0.05 (0.06)	0.02 (0.06)	0.13 (0.14)	0.14 (0.12)	0.12 (0.11)
Low-SES_2 (11% to 30%)	0.03 (0.03)	0.03 (0.01)	0.02 (0.01)	0.21* (0.13)	0.22* (0.12)	0.24* (0.11)
Low-SES_3 (more than 31%)	0.11** (0.03)	0.11** (0.04)	0.12** (0.03)	0.33** (0.23)	0.34** (0.12)	0.32** (0.23)
Rural	0.06* (0.02)	0.04 (0.02)	0.05* (0.02)	-0.11 (0.14)	-0.12 (0.13)	-0.10 (0.17)
Urban	0.04 (0.03)	0.001 (0.001)	0.03 (0.001)	-0.05 (0.01)	-0.03 (0.01)	-0.04 (0.01)

Table 9 Continued

Fixed Effects	Transfer Intention Model (N=32)	Transfer Intention Model with Salary (N=21)	Transfer Intention Model without Salary (N=21)	Quit Intention (N=32)	Quit Intention with Salary (N=21)	Quit Intention Model without Salary (N=21)
Working hours	0.02 (0.04)	0.05 (0.04)	0.04 (0.06)	0.05 (0.005)	0.03 (0.003)	0.03 (0.004)
Teacher-student ratio	0.003* (0.0007)	0.002 (0.005)	0.003* (0.0007)	0.006 (0.008)	0.0048 (0.001)	0.005 (0.005)
Country predictors						
Perceived teacher status	0.11* (0.09)	0.09 (0.07)	0.10* (0.07)	-0.87*** (0.11)	-0.97** (0.13)	-0.86*** (0.09)
The change of unemployment rate	0.01 (0.02)	0.03 (0.01)	0.02 (0.02)	0.01 (0.06)	0.02 (0.02)	0.03 (0.08)
Relative salary		0.008 (0.17)			-0.62* (0.16)	
Salary prospects		-0.67** (0.16)			0.04 (0.11)	
The degree of local wage flexibility	-0.006 (0.001)	0.005* (0.006)	0.008 (0.002)	0.002 (0.001)	0.002 (0.002)	0.002 (0.001)
GDP	-0.00003 (0.000)	-0.00003 (0.000)	0.00002 (0.000)	0.00001 (0.000)	-0.00006 (0.000)	0.00003 (0.000)
Model deviance (parameters)	188837.72 (62)	108812.2 (87)	188841.6 (62)	192171.65 (62)	110252.27 (87)	191952.4 (62)

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

School size also was associated with teachers' transfer intention. As school size increased, teacher intention to transfer decreased. The significance disappeared after adding salary information. The teachers from high-poverty schools (30% or more low-SES students) were more likely to have turnover intention. Also, the high percentage of minority students and the students with special needs had positive effect on teacher transfer intention. Rural teachers were more likely to consider switching schools. This correlation, again, was no longer significant in the model considering teacher salary. Working hours were not related to teacher intention to change school. The teacher-student ratio had a positive effect on transfer intention. Transfer

intention was higher in the countries with higher teacher-student ratios but the significance disappeared after considering salary variables.

<div align="center">*The Effects of Country Variables*</div>

The Direct Effects

In the transfer intention models, the variable of perceived teaching status was a contextual predictor (see Table 9). The positive correlation indicated that the more teachers believed that society valued their job, the more likely they were to switch schools ($r=.11$, $p<.05$). This effect, however, didn't hold constant after adding salary variables (N=21).Career prospects was negatively related to the outcome ($r=-.67$, $p<.01$). The teachers were less likely to change schools in the countries where they had better career prospects. Relative salary has no effect on teacher transfer intention. The degree of local wage flexibility had positive effect on teachers' transfer intention in the salary model. Teachers were more likely to change school in the countries where schools had more power to make salary decisions.

In the quit intention models (see Table 9), perceived teacher status was a strong predictor for quit intention ($r=-.87$, $p<.01$). The result showed that teachers had lower levels of quit intention in countries where they believed teaching was prestigious (see Figure 9). In contrast to the transfer intention model, relative salaries had a negative effect on quit intention ($r=-.62$, $p<.01$). The estimate indicated that for every one unit increase in relative salary a country obtained, teachers within that country would expect a 0.62 unit decrease in quit intention. This finding underscores the important role of teachers' relative salaries in their career decisions. In addition, the unemployment rates were negatively related to teachers' quit intention ($r=-.03$, $p<.01$). The teachers from the countries with higher unemployment rates tended to have lower level of quit intention than those from countries with lower unemployment rates.
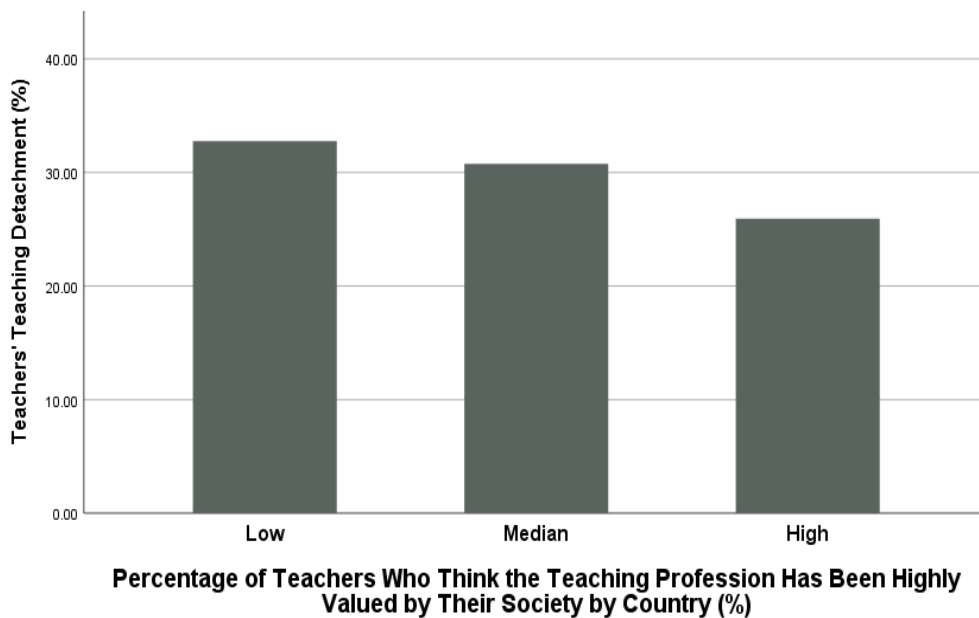
Figure 9 Relationship between perceived teaching status and quit intention across countries

The Cross-level Interaction (the Moderation Effect of Country Variables)

One of the purposes of this study was to assess the moderation effect of country-level factors on the relationships between the lower-level factors and outcomes. Cross-level interactions are useful for answering questions about why lower-level effects vary across higher-level units (Raudenbush & Bryk, 2002). In this study, we were interested in the extent to which the teacher and school level effects varied across countries, with particular attention paid to whether country variables may alter the relationship between student disadvantage and teacher turnover intention. In addition to the indicators of working conditions and school location, we have created an index for disadvantaged schools by using CFA analysis. The indicators of disadvantaged schools include schools with high-percentage of low-income, minority and special-education students and the schools with high-percentage of low-performing students and

the students with behavior issues. The analysis revealed some significant cross-level interactions for both the transfer and quit intention model (see Table 10).

Table 10 Cross-level interaction effects

Transfer Intention	Rural	Urban	Student-teacher ratio	Working hours	Index of disadvantaged school
Perceived teacher status	0.21	-0.002	0.05	-0.06*	-0.18
	(-0.23)	-0.04	-0.04	-0.004	-0.11
Relative salary	-0.85	0.19	-0.03**	-0.05*	-0.15
	-0.03	-0.07	-0.007	-0.06	-0.03
Career prospects	0.04	0.01	-0.03	-0.05**	-0.04
	-0.06	-0.04	-0.01	-0.04	-0.02
Degree of wage flexibility	-0.004*	0.004	0.0002	-0.0003*	0.001
	-0.005	-0.0004	-0.0005	-0.0001	-0.004
Quit intention	Rural	Urban	Student-teacher ratio	Working hours	Index of disadvantaged school
Perceived teacher status	0.51	-0.002	0.05**	-0.003	-0.01
	-0.23	-0.04	-0.04	-0.004	-0.02
Relative salary	-0.85**	0.19*	-0.03**	0.08	0.005
	-0.03	-0.07	-0.007	(0.005)	-0.003
Career prospects	0.04	-0.31*	-0.03*	-0.003	0.08
	-0.06	-0.14	-0.01	-0.004	-0.06
Degree of wage flexibility	-0.002*	0.004	0.0002	0.0003	0.0004
	-0.007	-0.0004	-0.0005	-0.0005	-0.0003

Transfer Intention Model

In Table 9, the perceived teacher status has weakened the strength of the relation between working hours and transfer intention. As perceived teaching status increased, the effect of a high proportion of low-income students on teachers' transfer intention decreased. This means that teachers with longer working hours were less likely to change schools in high-teaching-status countries than those in low-teaching-status countries ($r=-.06$, $p<.05$).

Relative salary weakened the correlation between rural school and transfer intention ($r=-0.85$, $p<.05$). The rural teachers were less likely to have teachers' transfer intentions in the

countries with higher relative salaries. Similarly, relative salary has reduced the effects of student-teacher ratio on the outcome (r=--.03, p<.01). Teachers with larger class size were less likely to change schools in the countries where teachers' social standing was high. Relative salary also had significant moderation effect on the correlation between working hours and transfer intention. The teachers seemed to be less sensitive to the longer working hours in the countries where teachers were paid well.

Career prospects had a negative effect on the relation between working hours and transfer intention. Working long hours became less influential to teachers' intent to change schools in the countries with better career prospects. The degree of local wage flexibility had negative moderation effect on both rural school and working hours. With the flexibility of local wage became larger, the effect of rural school and working hours on teachers' transfer intention became smaller.

Quit Intention Model

As Table 10 indicates, the perceived teacher status had positive moderation effect on the relation between student-teacher ratio and quit intention. The strength of the correlation between student-teacher ratio and quit intention increased in the countries where perceived teacher status was high (r=0.05, p<.01).

Relative salary has weakened the effects of rural and urban schools on quit intention. In countries with better teacher payment, the teachers working in rural or urban schools were less likely to consider quitting their job. The relatively high salaries have decreased the negative effects of high student-teacher ratio on quit intention. As relative salary increased, the teachers with large class size became less likely to leave teaching profession. It's worth noting that both relative salary and career prospects (r=-0.03, p<.01) have reduced the effect student-teacher ratio

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on quit intention. Teachers were less likely to consider leaving in the countries where they were paid well and had better career prospects. The teachers who were teaching urban schools were also less likely to leave in the countries where teachers had better career prospects. The degree of local wage flexibility weakened the relationship between rural teachers and quit intention. The rural teachers had less quit intention in the countries with more local wage flexibility to teacher's pay.

The Sensitivity Test

We have conducted a sensitivity test to detect whether the results were driven by certain country (s). We excluded from the analysis one country at a time to ensure that there was no country was misleading the results. The weighted analysis showed that the results were generally consistent and dropping countries hardly affected results.

Discussion

This study provides in-depth analyses of how country contexts along with teacher and school variables might relate teachers' turnover intentions. Using a large sample of teachers and schools from 32 OECD countries, we estimated a set of three-level HLM models of turnover intention. Theoretically, this approach allows us to explore the country contexts that should be applied to turnover models. The results showed that teacher turnover intention, including both transfer intention and quit intention, varied significantly across countries.

First of all, this study examined how country differences in teacher turnover intentions were explained by multilevel effects. Holding constant compositional differences, the results are in line with previous research that the national contexts are influencing different aspects of schools, including their teachers (e.g., Chiu & Khoo, 2005; Huisman & Smits, 2009) and countries vary significantly on a range of attributes which may influence teachers' turnover

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intentions (OECD, 2016). Among the country variables, the perceived teaching status was one of the most important national predictors and was significant across almost all of the models (with or without a consideration of salaries). Quit intention was lower in countries where teachers thought their profession was respected and valued. Such a relationship has an important policy implication for effective teacher retention. Meanwhile, teachers were more likely to switch schools in countries where teaching had a high social status. One explanation could be that teachers from countries with high teaching status have more autonomy and freedom/confidence in choosing where they want to teach.

In addition to teachers' social status, this study has also explored the effect of teachers' economic status, such as teachers' relative salary and career prospects, on teacher turnover intention. Consistent with previous work, the results showed that relative salary can explain, to some extent, the cross-country differences of teacher turnover intentions *(*Imazeki,2005; Ondrich et al.,2008). Teachers' relative salary had a negative effect on quit intention, meaning that teachers in countries that invested more in teacher salaries reported lower levels of quit intention. Teachers' career prospects were negatively related to teachers' transfer intention, but we didn't find any significance between career prospects and quit intention. Salary structures vary substantially across countries (Woessmann, 2011), which may have different influences on the attractiveness of teaching in different countries. Also, the insignificance may be due to the small number of countries included in the model (N=21). The degree of local wage flexibility was positively associated with the transfer intention, while whether for flexible or inflexible wage decision settings, the insignificance held constant in quit intention model. One of the potential explanations might be that the teachers from the countries with more flexible wage decisions at school level might have more opportunities to choose schools with a better payment.

This study also investigated the effects of general economic conditions on teacher turnover intentions. The findings didn't show any significance between the change of unemployment rates and teacher turnover intention. It's worth noting that compared with national-level unemployment rate, the local unemployment situation may have more influence on teachers career decision. Additionally, teacher pay and other conditions may have played a more important role in keeping teachers in teaching positions in the long run. Moreover, the findings showed that the wealth of a country, measured GDP per capital, was not related to teachers' turnover intention. The wealthy countries were not more likely to retain their teachers than poor countries.

Secondly, aligned with the previous findings (e.g., Allen, Burgess, & Mayo, 2018; Bonhomme, Jolivet, & Leuven, 2016; Hanushek, Kain, O'Brien, & Rivkin, 2005), working conditions were associated with teachers' turnover intentions. The findings have displayed significant within-country and between-country differences in teachers' working conditions and teachers do respond to the differences after controlling for teacher and country attributes. For example, the teachers from the low-income schools or the schools with high proportion of low-performing students tended to have higher level of turnover intentions. Also, student behavior issue was an important predictor of both teachers' transfer intention and quit intention, even after controlling for salary information. As previous study showed that, high level discipline issues will make teachers' work more demanding and frustrating at a level that is not offset by high pay (Carnoy & DeAngelis, 2002).

Furthermore, the findings showed positive correlations between student-teacher ratio and transfer intention, meaning teachers were sensitive to large class size. However, another indicator of work demand, working hours, was not significantly related to the outcomes. This

may not be unexpected as working hours were found to have rather modest or weak influence on teacher job satisfaction and turnover in some literature (Han, Borgonovi, & Guerriero, 2018; Tolbert & Moen, 1998). Future research may need to disentangle the effects of working hours from actual workload the teachers are having.

Different from earlier research, one of the focuses of this study was to test whether the country attributes may have changed teachers' sensitivity to working conditions including school disadvantages (e.g., high poverty, low achievement, discipline issues). This study found some moderation effects of the country variables. For example, the relationship between the working hours and teacher transfer intention varied as a function of the country-level variable. Teachers became less sensitive to work time in the countries where teaching had a higher status than the teachers from the countries with a low teacher status. On the contrary, the perceived teacher status has increased the correlation between student-teacher ratio and quit intention. The teachers with larger class size seemed to be more likely to leave in the countries with higher teacher social standing. Furthermore, both relative salaries and career prospects have reduced the effects of some of the working conditions, such as school location and work demands.

Thirdly, the study has investigated teachers' transfer intention and quit intention individually. The participating countries differed significantly regarding the percentages of teachers with turnover intentions. Some countries had more teachers with transfer intention than those with quit intention (e.g., Malaysia, Mexico), while the countries, such as Sweden and Spain, had more teachers with quit intention than the teachers wanted to change school. The findings might imply the influences of the country contexts on teachers' turnover intentions.

The multilevel analysis indicated that the factors, from the individual to country level, had different effects on teachers' transfer intention and quit intention. For example, consistent

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with the prior literature (Ingersoll & May, 2012), the teachers who tended to transfer schools seemed to be more sensitive to student demographics than the teachers with quit intention. On the other hand, as some previous studies have shown (Imazeki, 2005; Theobald & Gritz, 1996), the teachers with quit intention were more likely respond to the differences of teacher relative salaries. Teacher social status also had different effect on the turnover intentions. In the countries with high teacher status, teachers were more likely to change schools but less likely to consider quitting. The study has provided the evidences that it is important to differentiate between movers and leavers and to have different policy responses (Kukla-Acevedo, 2009). The policies regarding teacher recruitment and retention may need to be more directed and specific to generate a more targeted response.

<div align="center">**Implications and Conclusions**</div>

This study highlights the importance of a cross-national approach to teacher turnover research. Teacher turnover is one of the topics that have been largely researched in the educational field. Yet, to date, most of the teacher turnover research and theories have been tested and generated within some Western countries, especially in the United States (e.g., Goldhaber, Gross, & Player, 2007; Ingersoll, 2001). Researchers have warned that over-emphasis on intra-national studies may cause insularity that potentially could lead to insensitivity concerning teacher policies in various situations (Dolton & Marcenaro-Gutierrez, 2011). This contribution ties directly to the call for an increase in turnover research to better capture social contexts (Hausknecht & Trevor, 2011).

The findings of the study shed light on the application of turnover theory and research may need to be tailored to specific national contexts to make them more practically relevant. Consistent with the previous findings (Klassen et al., 2012), we found that social context can

directly and indirectly influence on teachers' engagement and teaching commitment. For instance, despite the large evidences of the correlation between working conditions and teacher turnover in the US studies, those variables may have a differential effect on teacher turnover intentions in different country contexts and the relationships were less significant in some countries than in others. Country context may have played a role in weakening or even breaking such a correlation and teachers from countries where teaching is valued seem to be more willing to stay. Future research should explore more national variables that might have contributed to teachers' career decision and teacher labor market in general.

Furthermore, the findings of the study lend support to the idea that teaching conditions are important to teachers' teaching engagement. The teachers with higher levels of satisfaction to their working conditions tended to stay. There have been many policy decisions across countries aiming at increasing the attractions to teaching. The quick solution may be increasing teachers' salaries. However, full reliance on salary increase may fail to recognize some other key dimensions. The findings of this cross-national study have demonstrated that instead of simply looking to raise salaries in general, improving teachers' working conditions to create a more desirable job environment may be more important over the long haul.

Our findings have also echoed the role of an effective pay packages in securing teachers, especially for high-need schools (e.g., Lazear, 2003). Governments should focus on the flexible and optimal pay structure that addresses not only the wide disparities among schools and different working conditions but also teacher's career growth. Some governments, such as Japan, have long provided such supports to the teachers who are working in high-needs schools and areas (UNESCO Institute for Statistics, 2006). Furthermore, although the findings have again suggested the importance of teachers' relative salaries, future cross-national research, as some

scholars suggested (e.g., Hanushek, 2009), may need to focus on how teacher quality responds to different levels of salaries.

This study has also underscored the role of teachers' social status in teachers' retention and stressed the role of government in promoting a positive image of teachers and raising public awareness of the value the teaching profession. Nowadays, for both individuals and nations, education is becoming increasingly important and teachers around the world remain in the policy spotlight. However, although a range of literature has long confirmed the significant effect of teacher quality on student achievement (Hanushek, 2011; Hanushek, Piopiunik, & Wiederhold, 2014), teachers around world feel that their work has been undervalued (OECD, 2015). This study revealed that teacher salaries and working conditions were not the only important factors in teacher retention; the ability of countries to successfully recruit and retain quality teachers, especially for disadvantaged schools, also depended on the social standing of teachers. The high status and prestige may not only attract more quality teachers but also offset the decline of salaries and working condition. Nevertheless, teaching status is a hard-to-measure concept and contains multiple aspects (Bushaw & Lopez, 2011). It must take into account various factors that involve the profession (e.g., social and economic development, characteristics of education systems, school organization) in order to effectively and comprehensively improve teaching status.

Teachers across many countries struggle with the increasing challenges that undermine their teaching commitment. There are a variety of factors that might affect teachers' career decisions and some of them are outside the educational systems (UNESCO Institute for Statistics, 2006). While not perfect, this study provides a comprehensive picture of how country contexts are associated with teacher turnover intention. Teacher policies vary across countries due to

different educational beliefs and practices, as well as different demands and expectations on schools and teachers (Woessmann, 2016). The findings of multilevel approach have implications for how countries should plan for ensuring stable teacher forces for public education. In addition to the teacher and school attributes, many factors outside the educational systems are also influencing different aspects of teacher turnover intention. Education policymakers should focus on the multiple levels to attract and retain quality teachers, from school to national level policy design and implementation.

Limitations

This study has some limitations. First, all the factors were self-reported by teachers and principals. The possible method or respondent bias should not be ruled out. The reliability of the findings is limited to the reliability of the data sources used in the study: international surveys and government reports. Second, this was a correlational study based on a cross-sectional dataset, any cause and effect implications are not guaranteed. Third, the variance across countries was still significant, calling for variables to enhance the explanatory power of the models. Although we focused on several country-level variables, other unknown (omitted) factors may have contributed to this unexplained variance. After all, various hard-to-observe factors may have contributed to the between-country differences in education and school systems (Woessmann, 2016). Additionally, there were no data on other intermediate levels such as school districts. It might be possible that the effects of the omitted levels were reflected in the individual-level estimates. Fourth, the small number of countries in the salary model (N=21) may cause potential sampling bias.

References

Ahn, T. (2015). Matching strategies of teachers and schools in general equilibrium. *IZA Journal of Labor Economics, 4*(1), 1.

Akiba, M., Chiu, Y., Shimizu, K., & Liang, G. (2012). Teacher salary and national achievement: A cross-national analysis of 30 countries. *International Journal of Educational Research, 53*, 171-181.

Allen, R., Burgess, S., & Mayo, J. (2018). The teacher labour market, teacher turnover and disadvantaged schools: New evidence for england. *Education Economics, 26*(1), 4-23.

Allensworth, E., Ponisciak, S., & Mazzeo, C. (2009). The schools teachers leave: Teacher mobility in chicago public schools. *Consortium on Chicago School Research,* Retrieved from https://files.eric.ed.gov/fulltext/ED505882.pdf

Ávalos, B. & Valenzuela, J. P. (2016). Education for all and attrition/retention of new teachers: A trajectory study in Chile. *International Journal of Educational Development, 49*, 279-290.

Barbieri, G., Rossetti, C., & Sestito, P. (2011). The determinants of teacher mobility: Evidence using italian teachers' transfer applications. *Economics of Education Review, 30*(6), 1430-1444.

Bonhomme, S., Jolivet, G., & Leuven, E. (2016). Job characteristics and labor turnover: Assessing the role of preferences and opportunities. *The Economic Journal, 126*(594), 1342-1371.

Bonhomme, S., Jolivet, G., & Leuven, E. (2016). School characteristics and teacher turnover: Assessing the role of preferences and opportunities. *The Economic Journal*, Retrieved from https://pdfs.semanticscholar.org/2706/3828fd82b7c20bafd8d96b454002284f893b.pdf

Borman, G.D. & Dowling, N.M. (2006). The longitudinal achievement effects of multi-year

    summer school: Evidence from the Teach Baltimore randomized field trial. *Educational*

    Evaluation and Policy Analysis, *28*, 25-48.

Brill, S. & McCartney, A. (2008). Stopping the revolving door: Increasing teacher retention.

    Politics and Policy, 36(5), 750-774.

Britton, J. & Propper, C. (2016). Teacher pay and school productivity: Exploiting wage

    regulation. *Journal of Public Economics, 133*, 75-89.

Brooke, N. (2016). High-stakes accountability using teacher salary incentives in Brazil: An

    update. Retrieved from

    http://digibug.ugr.es/bitstream/handle/10481/44611/rev203art7.pdf?sequence=1&isAllowed

    =y

Bryan, M. L. & S. P. Jenkins (2015). Multilevel Modeling of country Effects: a Cautionary Tale,

    European Sociological Review, 1–20.

Burke, P. F., Schuck, S., Aubusson, P., Buchanan, J., Louviere, J. J., & Prescott, A. (2013). Why

    do early career teachers choose to remain in the profession? the use of best–worst scaling to

    quantify key factors. *International Journal of Educational Research, 62*, 259-268.

Burns, D. & Darling-Hammond, L. (2014). Teaching around the world: What can TALIS tell

    us. *Stanford Center for Opportunity Policy in Education,* Retrieved from

    https://edpolicy.stanford.edu/sites/default/files/publications/teaching-around-world-what-

    can-talis-tell-us_3.pdf.

Busemeyer, M. R. (2007). Determinants of public education spending in 21 OECD democracies,

    1980–2001. *Journal of European Public Policy, 14*(4), 582-610.

Bushaw, W. J. & Lopez, S. J. (2011). Betting on teachers: The 43rd annual Phi Delta

    Kappa/Gallup Poll of the public's attitudes toward the public schools. *Phi Delta Kappan*,

    93(1), 9–26.

Chew, H. G., Ng, K. Y. N., & Fan, S. (2016). Effects of alternative opportunities and

    compensation on turnover intention of Singapore PMET. *World Academy of Science,*

    Engineering and Technology, International Journal of Social, Behavioral, Educational,

    Economic, Business and Industrial Engineering, 10(3), 720-728.

Chiu, M. M. & Khoo, L. (2005). Effects of resources, inequality, and privilege bias on

    achievement: Country, school, and student level analyses. *American Educational Research*

    Journal, 42(4), 575-603.

Chung, T., Dolton, P., & Tremayne, A. (2004). The determinants of teacher supply: Time series

    evidence for the UK, 1962-2001. *Royal Economic Society Annual Conference.*

Contreras, D. & Rau, T. (2012). Tournament incentives for teachers: Evidence from a scaled-up

    intervention in Chile. *Economic Development and Cultural Change, 61*(1), 219-246.

deRee, J., Muralidharan, K., Pradhan, M., & Rogers, H. (2017). Double for nothing?

    experimental evidence on an unconditional teacher salary increase in Indonesia, Retrieved

    from http://documents.worldbank.org/curated/en/616961512396126770/pdf/WPS8264.pdf

Dolton, P. and van der Klaauw, W. (1999) The turnover of teachers: a competing risks

    explanation, *Review of Economics and Statistics, 81*, 543-552

Dolton, P. & Marcenaro-Gutierrez, O. D. (2011). If you pay peanuts do you get monkeys? A

    cross-country analysis of teacher pay and pupil performance. *Economic Policy, 26*(65), 5-55.

Dolton, P., Tremayne, A., & Chung, T. (2003). *The economic cycle and teacher supply OECD*

    Paris.

Duyar, I., Gumus, S., & SukruBellibas, M. (2013). Multilevel analysis of teacher work attitudes:

    The influence of principal leadership and teacher collaboration. *International Journal of*

    Educational Management, 27(7), 700-719.

Education at a Glance (2015). OECD Indicators. Retrieved from http://download.ei-

    ie.org/Docs/WebDepot/EaG2015_EN.pdf.

Education at a Glance (2017). OECD Indicators. Retrieved from

    https://www.hm.ee/sites/default/files/eag2017_eng.pdf.

Evans, D. K., & Yuan, F. (2018). The working conditions of teachers in low-and middle-income

    countries. Retrieved from

    https://www.riseprogramme.org/sites/www.riseprogramme.org/files/inline-files/Yuan.pdf.

Falch, T. & Strøm, B. (2005). Teacher turnover and non-pecuniary factors. *Economics of*

    Education Review, 24(6), 611-631.

Feng, L. (2014). Teacher placement, mobility, and occupational choices after

    teaching. *Education Economics, 22*(1), 24-47.

Field, A. (2009). *Discovering statistics using SPSS*, Sage publications.

GTSI, Global Teacher Status Index (2018),Retrieved from

    https://www.varkeyfoundation.org/media/4790/gts-index-9-11-2018.pdf.

GTSI, Global Teacher Status Index (2013), Retrieved from

    http://sro.sussex.ac.uk/63812/1/2013%2BGlobal%2BTeacher%2BStatus%2BIndex%2BI.

    pdf.

Goldhaber, D. & Walch, J. (2013): "Rhetoric Versus Reality: Is the Academic Caliber of the

    Teacher Workforce Changing?" *CEDR Working Paper*, 2013-4.

Goldhaber, D., Gross, B., & Player, D. (2007). Are public schools really losing their best? assessing the career transitions of teachers and their implications for the quality of the teacher workforce. *National Center for Analysis of Longitudinal Data in Education Research,*Working paper 12.

Clotfelter, C. T., Ladd, H. F., & Vigdor, J. L. (2011). Teacher mobility, school segregation, and pay-based policies to level the playing field. *Education Finance and Policy, 6*(3), 399-438.

Grissom, J. A., Viano, S. L., & Selin, J. L. (2016). Understanding employee turnover in the public sector: Insights from research on teacher mobility. *Public Administration Review, 76*(2), 241-251.

Gritz, R. M. & Theobald, N.D. (1996). The effects of school district spending priorities on length of stay in teaching. *Journal of Human Resources 31* (3): 477-512.

Haltiwanger, J., Scarpetta, S., & Schweiger, H. (2014). Cross country differences in job reallocation: The role of industry, firm size and regulations. *Labour Economics, 26*, 11-25.

Han, S. W., Borgonovi, F., & Guerriero, S. (2018). What motivates high school students to want to be teachers? the role of salary, working conditions, and societal evaluations about occupations in a comparative perspective. *American Educational Research Journal, 55*(1), 3-39.

Hanushek, E. A. (2009). Teacher deselection. *Creating a New Teaching Profession, 168*, 172-173.

Hanushek, E. A. (2011). The economic value of higher teacher quality. *Economics of Education Review, 30*(3), 466-479.

Hanushek, E. A. & Luque, J. A. (2003). Efficiency and equity in schools around the world. *Economics of Education Review, 22*(5), 481-502.

Hanushek, E. A. & Rivkin, S. G. (2007). Pay, working conditions, and teacher quality. *The Future of Children,* 69-86.

Hanushek, E. A. & Rivkin, S. G. (2010). Generalizations about using value-added measures of teacher quality. *American Economic Review, 100*(2), 267-271.

Hanushek, E. A., Kain, J. F., & Rivkin, S. G. (2004). Why public schools lose teachers. *Journal of Human Resources, 39*(2), 326-354.

Hanushek, E. A., Kain, J. F., O'Brien, D. M., & Rivkin, S. G. (2005). *The Market for Teacher Quality,*Retrieved from https://www.nber.org/papers/w11154.pdf.

Hanushek, E. A., Piopiunik, M., & Wiederhold, S. (2014). *The Value of Smarter Teachers: International Evidence on Teacher Cognitive Skills and Student Performance*, Retrieved from http://edoc.ku-eichstaett.de/21385/1/Hanushek%2BPiopiunik%2BWiederhold_JHR_Website.pdf

Hargreaves, L. & Flutter, J. (2013). *The Status of Teachers and the Teaching Profession: A desk-study for Education International(Unpublished manuscript*), UK: Department of Education, University of Cambridge.

Hargreaves, L., Cunningham, M., Hansen, A., McIntyre, D., Oliver, C., & Pell, T. (2007). The status of teachers and the teaching profession in England: Views from inside and outside the profession. *The Chancellor, Masters and Scholars of the University of Cambridge.*

Hayes, A. F. (2006), A Primer on Multilevel Modeling, Human Communication Research 32 (2006) 385–410, *2006 International Communication Association*, Retrieved from https:// doi:10.1111/j.1468-2958.2006.00281.x

Hendricks, M. D. (2014). Does It Pay to Pay Teachers More? Evidence from Texas. *Journal of Public Economics,109*(1): 50–63.

Hilton, G. L. (2017). Disappearing teachers: An exploration of a variety of views as to the causes

    of the problems affecting teacher recruitment and retention in England. *Bulgarian*

    Comparative Education Society. Retrieved from

    https://files.eric.ed.gov/fulltext/ED574197.pdf

Hoxby, C. M. & Leigh, A. (2004). Pulled away or pushed out? explaining the decline of teacher

    aptitude in the united states. *The American Economic Review, 94*(2), 236-240.

Huisman, J. & Smits, J. (2009). Effects of household-and district-level factors on primary school

    enrollment in 30 developing countries. *World Development, 37*(1), 179-193.

Hulin, C. L., Roznowski, M., & Hachiya, D. (1985). Alternative opportunities and withdrawal

    decisions: Empirical and theoretical discrepancies and an integration. *Psychological*

    Bulletin, 97(2), 233.

Imazeki, J. (2002). Teacher attrition and mobility in urban districts: Evidence from

    Wisconsin. *Fiscal Issues in Urban School,* 119-136.

Imazeki, J. (2005). Teacher salaries and teacher attrition. *Economics of Education Review, 24*(4),

    431-449.

Ingersoll, R. (2001). Teacher turnover and teacher shortages: An organizational analysis.

    Philadelphia: Graduate School of Education, Working Paper 9-1-01. University of

    Pennsylvania.

Ingersoll, R. M. (2003). Turnover and shortages among science and mathematics teachers in the

    United States. *Science Teacher Retention: Mentoring and Renewal,* 1-12.

Ingersoll, R. M. & Smith, T. M. (2003). The wrong solution to the teacher shortage. *Educational*

    Leadership, 60(8), 30-33.

Ingersoll, R. M. & May, H. (2012). The magnitude, destinations, and determinants of
mathematics and science teacher turnover. *Educational Evaluation and Policy
Analysis, 34*(4), 435-464.

Ingersoll, R., Merrill, L., & Stuckey, D. (2014). Seven trends: The transformation of the teaching
force. Retrieved from
http://www.cpre.org/sites/default/files/workingpapers/1506_7trendsapril2014.pdf.

Karbownik, K. (2016). *The Effects of Student Composition on Teacher Turnover: Evidence from
an Admission Reform*. Retrieved from
https://www.econstor.eu/bitstream/10419/147387/1/cesifo1_wp6133.pdf

Kim, E. & Han, Y. (2002). Attracting, developing and retaining effective teachers: Background
report for Korea. *Seoul: Korean Educational Development Institute.*

Kim, E., Han, Y., & Park, J. (2008). Teachers' salaries in Korea, 1985 to 2007: An in-depth
analysis and policy recommendations. *KEDI Journal of Educational Policy, 5*(2)

Kukla-Acevedo, S. (2009). Leavers, movers, and stayers: The role of workplace conditions in
teacher mobility decisions. *The Journal of Educational Research, 102*(6), 443-452.

Ladd, H. F. (2007). Teacher Labor Markets in Developed Countries. *Future of Children, 17*(1),
201-217.

Lankford, H., Loeb, S., & Wyckoff, J. (2002). Teacher sorting and the plight of urban schools: A
descriptive analysis. *Educational Evaluation and Policy Analysis, 24*(1), 37-62.

Leigh, A. (2012). Teacher pay and teacher aptitude. *Economics of Education Review, 31*(3), 41-
53.

Leigh, A. & Ryan, C. (2008). Estimating returns to education using different natural experiment
techniques. *Economics of Education Review, 27*(2), 149-160.

Learning Policy Institute (2016). *A Coming Crisis in Teaching? Teacher Supply, Demand, and Shortages in the U.S*. Retrieved from https://learningpolicyinstitute.org/product/coming-crisis-teaching-brief.

Liang, X. (2000). Teacher pay in 12 Latin American countries: How does teacher pay compare to other professions? What determines teacher pay? Who are the teachers? World Bank, Latin America and the Caribbean Regional Office.

Iliya, A. & Ifeoma, L. G. (2015). Assessment of teacher motivation approaches in the less developed countries. *Journal of Education and Practice, 6*(22), 10-17.

Liu, S. & Onwuegbuzie, A. J. (2014). Teachers' motivation for entering the teaching profession and their job satisfaction: A cross-cultural comparison of china and other countries. *Learning Environments Research, 17*(1), 75-94.

Luczak, L. D. & Loeb, S. (2013). *How teaching conditions predict: Teacher turnover in California schools. Rendering school resources more effective*(pp. 48-99). Routledge.

MacBeath, J. (2012). *Future of teaching profession.* Retrieved from Education International Brussels.

Matsuoka, R. (2015). School socioeconomic context and teacher job satisfaction in japanese compulsory education. *Educational Studies in Japan, 9*, 41-54.

Nagler, M., Piopiunik, M., & West, M. R. (2015). *Weak Markets, Strong Teachers: Recession at Career Start and Teacher Effectiveness,* Retrieved from https://www.econstor.eu/bitstream/10419/121766/1/832334510.pdf

Newmann, F.M. & Wehlage, G.G. (1995). *Successful School Restructuring: A Report to the Public and Educators*. Madison: Center on Organization and Restructuring of Schools, University of Wisconsin.

OECD (2005). Teachers matter: Attracting, developing and retaining effective

teachers Organisation for Economic Co-operation and Development. Retrieved from

https://www.oecd.org/education/school/34990905.pdf

OECD (2014), New Insights from TALIS 2013: Teaching and Learning in Primary and Upper

Secondary Education. Retrieved from http://dx.doi.org/10.1787/9789264226319-en

OECD (2016), PISA 2015 Results (Volume II): Policies and Practices for Successful Schools,

PISA. http://dx.doi.org/10.1787/9789264267510-en.

Ondrich, Y., Pas, E., & Yinger, J., (2008). The Determinants of Teacher Attrition in Upstate

New York. *Public Finance Review*, 36, 112–144.

Park, H. & Byun, S. (2015). Why some countries attract more high-ability young students to

teaching: Cross-national comparisons of students' expectation of becoming a

teacher. *Comparative Education Review, 59*(3), 523-549.

Plunkett, M. & Dyson, M. (2011). Becoming a teacher and staying one: Examining the complex

ecologies associated with educating and retaining new teachers in rural

Australia? *Australian Journal of Teacher Education, 36*(1), 3.

Raudenbush, S. W. & Bryk, A. S. (2002). *Hierarchical linear models: Applications and data

analysis methods Sage. Resources,37*(1), 192-216.

Ruiter, S. & Van Tubergen, F. (2009). Religious attendance in cross-national perspective: A

multilevel analysis of 60 countries. *American Journal of Sociology, 115*(3), 863-895.

Scafidi, B., Sjoquist, D. L., & Stinebrickner, T. R. (2007). Race, poverty, and teacher

mobility. *Economics of Education Review, 26*(2), 145-159.

Sellar, S. & Lingard, B. (2013). The OECD and global governance in education. *Journal of

Education Policy, 28*(5), 710-725.

Shenkar, M. & Shenkar, O. (2011). Labor conflict on the national stage: Metaphoric lenses in Israel's teachers' strike. *Comparative Education Review, 55*(2), 210-230.

Simon, N. S. & Johnson, S. M. (2015). Teacher turnover in high-poverty schools: What we know and can do. *Teachers College Record, 117*(3), 1-36.

Slater, H., Davies, N. M., & Burgess, S. (2012). Do teachers matter? Measuring the variation in teacher effectiveness in England. *Oxford Bulletin of Economics and Statistics, 74*(5), 629-645.

Symeonidis, V. (2015). The status of teachers and the teaching profession. *Education International Research Institute: Belgium.* Retrieved from https://download.ei-ie.org/Docs/WebDepot/The%20Status%20of%20Teachers%20and%20the%20Teaching%20Profession.pdf

Thomson, M. M., Turner, J. E., & Nietfeld, J. L. (2012). A typological approach to investigate the teaching career decision: Motivations and beliefs about teaching of prospective teacher candidates. *Teaching and Teacher Education, 28*(3), 324-335.

Tiplic, D., Brandmo, C., & Elstad, E. (2015). Antecedents of Norwegian beginning teachers' turnover intentions. *Cambridge Journal of Education, 45*(4), 451-474.

UNESCO (2016). *The world needs almost 69 million new teachers to reach the 2030 education goals.* Retrieved from http://unesdoc.unesco.org/images/0024/002461/246124e.pdf.

UNESCO (2006). *Teachers and educational quality: Monitoring global needs for 2015.* Retrieved from http://unesdoc.unesco.org/images/0014/001457/145754e.pdf.

Van Amelsvoort, H. G. & Scheerens, J. (1996). International comparative indicators on teachers. *International Journal of Educational Research, 25*(3), 267-277.

Van de Schoot, R., Lugtig, P., & Hox, J. (2012). A checklist for testing measurement

    invariance. *European Journal of Developmental Psychology, 9*(4), 486-492.

Vegas, E., Loeb, S., Romaguera, P., Paglayan, A., & Goldstein, N. (2010). Teacher policies

    around the world: Objectives, rationale, methodological approach, and products. Retrieved

    from

    http://siteresources.worldbank.org/EDUCATION/Resources/Vegasetal__Teacherpoliciesaro

    undtheworld.draft.pdf

World Bank (2013).World Bank Unemployment Rate 2013. Retrieved from

    https://data.worldbank.org/indicator/sl.uem.totl.zs

Wolman, P. (2010). Status of the American Public School Teacher, 2005-2006. Washington, DC:

    National Education Association Research Department.

Woessmann, L. (2011). Cross-country evidence on teacher performance pay. *Economics of*

    Education Review, 30(3), 404-418.

Woessmann, L. (2016). The importance of school systems: Evidence from international

    differences in student achievement. *Journal of Economic Perspectives, 30*(3), 3-32.

4. FACTORS RELATING TO TEACHERS' INTENTION TO CHANGE SCHOOLS: A MULTILEVEL PERSPECTIVE[2]

Introduction

Teacher turnover is a global concern that influences students all over the world. The turnover rates across countries have steadily increased in recent decades (OECD, 2014). Statistics in North American, for example, have indicated the U.S. teacher turnover rates were about 30–50% over the past 40 years (The U.S. Department of Education, 2015). In 2015-16 school year, there were around 47,000 to 80,000 teaching vacancies in public schools according to the latest NCES report (Sutcher, Darling-Hammond, & Carver-Thomas, 2016). The high turnover rates in public schools, especially in those hard-to-staff schools, remains a growing problem and has become the largest component of teacher supply problems in the U.S. school system (Adnot, Dee, Katz, & Wyckoff, 2017). The schools with low market attractiveness usually face more severe teacher turnover and more challenges staffing classrooms with high-quality teachers than other schools (Sutcher et al., 2016). The purpose of the study was to examine the individual and school organizational factors that were associated with teachers' intentions to change schools. Particular attention has been paid to the teacher transfer intention in disadvantaged schools (e.g., the schools with high proportions of low-income or/and minority students).

Teacher turnover usually includes both attrition and school-to-school mobility (Stuit & Smith, 2012). However, research attention has mainly focused on those who leave their teaching

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position altogether, whereas teachers who move to another school or district have been understudied as it does not increase or decrease the overall number of teachers (Grissom, Viano, & Selin, 2016). Yet research evidences have shown that high teacher turnover rates are negatively associated with students' achievement, especially for those disadvantaged students (Ingersoll, 2001). Additionally, some studies separately examining teacher turnover revealed that the predictors of teachers' transfer and quit decision were not necessarily the same (Kukla-Acevedo, 2009). Therefore, studying teacher transfer intention has important policy implications. For instance, it may be useful for policy-makers to avoid superficial or false policy adoptions by accurately identifying the factors contributing to teachers' decisions of changing schools.

Moreover, compared with the role of salaries on teacher turnover decisions (e.g., Goldhaber, Gross, & Player, 2007; Ransom & Sims, 2010), the effects of non-pecuniary factors have not been sufficiently studied (Weston, 2015). Previous studies have indicated that the reasons of teacher turnover and mobility still remain unclear due to the lack of knowledge on the differences in non-pecuniary job attributes (Tiplic, Brandmo, & Elstad, 2015; Loeb & Page, 2000). The current study attempts to contribute to the field of teacher turnover by investigating the effects of non-pecuniary factors, especially the organizational conditions, on teacher transfer intention. While numerous studies have documented the pattern that teachers tend to leave the schools with high proportion of low-income and/or minority students (e.g., Boyd, Lankford, Loeb, & Wyckoff, 2005;Guarino,Santibanez, & Daley, 2006), more research efforts should focus on how to disentangle the influence of student demographics from that of the organizational conditions (Kraft, Papay, Charner-Laird, Johnson, Ng, & Reinhorn, 2012). As this study will show, teachers seem to be more vulnerable to poor organizational conditions (e.g. lack of teacher cooperation, poor teacher-student relationships) than to student demographics.

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Also, major research consideration of teacher turnover has been placed on individual antecedents and at a single level, leaving the potential multilevel effect on teacher turnover largely unexplored (Lindqvist, Nordänger, & Carlsson, 2014). Unlike the traditional analytical approach, multilevel modeling can separate the organization-level effects from individual-level effects and capture the information that might otherwise have been overlooked (Holtom, Mitchell, Lee, & Eberly, 2008). Under the multilevel framework, this study is an effort to draw more research and policy attentions to teacher transfer intention from both individual and organizational levels (Meyer & Benavot, 2013). An improved understanding of the multilevel antecedents can benefit school organizations, enhance teachers' satisfaction and improve educational outcomes (Holtom et al., 2008). Particularly, the understanding of the contexts and factors relating to disadvantaged schools by using multilevel perspective has implications for policy efforts to reduce long-standing educational disparities, particularly in equitable teacher allocation (Li, Lee, Mitchell, Hom, & Griffeth, 2016).

In addition to the direct effect of school disadvantage on teachers' transfer intention, this study has also focused on the cross-level interaction effect of school disadvantage (e.g., high proportion of low-income students). School environment can shape the relationship between teacher characteristics and transfer intention (Kraft et al., 2012). To further understand the conditions under which different teachers might have different job decisions, this study examined the moderating role of school disadvantage on the outcome after controlling for the individual- and school-level predictors. This moderation analysis is useful for answering questions about why individual effects vary across school units (Raudenbush & Bryk, 2002).

The dataset used in the study was the 2013 Teaching and Learning International Survey (TALIS) administrated by the Organization for Economic Co-operation and Development

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(OECD). The current study has only focused on the U.S. data from the TALIS. By using multilevel analysis, this study is an attempt to understand the non-pecuniary factors contributing to the variations of teacher turnover intention across the U.S. lower secondary schools (grades 7-9). In line with previous studies (Tiplic, Brandmo, & Elstad, 2015), the phrase "transfer intention" in this study refers to teachers' attitudes favoring leaving their current workplace and move to another school. The research is guided by the questions as following:

1. What are the relative roles of individual and school characteristics and organizational conditions in explaining teachers' intention to change school?

2. To what extent the teachers from disadvantaged schools (e.g., low-income and/or minority schools) are more likely to have transfer intention?

3. Do disadvantaged schools moderate the effect of the teacher characteristics on the outcome (cross-level interaction)?

Literature Review

Prior scholarly efforts to address and understand teacher turnover have included a multiplicity of methods. Although it is difficult to compare findings across such conceptual and methodological diversity, several overarching conclusions have been reached.

Teacher Turnover Intention

Teacher turnover intention has been seen as a strong predictor and an alternative measure of actual turnover behaviors (Cho & Lewis, 2012), and has been incorporated into many employee turnover models (Medina, 2012). Unlike the costly longitudinal designs for actual turnover behaviors by using administration data, the survey data for turnover intention have their desirable statistical qualities (Cohen, Blake, & Goodman, 2015). For example, they usually contain much more variable information than regular educational administration data. The

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TALIS data file in the current study, for instance, contains both basic information of the teachers and schools and perception data on a series of topics (e.g., school climate and leadership). The richness of the survey data provides us an opportunity to capture the factors that might have been missed out by solely relying on administration data.

Much turnover intention research has been conducted in the fields of Organizational Psychology (e.g., George & Jones, 2008), and Economics (e.g., Sousa-Poza & Henneberger, 2004; Markey, Ravenswood, & Webber, 2012). Limited work has been found in the field of Educational Policy (Felps, Mitchell, & Byington, 2006). Studying teacher turnover intention is important not only for identifying the movers but also understanding the "reluctant stayers" since not everyone with turnover intention will actually leave (Li et al., 2016). Those "reluctant stayer" have been described as "bad apples" in the workplaces (Felps et al., 2006). The effect of reluctant stayers can be severe because low job satisfaction and high stress may result in low work enthusiasm and productivity (Zembylas & Papanastasiou, 2004), which certainly will impact on students' learning and development (Sargent & Hannum, 2005).

Non-pecuniary Factors

Substantial empirical research has documented the determinants and predictors of teacher turnover in the last 50 years, which can be divided into two main areas of focus. The first looks at pecuniary factors, such as teacher relative pay, as primary determinants of teacher labor market (e.g., Cowan & Goldhaber, 2015). However, despite of the importance of salaries on teacher market and teaching quality, research often finds the positive relationship between salaries and teacher turnover fail to be robustly confirmed in some large cross-sectional data (e.g., Hanushek, Rivkin, Rothstein, & Podgursky, 2004; Hanushek & Rivkin, 2007). Jointly estimating the teaching working condition and non-teaching wages, Gilpin (2011) noted that compared with

the working environment, the wage differentials had only significantly affected inexperienced teachers. The working environment, in contrast, had significant effect on both inexperienced and experienced teachers.

The significant rigidities in teacher labor markets, such as the fixed salary schedule, geographic constraints, and union restrictions, could all distort the wage impacts (Woessmann, 2011). Furthermore, as job has various characteristics, teachers also have different preferences and they may respond to working conditions and salaries differently. The non-pecuniary elements surrounding teachers' job, on the other hand, could either make their teaching more effective or more difficult, and keep teachers in school or drive them away (Falch & Strom, 2005). Hence, despite the significance of salaries on teacher turnover, researchers should also focus on the non-pecuniary factors when designing and implementing teacher recruitment and retention policies, especially when it is challenging to attract and retain quality teachers through monetary measures.

Inspired by Ingersoll's teacher turnover study in 2001, the current study has categorized the potential non-pecuniary factors causing teacher turnover into three areas: teacher characteristics, school characteristics and organizational conditions.

Teacher Characteristics

Numerous studies have focused on the individual characteristics while examining the reasons of teacher turnover. Although the findings have been inconsistent at times, some factors are typically found to be related to turnover decision.

In terms of the effects of teacher experiences on their turnover intention, a range of empirical findings have revealed that turnover is more common among young and novice teachers (Hanushek, Rivkin, & Schiman, 2016; Kiffer & Tchibozo, 2013). A study using a

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national dataset in the United States revealed that almost 40% of new teachers left the field within their first five years (Ingersoll & Smith, 2003) and the attrition rates of first-year teachers have increased by 33% in the past 20 years (Ingersoll, Merrill, & May, 2012). The reasons such as dissatisfaction with workplace conditions, moving to a better school, and insufficient support from administrators have been most frequently cited as factors contributing to the turnover of early-stage teachers (Luekens, Lyter, & Fox, 2004).

Literature on gender differences in teacher turnover shows mixed results. The majority of the studies reviewed found female teachers were more likely to quit than their male counterparts (Borman & Dowling, 2006; Guarino, Santibanez, & Daley, 2006). Some studies found no significant influence of gender, either on transfer or quit behaviors (e.g., Henke, Chen, Geis, & Knepper, 2000; Omenn Strunk & Robinson, 2006).

For the teachers' professional and educational background, the evidences from Washington State (Krieg, 2006), Texas (Hanushek, Kain, O'Brien, & Rivkin, 2005) and New York City (Boyd, Grossman, Lankford, Loeb, & Wyckoff, 2008) have suggested that highly-qualified teachers were less likely to leave their current profession. However, in a study of using matched student-teacher panel data from Florida, the authors examined the distribution pattern of teacher quality. They found the mobility likelihood of top-quartile and bottom-quartile teachers was higher than the teachers with average teaching quality (Feng & Sass, 2016). Furthermore, increasing empirical findings have revealed that highly-qualified teachers are more likely to leave the schools with high proportion of low-income, low-achieving and non-white students (Feng, 2014).

With regard to teaching subjects, math and science teachers have been found to be more likely to leave or change schools than other teachers (Henke, Zahn, & Carroll, 2001; Ingersoll &

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May, 2012). In a meta-analysis study of the factors relating to teacher turnover, the authors found that a math or science teacher's the odds of turnover was approximately twice those for other teachers ($z = 3.93$, $p < .01$) (Borman & Dowling, 2006). In addition, the turnover rates of math and science teachers are particularly high in hard-to-staff schools (Ingersoll & May, 2011).

In addition to the above mentioned, compelling evidences have linked teacher self-efficacy with their career decisions (Bogler & Somech, 2004). The teachers with higher teaching self-efficacy tend to have a more positive attitude toward their teaching profession and are less likely to leave (e.g., Rots, Aelterman, Vlerick, &Vermeulen, 2007; Skaalvik & Skaalvik, 2014). On the other hand, the teachers who leave their current position tend to show a lower level of self-efficacy than the teachers who stay (Hong, 2012). A meta-analysis study focusing on the effects of teacher self-efficacy revealed that teachers' self-efficacy were positively associated with their teaching commitment ($ES = +0.32$) (Chesnut & Burley, 2015).

School Characteristics

School characteristics are those that are outside the control of policy (e.g., student demographics and school location) (Ingersoll, 2001). Previous studies suggest teachers tend to leave the schools with high proportions of low-income and/or minority students (Feng, 2014; Scafidi, Sjoquist, & Stinebrickner, 2007). Incorporating student racial and ethnic characteristics, Feng (2005) found that the possibility of a teacher leaves his or her current job position is higher in a school with higher percentages of minority students. Moreover, research show that teacher mobility and turnover are more strongly related to student characteristics than to salary differentials (e.g., Bonhomme, Jolivet, Leuven, 2016; Hanushek, Kain, and Rivkin, 1999).

Regarding the effects of school location on teacher turnover, research across the world has pointed to teachers' geographic preferences in choosing more advanced and desirable places

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(Hanushek & Rivkin, 2010). In a recent quantitative study of the Chicago public schools, the analysis indicated that even after controlling for a wide range of characteristics, the teachers were still more likely to choose a teaching position in the particular geographic regions, such as the affluent north area of the city (Engel, Jacob, & Curran, 2014). Teachers' location preferences can hurt many urban and rural schools that have a large proportion of poor and lower-achieving students and make the retention more complicated and challenging in those schools (Hanushek & Rivkin, 2010).

Research on school size and teacher turnover has shown mixed results. Some studies indicated the higher attrition in large, urban schools (Brill & McCartney, 2008), while others found turnover rates were negatively correlated with school size (Carver-Thomas & Darling-Hammond, 2017). Through analyzing the teacher turnover data in Norway between 1992–1993 and 1999–2000, Falch and Strom (2005) found that school size was a significant predictor in teachers' turnover decisions. The highest turnover rates were observed in the smallest and largest schools.

Organizational Conditions

Research outside of the education has a long tradition to show that overall organizational conditions significantly affect employees' attachment to organization (e.g., Price 1977; Li, Lee, Mitchell, Hom, & Griffeth, 2016). A growing body of empirical research in education have also documented that teachers not only rationally weigh all of the objective factors (e.g., salary, location, student demographics), but also evaluate whether a school organization has met their emotional and psychological needs while making career decisions (e.g., Ingersoll, 2001; Johnson & Birkeland, 2003).

Research has found that distributed leadership has positive impacts on teachers' job satisfaction (Harris et al. 2007). With school incorporating more different stakeholders in their decision-making processes, teachers' job satisfaction increased as well (Barbieri, Rossetti, & Sestito, 2011; Shen, Leslie, Spybrook, & Ma, 2012). Teachers tend to stay when they have greater voices in terms of school policies and administrations, such as curriculum development, methods and/or materials (Meirink et al., 2010).

Furthermore, teachers are less likely to leave if they work in a supportive and collaborative environment (Achinstein, Ogawa, Sexton, & Freitas, 2010). For example, effective teacher cooperation has been seen as a good predictor of teaching self-efficacy and job satisfaction (Duyar, Gumus, & SukruBellibas, 2013). In fact, teacher cooperation is not only a strategy to build learning communities and improve student achievement, but also a measure to improve teachers' engagement in their schools (Kaufman, Grimm, & Miller, 2012).

As an essential aspect of teachers' daily life in school, teacher-student relationship is an important source of sustained teaching commitment (Heikonen, Pietarinen, Pyhältö, Toom, & Soini, 2017). It has also been considered as one of the causes leading to teacher turnover (Skaalvik & Skaalvik, 2011), especially among early-career teachers (McCormack, Gore, & Thomas, 2006). Drawing data from a sample of 664 Canadian teachers, the researchers noted that teacher-student relationship was the most consistent predictor of teachers' commitment among all of the school climate variables (Collie, Shapka, & Perry, 2011).

Another important indicator of organizational conditions is student discipline.In some recent teacher attrition studies, besides salaries, the issue of student discipline was the next most cited reason for teachers' turnover decisions (e.g., Borman & Dowling, 2006; Brill & McCartney, 2008). Overwhelming discipline issues may result in teachers' job dissatisfaction and quit

decision (Brill & McCartney, 2008). This issue has more impacts on the beginning teachers who tend to have high level of pressure in managing students' behaviors (e.g., Lukens, Lyter, & Fox, 2004).

Methods

In the last 50 years, teacher turnover research has expanded from immediate causes and consequences to a more complex process and from a focus on individual attitudes to multi-dimensions of interests (e.g., group or organizational variables) (Holtom et al., 2008). Much less work, however, has analyzed teacher turnover intention as an individual decision nested within the larger contexts (Omenn Strunk & Robinson, 2006). Researchers across fields, such as Organization (Cooney, 2007), Social Psychology (Dunn, Masyn, Yudron, Jones, & Subramanian, 2014) and Human Resource Management (Upton & Egan, 2010), have discussed the potentials and advantages of employing multilevel theoretical framework. For the researchers continuously seeking to explain the behaviors and practices of students, teachers, schools and even countries, it is important to expand educational theories and empirical investigations to encompass these multilevel effects (Omenn Strunk & Robinson, 2006).

Shifting from individual to group or organizational levels, researchers have recognized that the individual-level turnover theories could not directly be synthesized to account for all higher-level processes and outcomes (Reilly, Nyberg, Maltarich, & Weller, 2014). The larger organizational contexts can also account for the variations in teacher turnover (Omenn Strunk & Robinson, 2006). Thus, rather than a "one size fits all" view of turnover, the investigations of turnover decisions from both individual and collective levels have been encouraged (Hausknecht & Trevor, 2011). In the current study, the multilevel framework was employed to explain the effects of teacher and school attributes on the teacher transfer intention. The study adopted two-

level hierarchical linear modeling (HLM) to analyze the effects of individual and school characteristics on the outcome. HLM is very useful in detecting the dependency in observations while analyzing the nested structure of multilevel data, and reducing the possibility of Type I error(Kwok, West, & Ryu, 2010). The two-level HLM model in the current study can be expressed as:

Level 1:

$$Y_{ij} = B_{0j} + \sum_{p=1}^{n} B_{pj}W_{pj} + e_{ij}$$

Y_{ij} is turnover intention score according to teacher i in school j.

B_{0j} is the intercept for teacher i in school j.

B_{pj} is level-1 coefficients, with a vector of level-1 predictors W.

e_{ij} is random effect for teacher i in school j, expressed as

$$e_{ij}, \sim N(0, \sigma^2)$$

Level 2:

$$B_{pj} = H_{p0} + \sum_{q=1}^{Q_q} H_{pq}X_{qj} + r_{pj}$$

H_{p0} is the intercept for B_{pj} in school j, H_{pq} is level-2 coefficients, X_{qj} is the level-2 predictors, and r_{pj} is the level-2 random effect for school j. The level-2 variables have been centered on the grand mean.

First, a null model was built as a baseline model and the intraclass correlation coefficient (ICC) was calculated to test the appropriability of using multilevel model; second, the study employed a random-coefficient model to examine the effects of individual variables on the

turnover intention across all schools (Hox, Moerbeek, & van de Schoot, 2010); third, a random intercept model was used to examine the effect of the school predictors; fourth, the final model was an intercept-and-slope-as-outcome model which can capture the effects of the teacher and school variables on the outcome and test the cross-level effects. The intercept and slope coefficients were allowed to vary on the school level. The statistical software HLM 7.1 was used for the data analysis.

Data File and Sample

The dataset in this study was the TALIS 2013. The TALIS was first conducted in 2008 in 24 participating countries. In 2013, the second cycle of TALIS was implemented in 34 countries from different continents. This survey closely looked at the school and classroom features that influenced on teacher effectiveness. The survey study adopted the contextualizing teaching and learning conditions (IEA) (Purves, 1987) as the conceptual framework. The U.S. data were collected in the spring of 2013.

In order to ensure a representative sample of the target population in each participating country, the TALIS 2013 sampling procedure included a two-stage stratified probability sampling design. The first stage randomly drew 200 (or more) schools from the population schools (lower secondary education) per country. The second stage randomly sampled at least 20 teachers who taught regular classes and who did not also act as principals in each of these schools. The TALIS study has ensured that each teacher in a school had equal probability of selection. A school will be excluded if the response rate is lower than 50% of sampled teachers. In the current study, the sampling weights were applied at the teacher and school levels in order to reduce the sampling error caused by the unequal probability of selection. Over 1630 lower secondary teachers (grade 9 and grade 10) and 122 principals were sampled in the United States

in 2013. Due to the missing data, the sample size in the current study was 1485 teachers nested in 98 schools. The examination of the correlation matrix for the variables suggested that the multicollinearity had not been detected in this study.

Variables

Based on the research purposes and the previous studies that indicate their relevance, a set of variables have been selected for the statistical analysis (see Table 11). Guided by the multilevel framework, the variables of teacher characteristics, such as teaching experiences, gender, teaching subjects, were included into the first level (the individual level) to test how teacher characteristics were related to the teachers' turnover intention. At the second level (the school level), the school characteristics and organizational conditions, have been included into the study. In addition, the cross-level interaction effects have also been assessed.

Table 11 Definitions of predictors used in the analysis

Level 1
Teacher Characteristics:
• Gender: a dichotomous variable where 1 = male teacher and 0 = female teacher.
• Age (group mean centered)
• Math: 1 = primarily teaching secondary math and 0 = all other teachers.
• Science: 1 = primarily teaching secondary science and 0=all other teachers.
• Teaching Experience: Years of full-time teaching experience in schools
• Classroom Size (group mean centered)
• Teacher Preparation (Pedagogy): Elements included in formal education or training/ Pedagogy of the subject(s) I teach. 1=Yes, for all subject(s) I teach, 2=Yes, for some subject(s) I teach, 3=No
• Teacher Self-efficacy (TSELEFFS): Index from TALIS-US Teacher data file
• Working Hours
Level 2
School Characteristics
• School Size: Total school enrollment
• Rural: a dichotomous variable where 1 = rural and 0 = other schools.
• Urban: a dichotomous variable where 1 = urban and 0= other schools
• Percentage of minority students: 1=none, 2= 1% to 10%, 3= 11% to 30%, 4= 31% to 60%, 5= more than 60%.

Table 11 Continued

Level 2

- Percentage of Low-SES students: 1=none, 2= 1% to 10%, 3= 11% to 30%, 4= 31% to 60%, 5= more than 60%.

Organizational Conditions

- Teacher Cooperation (TCOOPS): Index from TALIS-US Principal data file
- Distributed Leadership
- Working Hours.
- School Discipline
- Teacher-student Relationships (TSCTSTUDS): Index from TALIS-US Teacher data file

The TALIS survey data contain both single-item variables and derived variables (constructs/latent variables) created from multiple items. The index for each of the construct that was computed as factor scores by using confirmatory factor analysis (CFA) has been provided by the TALIS (OECD, 2014). The TALIS 2013 Technical Report has presented detailed information regarding the scale construction and validation. The current study used some of the latent variables from the TALIS 2013. For example, the distributed leadership was measured by four questions in terms of the degree of schools in incorporating different stakeholders in decision-making process. The index of teacher-student relations measured the quality of the relationships teachers had with their students. The index of teacher self-efficacy measured teachers' ability of classroom management, instruction, and engaging students in learning. The index of teacher cooperation measured the level of teaching cooperation among teachers. The index of school discipline measured the degree of school disciplining issues in the schools (OECD, 2014)

According to the U.S. data file from the TALIS 2013, the disadvantaged schools in the current study refer to the schools with high proportion of low-income and/or minority students and the low-income students refer to the students who are eligible for free school meals. The

minority students refer to the students whose first language is different from English (OECD 2014). In the survey, the principals were asked to identify the percentage of students that came from the disadvantaged groups. The response (1-5) categories included none, 1% to 10%, 11% to 30%, 31% to 60%, and more than 60%.

The dependent variable used in the study is the question: I would like to change to another school if that were possible. 1= strongly disagree to 4 = strongly agree. Table 11 displays all of the independent variables for the analysis.

Results

Table12 is the descriptive statistics of the variables that were calculated with respect to their means for the whole set of sample. The total number of the teachers and schools has been presented in the table, as well as their standard deviation, minimum and maximum of the values.

Table 12 Descriptive statistics of the variables

Variable Name	N	Mean	SD	Min	Max
Teacher-Level Predictors					
Gender	1485	0.32	0.47	0	1
Age	1485	41.98	11.42	22	74
Teaching Experience	1485	13.93	9.55	0	47
Math	1485	0.29	0.46	0	1
Science	1485	0.20	0.40	0	1
Teacher Preparation	1485	1.27	0.56	1	3
Teacher Self-Efficacy	1485	12.65	1.81	7.15	15.40
School-Level Predictors					
School Size	98	795.63	580.02	45	2670
% of Minority Students	98	2.40	1.05	1	5
% of Low-SES Students	98	3.89	1.02	1	5
Rural	98	0.15	0.36	0	1
Urban	98	0.38	0.49	0	1
School Discipline	98	11.13	0.98	7.14	13.59
Distributed Leadership	98	11.39	1.49	8.37	15.45
Teacher Cooperation	98	8.33	2.02	3.95	14.23
Teacher-Student Relationships	98	13.73	0.83	11.98	16.18

The first step of the HLM analysis was to create an unconditional model to partition the total variance in the outcome variable into each level of the data (Lai & Kwok, 2015). A two-level unconditional model, which did not include any predictors at any level, was developed. The estimated variance components from the unconditional model were σ^2=0.692, τ=0.067. The results suggested that there existed a significant within-and between-school variation in transfer intentions among teachers. The ICC was computed as a ratio of group-level variance over the total variance:

$$\text{ICC} = \tau_\pi/(\sigma^2 + \tau) = 0.067/(0.692 + 0.067) = 0.107$$

The value of ICC in this study reflected the amount of variation unexplained that can be attributed to the higher-level predictors, as compared to the overall unexplained variance. The resulted showed that 10.7% of the total variance in transfer intention was accounted for by the between-school differences. The rest of the variance 89.3% [1−0.107=0.893] can be explained by the within-school differences. Even though the ICC was relatively small, the multilevel models were utilized as for small ICC still has substantial impact on the inferences (Raudenbush & Bryk, 2002).

Random-Coefficient, Random Intercept and Intercept-and-Slope-as-Outcome Model

In the Random-Coefficient model, the variables of teacher characteristics were included to predict the transfer intention. In the Random Intercept model, the school-level variables were added to assess the role of working conditions in the teachers' transfer intention. In the last model, the Intercept-and-Slope-as-Outcome Model, both the teacher and school level predictors and the cross-level interaction have been included into the analysis.

Table 13 Parameter estimate

Fixed Effects	Unconditional Model	Random-Coefficient Model	Random Intercept Model	Intercept-and-Slope-as-Outcome Model
INTRCPT	2.31*** (0.03)	2.33*** (0.09)	2.32*** (0.16)	2.31*** (0.24)
Gender		0.024 (0.04)		0.027 (0.04)
Age		-0.004 (0.06)		-0.003 (0.002)
Teaching Experience		-0.001* (0.00)		-0.02 (0.003)
Math		0.024* (0.01)		0.07* (0.05)
Science		0.05 (0.009)		0.04 (0.05)
Teacher Preparation		0.008 (0.02)		-0.03 (0.007)
Teacher Self-Efficacy		-0.32*** (0.01)		-0.17*** (0.00)
School Predictors				
School Size			-0.0002 (0.03)	-0.0002 (0.00)
% of ELL			-0.025 (0.005)	-0.02 (0.03)
% of Low SES			0.039* (0.05)	0.02* (0.03)
Rural			0.103 (0.02)	0.02 (0.06)
Urban			0.103* (0.06)	0.09* (0.04)
Distributed Leadership			0.02 (0.01)	0.01 (0.01)
School Discipline			0.16** (0.005)	0.19** (0.05)
Teacher Cooperation			--0.37 (0.08)	-0.43*** (0.11)
Teacher-Student Relationship			-0.51** (0.04)	-0.37** (0.14)
Working Hours			0.10** (0.024)	0.07* (0.004)
Deviance (parameters)	209685.23 (4)	162581.10 (16)	207963.23 (21)	151511.76 (121)

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

Effect of Individual Characteristics

The demographic variables, such as age and gender, were not associated with teachers' turnover intention (see Table 13). The teaching experience was no longer an important predictor in the final model after controlling for the school-level variables. The math teachers tended to consider changing school. Teachers' self-efficacy was a strong predictor in the both Random-Coefficient Model and Intercept-and-Slope-as-Outcome Model. It was negatively related to teachers' turnover intention ($r=.17$, $p< .001$) and this significance held after adding school level variables. With teachers' self-efficacy increased, their intentions to move decreased.

Effect of School and Organizational Characteristics

Regarding the school characteristics, the proportions of low-SES students were associated with the level of transfer intention. As shown in Figure 10, the schools with the highest percentage of low-income students had the largest portion of teachers having transfer intentions. The teachers from urban schools were more likely to move in the full model after adding the teaching-level variables (see Figure 11). The variable teaching hours was significantly associated with the transfer intention ($r=.098$, $p<.01$). The teachers from the schools with longer teaching hours tended to have higher transfer intention.
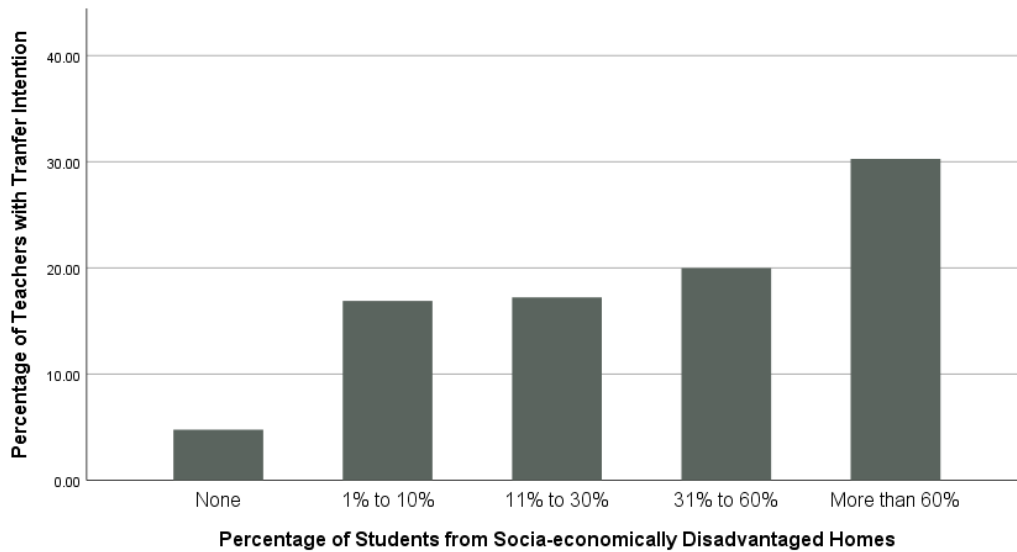
Figure 10 Percentage of students from socio-economically disadvantaged homes
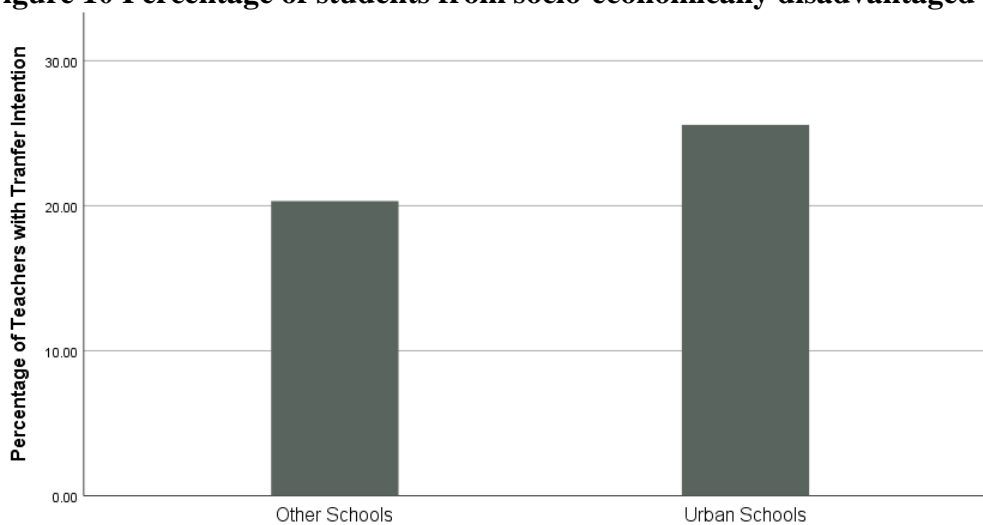
Figure 11 Relationship between school location and teachers' transfer intention

There were several important organizational characteristics that had significant effects on the teacher transfer intention. The first one was the teacher cooperation, in the Intercept-and-Slope-as-Outcome Model (Model 3), the teachers who were from the schools with higher level teacher cooperation were less likely to consider changing school (r=-.43, p < .001). With the level of teacher cooperation increased, teachers' transfer intentions decreased. The second one

was the teacher-student relationship. As a contextual variable, the teacher-student relationship

has also significantly impacted on the outcome. A better teacher-student relationship in a school

has reduced the probability of teachers switching schools (r=-.35, p<.01). The last important

predictor at the school level was the student discipline. The student discipline had positive

effects on the teacher turnover intention. The schools with more discipline issues were more

likely to lose teachers (see Figure 12) (r=.18, p<.01). Distributed leadership had no significant

effect on the outcome.
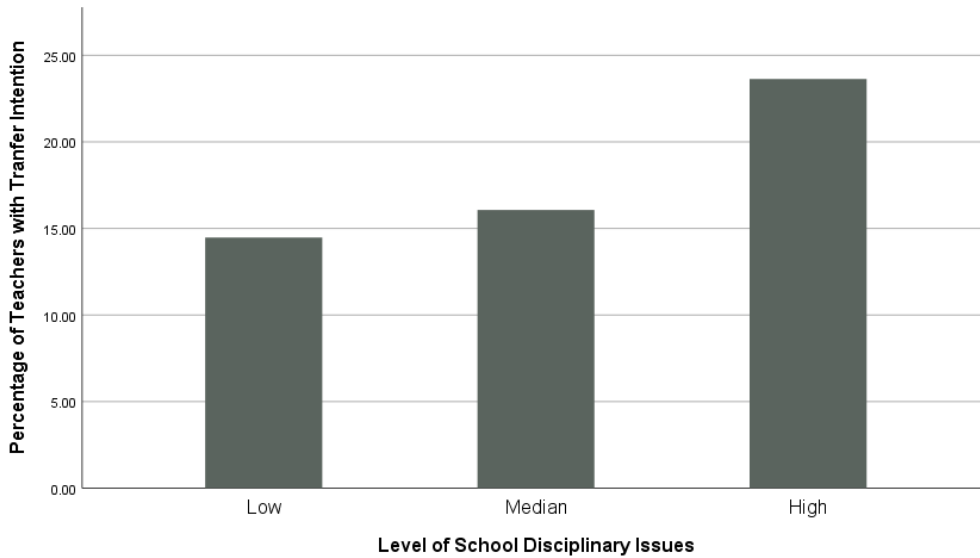
Figure 12 Level of school disciplinary issues

Variance Components and Percentage of Explained Variance

In Table 14, the Model 1 indicated that 20 % of the variation in the within-school

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difference can be explained by adding teacher-level predictors into the model and 38 % of the variation in the between- school differences was explained by adding school predictors into the Model 2. The full model which included all of the factors showed 19 % and 36% explained variance for the within-school and between-school, respectively.

Table 14 Variance components and percentage of explained variance

| Models	Variance Components	
	Within-school (σ^2)	Between-school (τ_π)
Null Model	0.692***	0.067***
Model 1_Level 1 predictors	0.552**	0.064**
Model 2_Level 2 predictors	0.657**	0.042*
Model 3_ full model	0.542*	0.042
Percentage of explained variance (%)		
Model 1_Level 1 predictors	20	
Model 2_Level 2 predictors		38
Model 3_full model	19	36

The Cross-level Interaction

The analysis has revealed some effects of the cross-level interaction in Model 3 (see Table 15). In the cross-level interaction of the low income and age, the age had more effects on the teacher transfer intention in the low-income schools. With the proportion of the low-income students increased, the younger teachers were more likely to leave. Similarly, in the cross-level interaction of the low-income schools and teaching experiences, the effect of teaching experience also had more effects on the teacher transfer intention in the low-income schools. It means the novice teachers were more likely to consider changing school in the low-income schools than in the high-income schools. In addition, high percentage of ELL students enhanced the effects of science teacher on the outcome. That is, with the proportion of ELL teachers

increased, the science teacher's turnover intention increased as well. In contrast, the rural schools have reduced the effect of teaching preparation on turnover intention. The science teachers' transfer intention was higher in the schools with more teaching time than those from the schools with less teaching time.

Table 15 The cross-level interactions

% of Low Income Students *Age	0.033(0.01)**
% of Low Income Students *Teaching Experience	0.013(0.003)**
% of ELL Students*Science	0.002(0.001)**
Rural School*Teaching Preparation	-0.004(0.00)**
Working Hours*Science Teachers	0.03 (0.008)**

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

Limitations

This study involved some limitations. First, all the data from the TALIS database were self-reported by the teachers and school principals. The self-enhancement biases may influence on the objectivity of the responses (Alloy & Ahrens, 1987). Therefore, the possible method or respondent bias should not be ruled out. Second, it's a correlational study based on a cross-sectional data set. Instead of establishing a causal relationship between the independent variables and turnover intentions, the focus of the study was to examine the nature and degree of the relationship between the variables. Thus, any cause and effect implication are not guaranteed. Third, some factors that have significant influence on teacher turnover intention may have not been included in the TALIS data, such as personality traits, family influences, teaching performance and student achievement.

Discussion and Conclusion

Unlike most prior studies in teacher turnover intention, the current study tested the integrative models of individual and school organizational factors pertaining to turnover intention. Three models were estimated to explain the variation at both the teacher and school levels. The results showed that the teachers' transfer intentions varied significantly across schools and the substantial portion of the variance in the teacher turnover intention was accounted for by the within-school differences, which was consistent with some of the previous studies (e.g., Liu & Meyer, 2005). However, the between-school differences have also explained a notable portion of the total variance.

At the individual level, the findings have supported the research indicating that math teachers had higher likelihoods of attrition (Borman & Dowling, 2006). In this study, the age and gender did not achieve statistical significance in any of the models. The teaching experience was negatively associated with the teachers' intentions to switch school in the Random Coefficient model, meaning the teachers with less teaching experiences were more likely to change school than the experienced teachers. However, the correlation was no long significant after controlling for the school-level predictors and cross-level interaction effects. The teachers' education background also appeared not to affect teachers' turnover decisions, all else held constant. The school discipline played a significant role in teachers' decision to switch school. The teachers who had to spend a lot of time in dealing with the issues of classroom discipline were more likely to consider moving. The finding has supported the prior research suggesting that student misbehavior is one of the important causes of teaching stress and is associated with teacher turnover (Kraft et al., 2016). Moreover, consistent with some previous studies, the teacher self-

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efficacy was negatively associated with the transfer intention (Ware & Kitsantas, 2011). The teachers who reported higher level of self-efficacy tended to stay in their current workplace.

Some school characteristics still remained a significant effect when controlling for the individual factors. For example, aligning with the previous literature, the finding of the current study showed that the teachers from the low-income schools were more likely to consider changing school (Hanushek et al., 2004). Also, the teachers from urban schools reported higher level of turnover intention than the teachers from other schools. One of the explanations for that is the urban districts in the United States typically have the largest minority and low-income populations compared with suburban or rural districts (Hanushek et al., 2004).

In accordance with the previous evidences that teachers often move to the schools with better working conditions (Allensworth, Ponisciak, & Mazzeo, 2009; Karadag, Baloglu, & Cakir, 2011), this study found that the teachers from the schools with insufficient resources and supports, and unsatisfactory school climate were more likely to leave. The organizational conditions, such as the teacher collaboration, teacher-student relationship and school discipline, all influenced on teachers' transfer intentions. The findings showed that teaching hours had significant contextual effect at the school level. The teachers tended to leave the schools with longer working hours. Also, the teachers were more likely to consider leaving the schools with high rates of student misbehavior. The findings have also pointed to the preferences of teachers towards the schools with more cooperative and supportive environment that can help them do their job well. The findings have contributed to a growing literature on the role of non-pecuniary factors, such as school organization, in teacher turnover (e.g., Price, 1977; Li et al., 2016).

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It's worth noting that some recent studies have suggested that high turnover rates in the schools serving low-income, minority students may not necessarily indicate teachers are fleeing their students (Ingersoll & May, 2012; Simon & Johnson, 2015). Some teachers decided to leave their current schools not because of student demographics but poor organizational conditions (Ingersoll & May, 2012; Johnson & Birkeland, 2003). This study has also highlighted the influential role of the organizational conditions, such as supportive and cooperative environment, on keeping teachers in their school. Thus, linking teachers' turnover decisions to specific organizational conditions may help expanding our understandings of teacher turnover.

Furthermore, the study has revealed the effects of school disadvantages on teachers' turnover intentions. The findings indicated positive raw associations between the teacher turnover intention and school disadvantage. The associations diminished after controlling for the individual and school variables, but still remained significant. Besides the direct effects, the disadvantaged schools also had some indirect effect on the teacher transfer intention through the individual-level factors. That said, some relationships between the teacher-level factors and the outcome were strengthened or weakened by the indicators of school disadvantage. For instance, the teaching experience had more effects on the teachers' transfer intentions in the schools with higher percentage of low-income students. The science teachers who taught in the schools with high proportion of ELL students were more likely to switch school. All in all, as some prior studies have shown, disadvantaged schools tend to face more severe teacher turnover than other schools due to various reasons (Bonhomme, Jolivet, & Leuven, 2016).

The study has echoed the call for more accurate and comprehensive understandings of school organizations and the teachers in them (Liu & Meyer, 2005).It is essential to know how

both individual and school characteristics have simultaneously contributed to teachers' turnover intentions so that retention practices can be modified. Multilevel analysis is also very helpful in the understanding of cross-level interaction. For example, the results indicated that the teacher characteristics interacted with the school context to produce effects on teacher transfer intention. The conventional single-level research can't capture those cross-level interaction effects. In summary, this approach is useful in exploring teacher turnover intention through multilevel perspective, which can differentially inform the program and policy design for improving teacher retentions.

At a minimum, the current study is an effort to draw more policy attentions to the multilevel studies that could provide a response to the debate on what drive teachers from their current schools, especially disadvantaged schools. The findings of the study have underlined the need for an increased focus on organizational factors in terms of designing the policies of teacher retention and also have implications for school leadership. Although the study was conducted in the context of the United States, how to effectively retain quality teachers remains one of the major challenges facing public school systems across nations (Darling-Hammond and Lieberman, 2012). The future research and policy practice should conceptualize teacher turnover within a dynamic systems lens to form a more sophisticated and holistic model by combining constructs together across levels.

References

Achinstein, B., Ogawa, R. T., Sexton, D., & Freitas, C. (2010). Retaining teachers of color: A
    pressing problem and a potential strategy for "hard-to-staff" schools. *Review of Educational
    Research, 80(1)*: 71-107.

Adnot, M., Dee, T., Katz, V., & Wyckoff, J. (2017). Teacher turnover, teacher quality, and

    student achievement in DCPS. *Educational Evaluation and Policy Analysis, 39(1)*, 54-76.

Allensworth, E., Ponisciak, S., & Mazzeo, C. (2009). The schools teachers leave: Teacher

    mobility in Chicago public schools. *Consortium on Chicago School Research,* Retrieved

    from https://eric.ed.gov/?id=ED505882

Alloy, L. B. & Ahrens, A. H. (1987). Depression and pessimism for the future: Biased use of

    statistically relevant information in predictions for self-versus others. *Journal of Personality*

    and Social Psychology, 52(2),366.

Bogler, R. & Somech, A. (2004). Influence of teacher empowerment on teachers' organizational

    commitment, professional commitment and organizational citizenship behavior in

    schools. *Teaching and Teacher Education, 20*(3), 277-289.

Bonhomme, S., Jolivet, G., & Leuven, E. (2016). School characteristics and teacher turnover:

    Assessing the role of preferences and opportunities. *The Economic Journal, 126*(594),1342-

    1371.

Borman, G.D. & Dowling, N. M. (2006). The longitudinal achievement effects of multi-year

    summer school: Evidence from the Teach Baltimore randomized field trial. *Educational*

    Evaluation and Policy Analysis, 28,25-48.

Boyd, D., Grossman, P., Lankford, H., Loeb, S., & Wyckoff, J. (2008). Who Leaves? Teacher

    Attrition and Student Achievement (Working Paper No. 14022). *Cambridge, MA: National*

    Bureau of Economic Research, Retrieved from http://www.nber.org/papers/w14022

Brill, S. & McCartney, A. (2008). Stopping the revolving door: Increasing teacher retention.

    Politics and Policy, 36(5),750-774.

Carver-Thomas, D. & Darling-Hammond, L. (2017). Teacher turnover: Why it matters and what

    we can do about it. Palo Alto, *CA: Learning Policy Institute,* Retrieved from

    http://learningpolicyinstitute.org/sites/default/files/product-

    files/Teacher_Turnover_REPORT.pdf

Chesnut, S. R. & Burley, H. (2015). Self-efficacy as a predictor of commitment to the teaching

    profession: A meta-analysis. *Educational Research Review, 15*,1-16.

Cho, Y. J. & Lewis, G. B. (2012). Turnover intention and turnover behavior: Implications for

    retaining federal employees. *Review of Public Personnel Administration, 32*(1), 4-23.

Cohen, G., Blake, R. S., & Goodman, D. (2015). Does turnover intention matter? Evaluating the

    usefulness of turnover intention rate as a predictor of actual turnover rate. *Review of Public*

    Personnel Administration, 36(3), 240-263.

Collie, R. J., Shapka, J. D., & Perry, N. E. (2011). Predicting teacher commitment: The impact of

    school climate and social–emotional learning. *Psychology in the Schools, 48*(10), 1034-

    1048.

Cooney, K. (2007). Fields, organizations, and agency: Toward a multilevel theory of

    institutionalization in action. *Administration & Society, 39*(6),687-718.

Cowan, J. & Goldhaber, D. (2015). Do bonuses affect teacher staffing and student achievement

    in high-poverty schools? Evidence from an incentive for national board certified teachers in

    Washington State. *Center for Education Data and Research,* Retrieved from

    www.cedr.us/papers/working/CEDR%20WP%202015-4.pdf

Darling-Hammond, L. & Lieberman, A. (2012). Teacher education around the world: Changing

    policies and practices. New York: Routledge.

Dunn, E. C., Masyn, K. E., Yudron, M., Jones, S. M., & Subramanian, S. (2014). Translating

    multilevel theory into multilevel research: Challenges and opportunities for understanding

    the social determinants of psychiatric disorders. *Social Psychiatry and Psychiatric*

    Epidemiology, 49(6), 859-872.

Duyar, I., Gumus, S., & Sukru B. M. (2013). Multilevel analysis of teacher work attitudes: The

    influence of principal leadership and teacher collaboration. *International Journal of*

    Educational Management, 27(7), 700-719.

Engel, M., Jacob, B. A., & Curran, F. C. (2014). New evidence on teacher labor

    supply. *American Educational Research Journal, 51*(1),36-72.

Falch, T. & Strøm, B. (2005). Teacher turnover and non-pecuniary factors. *Economics of*

    Education Review, 24(6),611-631.

Felps, W., Mittchell, T. R., & Byington, E. (2006). How, when, and why bad apples spoil the

    barrel: Negative group members and dysfunctional groups. *Research in Organizational*

    Behavior, 27, 181-230.

Feng, L. (2014). Teacher placement, mobility, and occupational choices after

    teaching. *Education Economics, 22*(1), 24-47.

George, J. & Jones, G. (2008). Understanding and managing organizational behavior (5th ed.).

    Upper Saddle River, NJ: Pearson Prentice Hall.

Gilpin, G. (2011). Reevaluating the Effect of Non-Teaching Wages on Teacher

    Attrition. *Economics of Education Review, 30*(4), 598-616.

Goldhaber, D., Gross, B., & Player, D. (2007). Are public schools really losing their best?

    Assessing the career transitions of teachers and their implications for the quality of the

teacher workforce. *National Center for Analysis of Longitudinal Data in Education Research*, working paper 12.

Grissom, J. A., Viano, S.L., & Selin, J. L. (2016). Understanding employee turnover in the public sector: Insights from research on teacher mobility. *Public Administration Review, 76*(2), 241-251.

Guarino, C., Santibanez, L., & Daley, G. (2006). Teacher recruitment and retention: A review of the recent empirical literature. *Review of Educational Research, 76*(2),173-208.

Hanushek, E. A. & Rivkin, S. G. (2007). Pay, working conditions, and teacher quality. *The Future of Children*,69-86.

Hanushek,E. A. & Rivkin, S. G. (2010). Constrained Job Matching: Does Teacher Job Search Harm Disadvantaged Urban Schools? Retrieved from https://files.eric.ed.gov/fulltext/ED510551.pdf

Hanushek,E. A., Kain, J. F., & Rivkin, S. G. (1999). Do Higher Salaries Buy Better Teachers? Retrieved from https://files.eric.ed.gov/fulltext/ED437710.pdf

Hanushek,E. A., Rivkin, S. G., & Schiman, J. C. (2016). Dynamic effects of teacher turnover on the quality of instruction. *Economics of Education Review, 55*, 132-148.

Hanushek,E. A., Rivkin, S. G., Rothstein, R., & Podgursky, M. (2004). How to improve the supply of high-quality teachers. *Brookings Papers on Education Policy* (7), 7-44.

Hanushek, E. A., Kain, J. F., O'Brien, D. M., & Rivkin, S. G. (2005). The Market for Teacher Quality. Retrieved from http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.583.2575andrep=rep1andtype=pdf

Harris, D. N. & Adams, S. J. (2007). Understanding the level and causes of teacher turnover: a comparison with other professions. *Economics of Education Review, 26*,327-337.

Hausknecht, J. P. & Trevor, C. O. (2011). Collective turnover at the group, unit, and organizational levels: Evidence, issues, and implications. *Journal of Management, 37*(1),352-388.

Heikonen, L., Pietarinen, J., Pyhältö, K., Toom, A., & Soini, T. (2017). Early career teachers' sense of professional agency in the classroom: Associations with turnover intentions and perceived inadequacy in teacher–student interaction. *Asia-Pacific Journal of Teacher Education, 45*(3), 250-266.

Henke, R. R., Chen, X., Geis, S., & Knepper, P. (2000). Progress through the teacher pipeline: 1992-93 college graduates and elementary/secondary school teaching as of 1997 (NCES 2000-152). *Washington, DC: U.S. Department of Education, National Center for Education Statistics.*

Henke, R. R., Zahn, L., & Carroll, C. D. (2001). Attrition of new teachers among recent college graduates comparing occupational stability among 1992-93 graduates who taught and those who worked in other occupations. *Washington, DC: National Center for Education Statistics.*

Holtom, B. C., Mitchell, T. R., Lee, T. W., & Eberly, M. B. (2008). 5 turnover and retention research: A glance at the past, a closer review of the present, and a venture into the future. *The Academy of Management Annals, 2*(1),231-274.

Hong, J. Y. (2012). Why do some beginning teachers leave the school, and others stay? Understanding teacher resilience through psychological lenses. *Teachers and Teaching, 18*(4), 417-440.

Hox, J. J., Moerbeek, M., & van de Schoot R. (2010).*Multilevel analysis: Techniques and applications Routledge*.

Ingersoll, R. (2001). Teacher turnover and teacher shortages: An organizational analysis. *Philadelphia: Graduate School of Education, University of Pennsylvania*. Retrieved from http://repository.upenn.edu/cgi/viewcontent.cgi?article=1093andcontext=gse_pubs.

Ingersoll, R. M. & May, H. (2012). The magnitude, destinations, and determinants of mathematics and science teacher turnover. *Educational Evaluation and Policy Analysis, 34*(4), 435-464.

Ingersoll, R. M. & Smith, T. M. (2003). The wrong solution to the teacher shortage. *Educational Leadership, 60(8):*30-33. Retrieved from http://www.gse.upenn.edu/pdf/rmi/EL_TheWrongSolution_to_theTeacherShortage.pdf

Johnson, S. M. & Birkeland, S. E. (2003). Pursuing a "sense of success": New teachers explain their career decisions. *American Educational Research Journal, 40*, 581-617.

Kaufman, T. E., Grimm, E. D., & Miller, A. E. (2012).*Collaborative School Improvement: Eight Practices for District-School Partnerships to Transform Teaching and Learning*. Harvard Education Press, Cambridge, MA.

Kiffer, S. & Tchibozo, G. (2013). Developing the teaching competences of novice faculty members: A review of international literature. *Policy Futures in Education, 11*(3), 277-289.

Kraft, M. A., Marinell, W. H., & Shen-Wei,Y. D. (2016). School organizational contexts, teacher turnover, and student achievement: Evidence from panel data. *American Educational Research Journal,53*(5),1411-1449.

Kraft, M.A., Papay, J.P., Charner-Laird, M., Johnson, S.M., Ng, M., & Reinhorn, S. K. (2012). *Committed to their students but in need of support: How school context influences teacher turnover in high-poverty, urban schools*. Retrieved from http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.501.7847&rep=rep1&type=pdf

Krieg, J. M. (2006). Teacher quality and attrition. *Economics of Education Review, 25*(1),13-27.

Kukla-Acevedo, S. (2009). Do teacher characteristics matter? New results on the effects of teacher preparation on student achievement. *Economics of Education Review, 28*(1), 49–57.

Kwok, O., West, S., & Ryu, E. (2010). Hierarchical linear modeling. *Encyclopedia of Research Design*, 568-572.

Lai, M. H. C. & Kwok, O. (2015). Examining the rule of thumb of not using multilevel modeling: The "design effect smaller than two" rule. *The Journal of Experimental Education, 83*, 423–438.

Li, J. J., Lee, T. W., Mitchell, T. R., Hom, P. W., & Griffeth, R. W. (2016). The effects of proximal withdrawal states on job attitudes, job searching, intent to leave, and employee turnover. *Journal of Applied Psychology, 101*(10), 14-36.

Lindqvist, P., Nordänger, U.K., & Carlsson, R. (2014). Teacher Attrition the First Five Years – a Multifaceted Image. *Teaching and Teacher Education, 40*,94-103.

Liu, X. S. & Meyer, J. P. (2005). Teachers' perceptions of their jobs: A multilevel analysis of the teacher follow-up survey for 1994-95. *Teachers College Record, 107*(5), 985-1003.

Loeb, S. & Page, M. E. (2000). Examining the link between teacher wages and student outcomes: The importance of alternative labor market opportunities and non-pecuniary variation. *Review of Economics and Statistics, 82*(3),393-408.

Luekens, M. T., Lyter, D. M., & Fox, E.E. (2004). Teacher attrition and mobility: Results from the teacher follow-up survey, 2000-2001. *Washington, DC: U.S. Department of Education, National Center for Education Statistics.*

Markey, R., Ravenswood, K., & Webber, D. J. (2012). The impact of the quality of the work environment on employees' intention to quit. *Economics Working Paper Series 1220*. Retrieved from

https://pdfs.semanticscholar.org/7ff1/9008e64a232bcf9c37d8bcdbb2a054619cba.pdf

McCormack, A., Gore, J., & Thomas, K. (2006). Early career teacher professional learning. *Asia Pacific Journal of Teacher Education, 34*(1),95–113.

Medina, E. (2012). Job satisfaction and employee turnover intention: What does organizational culture have to do with it. *Columbia University Academic Commons*. Retrieved from https://s3.amazonaws.com/academia.edu.documents/41200095/Medina_Elizabeth.pdf?AW SAccessKeyId=AKIAIWOWYYGZ2Y53UL3A&Expires=1538710895&Signature=DDqP 9H7XGar6R8h5JRNBpTPnM7c%3D&response-content-disposition=inline%3B%20filename%3DMedina_Elizabeth.pdf

Meyer, H. & Benavot, A. (2013). PISA, power, and policy: The emergence of global educational governance. *Oxford: Symposium Books*.

Omenn, S. K. & Robinson, J. P. (2006). Oh, won't you stay: A multilevel analysis of the difficulties in retaining qualified teachers. *Peabody Journal of Education, 81*(4),65-94.

Organisation for Economic Co-operation and Development (OECD) (2014). *Education at a*

   Glance 2014 OECD indicators. Retrieved from https://www.oecd.org/edu/Education-at-a-

   Glance-2014.pdf.

Price, J. (1977).*The study of turnover*. Ames, IA: Iowa State University Press.

Purves, A. C. (1987). The evolution of the IEA: A memoir. *Comparative Education*

   Review, 31(1), 10-28.

Ransom, M. R. & Sims, D.P. (2010). Estimating the firm's labor supply curve in a "new

   monopsony" framework: Schoolteachers in Missouri. *Journal of Labor*

   Economics, 28(2),331-355.

Raudenbush, S.W. & Bryk, A.S. (2002). *Hierarchical linear models: Applications and data*

   analysis methods Sage.

Reilly, G., Nyberg, A.J., Maltarich, M., & Weller, I. (2014). Human capital flows: Using

   context-emergent turnover (CET) theory to explore the process by which turnover, hiring,

   and job demands affect patient satisfaction. *Academy of Management Journal, 57*(3),766-

   790.

Rots, I., Aelterman, A., Vlerick, P, & Vermeulen, K. (2007). Teacher education, graduates'

   teaching commitment and entrance into the teaching profession. *Teaching and Teacher*

   Education, 23(5), 543-556.

Sargent, T. & Hannum, E. (2005). Keeping teachers happy: job satisfaction among primary

   school teachers in rural Northwest China. *Comparative education review, 49*(2), 173-204.

Scafidi, B., Sjoquist, D. L., & Stinebrickner, T.R. (2007). Race, poverty, and teacher mobility.

   Economics of Education Review, 26(2), 145–159.

Simon, N. S. & Johnson, S. M. (2015). Teacher turnover in high-poverty schools: What we know
and can do. *Teachers College Record, 117*(3),1-36.

Skaalvik, E. M. & Skaalvik, S. (2011). Teacher job satisfaction and motivation to leave the
teaching profession: Relations with school context, feeling of belonging, and emotional
exhaustion. *Teaching and Teacher Education, 27*(6),1029-1038.

Skaalvik, E. M. & Skaalvik,S. (2014). Teacher Self-Efficacy and Perceived Autonomy:
Relations with Teacher Engagement, Job Satisfaction, and Emotional Exhaustion.
Psychological Reports, 114, 68-77.

Sousa-Poza, A. & Henneberger, F. (2004). Analyzing job mobility with job turnover intentions:
An international comparative study. *Journal of Economic Issues, 38*(1), 113-137.

Stuit, D. A. & Smith, T. M. (2012). Explaining the gap in charter and traditional public school
teacher turnover rates. *Economics of Education Review, 31*(2),268-279.

Sutcher, L., Darling-Hammond, L., & Carver-Thomas, D. (2016). *A Coming Crisis in Teaching?
Teacher Supply, Demand, and Shortages in the U.S. Report of the Learning Policy
Institute*. Palo Alto, CA: Learning Policy Institute.

Tiplic, D., Brandmo, C., & Elstad, E. (2015). Antecedents of Norwegian beginning teachers'
turnover intentions. *Cambridge Journal of Education, 45*(4),451-474.

U.S. Department of Education, *Teaching Vacancies and Difficult-to-Staff Teaching Positions in
Public Schools, 2015 Teaching Vacancies and Difficult-to-Staff Teaching Positions in
Public Schools*. Retrieved from https://nces.ed.gov/pubs2015/2015065.pdf

Upton, M. G. & Egan, T. M. (2010). Three approaches to multilevel theory building. *Human
Resource Development Review, 9*(4), 333-356.

Ware, H. W. & Kitsantas, A. (2011). Predicting teacher commitment using principal and teacher

    efficacy variables: An HLM approach. *The Journal of Educational Research, 104*(3), 183-

    193.

Weston, T. A. (2015).*Non-Pecuniary Factors Impacting the Retention of New Teachers at the*

    Secondary Level in One Virginia School Division. Retrieved from

    https://vtechworks.lib.vt.edu/bitstream/handle/10919/51761/Weston_TA_T_2015.pdf?seque

    nce=1andisAllowed=y

Woessmann, L. (2011). Cross-country evidence on teacher performance pay. *Economics of*

    Education Review, 30(3),404-418.

Zembylas, M. & Papanastasiou, E. (2004). Job satisfaction among school teachers in Cyprus.

    Journal of Educational Administration, 42 (3),357-374.

5. CONCLUSIONS

Teachers are one of the most critical education resources in every country (Hanushek & Rivkin, 2012). The foregoing discussion has shown that teacher quality is one of the most important factors affecting student achievement (OECD, 2005; Chetty, Friedman, & Rockoff, 2014). Many countries have been making policy efforts to enhance teacher competencies, retain effective teachers, and equalize teacher allocation (the World Bank, 2010; OECD, 2005). By using TALIS 2013 with other data sources, this study attempts to gain insight into, and a better understanding of, teacher distribution and turnover intention within lower secondary schools (grades 7-9) across countries.

First, this dissertation research is an effort to draw more policy attention to cross-country studies in the field of teaching force that might provide a response to some debates with regard to teacher distribution and turnover found in single-country studies. The first study has demonstrated issue of the unequal teacher distributions across countries and highlighted the role of government in narrowing the gaps of teacher distribution especially in unequal and poor countries. Specifically, equitable teacher distribution relies on government allocations of teachers more equally between and within schools to better ensure equitable distribution across student socioeconomic status. The second study has examined the country effects on teacher turnover intention across countries. After controlling for the individual and school level factors, the study has revealed some country-specific effects, such as teaching status and teacher salaries. The findings indicate that teachers' relative salary have a negative effect on quit intention, meaning teachers in the countries with higher level of relative salaries tended to stay in education. The perceived teaching status is other important predictors in the study which is significant across

almost all of the models (with or without considering salaries). The quit intention is lower in the countries where teachers think their profession has been respected and valued. That is, the differences in the way countries treat their teachers matter for the stability of teacher workforce.

This contribution ties directly to the call that teacher study should expand to better capture larger contexts, especially country contexts (Hausknecht & Trevor, 2011). Moreover, the dissertation study simultaneously looks at the issue in both the international and the U.S setting, enabling us to innovatively and selectively adopt best practices from the international studies while also being more cautious regarding the uncritical policy-borrowing that ignores contextual specificity.

Second, unlike most prior studies, this research test integrative models of the individual, organizational, and national aspects of factors pertaining to turnover intention with multiple international databases. Researchers in social science have increasingly used multilevel models to test effects of country contexts on individual perception, experiences and/or behavior (e.g., Heise & Kotsadam, 2015; Rai, Zitko, Jones, Lynch, & Araya, 2013). The second and third study of the dissertation is an attempt to demonstrate how research can benefit from using multilevel analysis to more explicitly investigate the macro/micro effects on teacher turnover than the existing studies have been able to do.

Through the multilevel analysis, the second study reveals that the variation in teacher turnover intention across 32 countries is a function of teacher-, school- and country-level factors. Furthermore, in addition to the direct effects, the second study has also revealed some moderation effects of the country contexts on teachers' turnover intentions. Teachers' reactions to some working conditions, such as student-teacher ratio, varied across countries. It means some

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country contexts, such as perceived teacher status and relative salary, had differential effects on the nature of strength of the relationships between working conditions and turnover intentions.

Using the multi-level methods, the third study has only focused on the US teachers' intention to change school. The findings display how both individual and organizational characteristics have simultaneously and interactively contributed to teachers' turnover intentions. The multilevel approach enables me to explore the differences in configuration while explaining variation for each level, which can be beneficial to differentially inform program and policy design in improving teacher recruitment and retention.

Third, prior research has confirmed that one of the leading causes of unequal teacher distribution is high teacher turnover rates in disadvantaged schools (e.g., Adnot, Dee, Katz, & Wyckoff, 2017; Sutcher, Darling-Hammond, & Carver-Thomas, 2016). The findings of the first study indicate that the unequal teacher quality distribution is very common across school systems, although there are some exceptions. Many countries have relatively large exposure gaps that disfavor low-income students in every measure of teacher qualifications and at both the classroom and school level. The findings from the second and third study, on a certain level, have mirrored the outcome of the first study. That said, on average and across countries, teachers from disadvantaged schools were more likely to considering leaving. The high turnover rates in public schools, especially in those hard-to-staff schools, may have exacerbated the inequalities of teacher distributions. Meanwhile, the understanding of the particular contexts and factors associated with the turnover intentions in disadvantaged schools has implications for policy efforts to reduce long-standing educational disparities.

Research has suggested that the gaps between low-income and high-income students in access to quality teachers are an outcome of a matrix of gaps involving structural inequities in

social and economic systems (Milner, 2010). My dissertation has also revealed the unequal teacher distribution and high level of turnover intention in disadvantaged schools in many countries, across different social and education systems. No matter what specific factors have caused the problem, an ongoing lack of equity and equality inside and outside of education settings is facing many countries. On the other hand, the findings have also implied that despite their crucial role in teaching children and implementing educational policies, quality teacher retention and distribution are still vulnerable to various aspects of inequity stemming from both the educational system and the whole social contexts.

Fourth, my dissertation study has addressed the concerns about teaching profession and the importance of better understanding on why teachers enter and leave the profession. The demands on teachers are increasing globally. Teachers nowadays are expected to be more responsive to complex educational conditions and various student backgrounds and needs (Learning Policy Institute, 2016). On the other hand, the attractiveness of teaching profession in many countries is declining. It's getting increasingly challenging for many countries and educational systems to recruit and retain highly-qualified people (OECD, 2016). The findings of this dissertation have suggested that teachers' social standing is not only about the measureable earnings, but also the social norms of how much a teacher is respected by her/his society. To what extent teachers are respected, rewarded and supported in their work may directly and indirectly impact on the abilities of a country or an educational system in attracting and keeping quality teachers.

This teacher distribution and turnover research is drawn from the large, international teaching and learning comparisons and may not lead to immediate policy changes, but at least, might generate more meaningful and deeper reflections and probing of our teacher policies and

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practices. Admittedly, "Globalization is profoundly altering the education policy landscape" (Verger, 2014, p14). Whether for global or local adaption, it is beneficial to understand the teaching sector within the larger social, economic, and cultural community by acknowledging teacher policies and practices at each level and for each group of stakeholders. The findings of the dissertation have also suggested it is important to recognize both the shared and unique norms and assumptions in terms of teacher quality and allocation through international research in order to both maximize the benefit of cross-national studies and minimize the potential consequences or missed opportunities that result from research and policy isolation.

The next steps on across-national teacher distribution and turnover research based on the TALIS 2013 and other large international data files might be, first, linking the variations of student performance and teacher distribution at both the between-school and within-school levels in order to more specifically understand how differences in teacher distribution affect student achievement across countries; second, comparatively testing the effects of school originations on teacher turnover across countries. The international datasets, such as TALIS and PISA, have provided profound perception data from both teachers and principals regarding their school organization (e.g., leadership, administration, and school climate).The cross-national comparative approach might be very useful in creating a dynamic systems lens to form a more sophisticated and holistic model by combining constructs together across levels. Thus, more of the antecedents, consequences (e.g., satisfaction, organizational performance), and boundary conditions of those effects on teacher turnover/mobility can be tested; third, researching the policy adoption based on the large, international educational measurement and research. Empirical evidence indicates that the policies enacted in response to these international studies have yielded impressive progress in education (Sahlberg, 2011). Further research is needed in

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how the international approaches and products inform teacher policies and practices in different countries and under diverse contexts. In doing so, we may introduce new perspectives in the field of teacher policy, as well as to disentangle some debates surrounding the convergence-divergence dilemma.

This research involved some limitations. For example, all the data from the TALIS database were self-reported by teachers and the school principals. The self-enhancement biases may influence on the objectivity of the responses may (Alloy & Ahrens, 1987). Therefore, the possible method or respondent bias should not be ruled out. There are some data elements (e.g., the value-added measures) that would be useful to a comprehensive study of teacher quality distribution are not included in the current study due to the data availability. Furthermore, instead of establishing a causal relationship between independent variables and turnover intentions, the focus of the study is to examine the nature and degree of the relationship between the variables. Thus, any cause and effect implication remain uncertain. Finally, in comparative studies, the differences across countries may exist in various hard-to-observe ways. For instance, the cultural traits, valuation of school and educational management, and other characteristics associated the variance of teacher turnover intentions. Those unobserved heterogeneity between countries may increase the probability of the omitted variable bias in international analyses.

References

Adnot, M., Dee, T., Katz, V., & Wyckoff, J. (2017). Teacher turnover, teacher quality, and student achievement in DCPS. *Educational Evaluation and Policy Analysis, 39*(1), 54-76.

Alloy, L. B. & Ahrens, A. H. (1987). Depression and pessimism for the future: Biased use of statistically relevant information in predictions for self-versus others. *Journal of Personality and Social Psychology, 52*(2), 366.

Chetty, R., Friedman, J. N., & Rockoff, J. E. (2014). Measuring the impacts of teachers II:

    Teacher value-added and student outcomes in adulthood. *American Economic*

    Review, 104(9), 2633-2679.

Hanushek, E. A. & Rivkin, S. G. (2012). The distribution of teacher quality and implications for

    policy. *Annual Review of Economics, 4*(1), 131-157.

Hausknecht, J. P. & Trevor, C. O. (2011). Collective turnover at the group, unit, and

    organizational levels: Evidence, issues, and implications. *Journal of*

    Management, 37(1),352-388.

Heise, L. L. & A. Kotsadam. (2015). Cross-national and multilevel correlates of partner violence:

    An analysis of data from population-based surveys. *The Lancet Global Health 3*(6), e332-

    40. Doi:10.1016/S2214-109X(15)00013-3.

Learning Policy Institute (2016). *A Coming Crisis in Teaching? Teacher Supply, Demand, and*

    Shortages in the U.S. Retrieved from https://learningpolicyinstitute.org/product/coming-

    crisis-teaching-brief.

Milner, H. R. (2010). Race, narrative inquiry, and self-study in curriculum and teacher

    education. *Culture, curriculum, and identity in education*, 181-206.

OECD (2005). Teachers matter: Attracting, developing and retaining effective

    teachers Organisation for Economic Co-operation and Development. Retrieved from

    https://www.oecd.org/education/school/34990905.pdf

OECD (2016), PISA 2015 Results (Volume II): Policies and Practices for Successful Schools,

    PISA. http://dx.doi.org/10.1787/9789264267510-en.

Rai, D., Zitko, P., Jones, K., Lynch, J., & Araya, R. (2013). Country-and individual-level

    socioeconomic determinants of depression: Multilevel cross-national comparison. *The*

    British Journal of Psychiatry, 202(3), 195-203.

Sutcher, L., Darling-Hammond, L., & Carver-Thomas, D. (2016). *A Coming Crisis in Teaching?*

    Teacher Supply, Demand, and Shortages in the U.S. Report of the Learning Policy

    Institute. Palo Alto, CA: Learning Policy Institute.

Verger, A. (2014). Why do policy-makers adopt global education policies? toward a research

    framework on the varying role of ideas in education reform. *Current Issues in*

    Comparative Education, 16(2), 14-29.

World Bank (2010), What Matters Most for Teacher Policies : A Framework Paper, Retrieved

    from https://openknowledge.worldbank.org/handle/10986/20143.

APPENDIX A

DESCRIPTION OF THE PARTICIPATING COUNTRIES (SECTION 3)

Country	Teacher	School	Female	Age			Average years of working experience as a teacher in total
				Under 30	30-49	50 or more	
Abu Dhabi (United Arab Emirates)	2184	166	59	12	76	12	13
Alberta (Canada)	1704	182	60	18	60	21	13
Australia	1882	123	59	16	47	37	17
Brazil	13078	1070	71	18	66	16	14
Bulgaria	2894	197	81	3	50	47	21
Chile	1521	178	63	21	49	30	15
Croatia	3597	199	74	14	56	30	16
Czech Republic	3182	220	76	11	54	35	18
Denmark	1572	148	60	6	58	36	16
England (United Kingdom)	2325	154	63	21	59	20	12
Estonia	3035	197	84	7	44	48	22
Finland	2674	146	72	8	59	33	15
Flanders (Belgium)	3016	168	68	24	52	24	15
France	2770	204	66	9	65	26	17
Israel	3191	195	76	14	59	27	16
Italy	3257	194	79	1	49	50	20
Japan	3454	192	39	19	51	31	17
Korea	2814	177	68	11	62	27	16
Latvia	2074	116	89	5	52	44	22
Malaysia	2951	150	71	18	69	13	14
Mexico	3064	187	54	13	62	26	16
Netherlands	1775	127	55	17	46	37	16
Norway	2739	145	61	11	55	34	15
Poland	3783	195	75	9	68	23	17
Portugal	3548	185	73	1	71	28	19
Romania	3236	197	69	14	60	27	16
Serbia	3768	191	66	10	59	30	15
Singapore	3081	159	65	32	57	12	18
Slovak Republic	3428	193	82	11	56	32	18
Spain	3231	192	59	3	62	35	16
Sweden	3132	186	66	5	57	38	16
United States	1843	122	66	18.2	52.4	29.4	14

APPENDIX B

DESCRIPTION OF THE NATIONAL VARIABLES (SECTION 3)

Country	Career prospects	Relative salary	Perceived teaching status	Degree of local wage flexibility	The change of unemployment rate (%)	GDP 2012
Abu Dhabi			2.76	35.61	-.51	57045
Australia	1.44	0.93	2.27	57.66	.24	42278
Flanders (Belgium)	1.73	0.87	2.38	78.17	.92	39498
Bulgaria			1.94	42.9	1.15	15738
Brazil			1.72	74.28	-1.35	14301
Alberta (Canada)	1.68	1.05	2.41	89.58	-.07	40588
Chile	2.09	0.73	2.04	37.93	-1.90	21099
Czech Republic	1.22	0.54	1.83	3.37	-.11	26733
Denmark	1.16	0.92	1.85	50.48	1.64	41524
England (United Kingdom)	1.7	0.95	2.20	13.01	11.47	34694
Spain	1.41	1.32	1.64	97.14	-1.60	31198
Estonia	1.31	0.84	1.80	27.4	-.55	24195
Finland	1.39	0.97	2.58	80.65	1.20	38104
France	1.74	0.86	1.47	83.09	1.50	36074
Croatia			1.65	91.74	4.08	19946
Israel	2.21	0.85	2.20	84.74	-3.77	30600
Italy	1.5	0.65	1.66	82.42	3.51	33668
Japan	2.2		2.10	93.39	-.58	35006
Korea	2.8	1.36	2.75	80.93	-.74	29495
Latvia			2.02	58.87	1.01	21229
Mexico	2.12		2.49	67.63	-.23	16144
Malaysia			3.11	98.17	3.23	21897
Netherlands	1.74	0.82	2.29	6.87	-.07	42453
Norway	1.18	0.71	2.17	72.38	-3.18	62858
Poland	1.71	0.83	1.92	60.44	-.03	22143
Portugal	1.86	1.23	1.71	81.81	7.61	25096
Romania			2.20	89.82	.11	17234
Singapore			2.73	83.81	-1.42	71475
Serbia			1.89	79.06	4.24	11587
Slovak Republic	1.52	0.42	1.44	12.01	-.88	25537
Sweden	1.33	0.82	1.44	31.75	1.48	41840
United States	1.52	0.68	2.16	45.67	.99	50859