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Principal Effects in Illinois: A Research Brief

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Executive Summary

Much attention has been paid of late to teachers' contributions to student gains (Rivkin, Hanushek, & Kain, 2005; Bill & Melinda Gates Foundation, 2010), but how big of an impact do principals have on student achievement? Compared to the research on teacher quality, the literature on the characteristics of effective principals has remained relatively untapped until quite recently (Branch, Hanushek, & Rivkin, 2009; Clotfelter, Ladd, Vigdor, & Wheeler, 2007). However, the emerging research consensus is that principal effects are both measurable and consequential (though smaller than teacher effects) and that effective principals are at least a prerequisite for highly successful schools (Creemers & Reezigt, 1996; Brewer, 1993; Wheeler, 2006). Yet research has also found that there are substantial variations in principal effects (Rice, 2010). As a result, recent studies have begun to investigate in more depth what differentiates principals who are more effective from those who are less so. In this report, we summarize recent research on the characteristics associated with principal effectiveness and examine Illinois data on the relationship between principal characteristics, student proficiency, and teacher qualifications.

A Review of Previous Research

In general, the research findings indicate that principal education, training, and professional development have no consistent, direct impact on student achievement gains (Rice, 2010).

Researchers have found some evidence linking principal effectiveness to measures of experience—Clark, Martorell, and Rockoff (2009) and Branch et al. (2009) both found that more experienced principals produced higher student achievement gains, especially in math. Several studies have found that school tenure (a principal's experience as a principal at their current school) appears to matter at least as much as principal experience in general (Wheeler, 2006; Branch et al., 2009). Another study revealed that, for new principals, school tenure as an assistant principal (AP) also seems to matter with regard to student achievement (Clark et al., 2009). While the overall impact of the principals is substantial, the amount of variation in effectiveness that can be explained by observable principal characteristics is relatively small, with effect sizing ranging from about .01 to about .10 (Wheeler, 2006; Branch et al., 2009; Clotfelter et al., 2007; Clark et al., 2009).

The school leadership research generally concludes that principal effects are indirect—that is, principals influence student achievement through their influence on a school's curriculum, culture, and teachers (Hallinger & Heck, 1998; Leithwood & Riehl, 2003). Recently, researchers have started to hone in on principals' abilities to attract, develop, and retain effective teachers as the most prominent mechanism by which they can improve student achievement (Brewer, 1993, Leithwood, Seashore-Louis, Anderson, & Wahlstrom, 2004; Grissom &

Loeb, 2009; Rice, 2010). For example, Brewer (1993) found that the primary impact of principals stems from making effective hiring choices, and Jacob and Lefgren (2005) found that principals affect school performance through their abilities to assess teacher quality. Although principals' academic qualifications do not have a direct impact on student achievement outcomes, Baker and Cooper (2005) and Wheeler (2006) both found that principals with stronger academic credentials tend to hire teachers with stronger academic backgrounds, who, in turn, tend to be more effective at improving student learning (Boyd, Grossman, Lankford, Loeb, & Wyckoff, 2009; Rice 2003; Wayne & Youngs, 2003). Other studies have found that more effective principals are able to attract and hire teachers with higher tests scores, more teaching experience, and better track records of improving student achievement (Clotfelter et al., 2007; Beteille, Kalogrides, & Loeb, 2010). Principals also have an impact on teachers' satisfaction, decisions about where to work, motivation, and working conditions (Louis, Leithwood, Wahlstrom, & Anderson, 2010; Rice, 2010), and research shows that highly rated and more tenured principals can reduce teacher turnover and teacher absences (Clotfelter et al., 2007; Clark et al., 2009). Further, Beteille, Kalogrides, and Loeb (2010) found that more effective principals were able to retain higher-quality teachers, remove less-effective teachers, and improve teachers' skills more rapidly, compared to less effective principals.

Our Study

In order to investigate the relationships between principal characteristics, teacher qualifications, and student achievements using Illinois data, we use two-level hierarchical linear growth models to measure the impact of principal characteristics on growth in student proficiency and teacher qualifications over time. In these models, the first level measures within school change over time and the second level measures differences between schools in initial school achievement or teacher qualifications status. The variables included in the statistical models represent three main categories—student, teacher, and principal variables—each aggregated to the school-level, and derive primarily from state administrative records maintained by the Illinois State Board of Education (ISBE). Our principal variables measure academic background characteristics, professional experience in Illinois public schools, and principal race. Our teacher variables are school-level measures of experience and teacher academic background. Our student variables were selected based on previous evidence of impact on achievement and include school enrollment, attendance and mobility rates, and student race and poverty concentrations. We estimate these statistical models for all Illinois public schools over six academic years (from 2000-01 through 2005-06), and we use four separate statistical models for each analysis in this study (Chicago elementary/middle schools, non-Chicago elementary/middle schools; Chicago high schools, and non-Chicago high schools).

Results: Principal Characteristics and Student Proficiency

Taken together, our results indicate that principal race, school principal tenure, and graduate program Carnegie classification (Carnegie, 2001) help to explain initial differences in student proficiency in elementary and middle schools statewide, and in non-Chicago high schools. School principal and assistant principal tenure and undergraduate college competitiveness for first year principals also explain some of the differences in school proficiency growth rates for elementary and middle schools, especially those not in Chicago. Proficiency growth rates in high schools appear to be unrelated to principal characteristics, which may be partly explained by the fact that year-to-year changes in high school proficiency during this time period were small and statistically insignificant. While most of these findings from this analysis are consistent with prior research in both size and direction of impact, the negative relationship observed between long school principal tenure (six or more years) and proficiency growth is noteworthy, and could suggest diminishing returns to extended principal school tenure spells or to age.

Results: Principal Characteristics and Teacher Qualifications

Our analyses reveal significant relationships between principal graduate program Carnegie classification and both initial teacher qualifications and teacher qualification growth rates for non-Chicago elementary

and middle schools. In particular, we find that non-Chicago elementary and middle schools with principals who received their advanced degrees from research institutions have higher initial ITACs (IERC's Index of Teacher Academic Capital) and also increase their ITAC at greater rates compared to non-Chicago elementary/middle schools with principals from masters-level institutions. These findings are consistent with prior research showing that principal academics are associated with teacher qualifications.

Conclusions

In sum, we find that principal characteristics have a small, but statistically significant, impact on student proficiency and teacher characteristics and, in general, our analyses of Illinois data using an HLM framework support the existing research evidence suggesting that principal experience and academic qualifications play a role in this relationship. In particular, our findings indicate that Illinois principals' effects on student achievement derive partially through experience as principal or assistant principal at their current school, and also that principals who obtained their advanced degrees from research universities (as opposed to masters-level institutions) have a positive association with study proficiency. Furthermore, our evidence also supports the notion that principals play a large indirect role in improving student achievement via their impact on the teaching corps. Our analyses of Illinois data suggest that principals with advanced degrees from research institutions have a positive association with improved teacher qualifications, which in turn, have a strong relationship with student proficiency. The table below summarizes our findings regarding the impact of principal characteristics on student proficiency and teacher academic qualifications.

Summary of Findings: Impact of Principal Characteristics on Student Proficiency and Teacher Academic Qualifications

Principal Characteristics		Impact on Student Achievement	Impact on Student Achievement Growth	Impact on ITAC (teacher qualifications)	Impact on Growth of ITAC (teacher qualifications)
Principal Experience	First Year at School (vs. 2nd–5th year at school)	No significant effects	Negative effect in non-CPS elem/mid schools	No significant effects	No significant effects
	6+ Years at School (vs. 2nd–5th year at school)	Positive effects in elem/mid schools	Negative effect in non-CPS elem/mid schools	No significant effects	No significant effects
	Years as Assistant Principal at School	No significant effects	Positive effects in elem/mid schools	No significant effects	No significant effects
Principal Academics	More Competitive Undergrad (vs. competitive)	No significant effects	No significant effects	No significant effects	No significant effects
	Less Competitive Undergrad (vs. competitive)	No significant effects	No significant effects	No significant effects	No significant effects
	Grad Degree from Research Institution (vs. masters-level institution)	Positive effect in non-CPS high schools	No significant effects	Positive effect in non-CPS elem/mid schools	Positive effect in non-CPS elem/mid schools

Implications

With so much recent research and policy attention on teachers and teacher quality, it may be easy to overlook the fact that principals also play a vital role in the success of our schools. Because principals are so important, it is essential to focus more intently on principal quality and work to ensure that our school leaders are both adequately supported and held accountable for their effectiveness. One promising development already underway in Illinois is recently passed legislation that will encourage frequent and high-quality evaluations for all principals in the state. However, the knowledge base on effective principal evaluation is relatively slim and most districts have little experience with the task. Two recent reviews of instruments for measuring principal performance suggest that few existing assessment systems are sufficiently valid, reliable, and comprehensive (Condon & Clifford, 2010; Davis, Kearney, Sanders, Thomas, & Leon, 2011).

One possible new direction for research lays in our results indicating principals who received their graduate degrees from research institutions (as opposed to masters-levels institutions) have an impact on both student proficiency levels and teacher qualifications. These initial findings suggest that the Carnegie classification of principals' advanced degree-granting institutions could serve as a potential indicator of the quality of principal preparation programs. Further investigation is warranted to determine whether, for example, doctoral-level institutions are more effective than masters-level institutions at imparting strategies that lead to improved school outcomes, or whether research institutions simply attract candidates who are more qualified or tend to seek out more rigorous educational experiences, and that these qualities are associated with principal effectiveness.

Finally, our findings on the importance of the assistance principalship, combined with earlier findings on the increasing utilization of the AP position across Illinois (Brown & White, 2010), suggest that principal quality is improving in the state and bodes well for future success. Although rural and small-town schools may have limited capacity to justify these positions, opportunities for teacher leadership, new principal mentoring, and pre-service residencies and internships are some potential strategies that can improve future principals' chances for success, and policymakers should consider funding such capacity-building efforts to help new principals hit the ground running.

About the Authors

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Introduction

Much attention has been paid of late to teachers' contributions to student gains (Rivkin, Hanushek & Kain, 2005; Bill & Melinda Gates Foundation, 2010), but how big of an impact do principals have on student achievement? One frequently cited study (Leithwood, Seashore-Louis, Anderson, & Wahlstrom, 2004) found that, of all the factors under schools' control, principal leadership was second only to classroom instruction in its contribution to student achievement gains. Hallinger and Heck (1996) have estimated that about a quarter of the variance in achievement under schools' control can be explained by differences in school leadership. Other studies have estimated a total, cumulative effect size for principal leadership between 0.17 (Branch, Hanushek, & Rivkin, 2009) and 0.25 (Waters, Marzano, & McNulty, 2003). Additional studies have found that principal effects—like teacher effects—are typically larger for math than for reading, and larger in high poverty schools than in low-poverty schools (Clark, Martorell, & Rockoff, 2009; Branch et al.2009; Scheerens & Bosker, 1997). Regardless of the precise size of principal effects, the research consensus is that principal effects are both measurable and consequential (though smaller than teacher effects) and that effective principals are at least a prerequisite for highly successful schools (Creemers & Reezigt, 1996; Brewer, 1993; Wheeler, 2006).

Yet research has also found that there are substantial variations in principal effects (Rice, 2010). As a result, recent studies have begun to investigate in more depth what differentiates principals who are more effective from those who are less so. In this report, we summarize recent research on the characteristics associated with principal effectiveness and examine Illinois data on the relationship between principal characteristics, student proficiency, and teacher qualifications.

The Relationship Between Principal Characteristics and Student Achievement

Compared to the research on teacher quality, the literature on the characteristics of effective principals has remained relatively untapped until quite recently (Branch et al. 2009; Clotfelter, Ladd, Vigdor, & Wheeler, 2007). In this section, we discuss several correlates of principal effectiveness that have been investigated over the past several years. But first, it is important to note that, while the overall impact of the principals is substantial, the amount of variation in effectiveness that can be explained by specific, observable principal characteristics is relatively small, with effect sizing generally ranging from about .01 to about .10 (Wheeler, 2006; Branch et al., 2009; Clotfelter et al., 2007; Clark et al., 2009). In this sense, the emerging findings on principal quality are quite similar to research on teacher effects, which also shows large cumulative effects and large variation in total effectiveness, only minimal amounts of which can be explained by variables that are readily measured (Goldhaber, Liddle, Theobald, & Walch, 2010).

Research on Principal Academic Background and Training

An early review of the research from outside education linked successful leadership with leaders' academic backgrounds (Leithwood, Day, Sammons, Harris, & Hopkins, 2006). This lent support to an initial hypothesis that principals with stronger academic characteristics might produce higher student achievement. However, since then, numerous researchers have probed the connections between principals' academic backgrounds and school achievement gains with mixed results. For example, Wheeler (2006) found that principals with better academic credentials generate improved achievement, but Clark, Martorell, and Rockoff (2009) found little relationship between student performance and principal academic background. Another study (Clotfelter et al., 2007) found positive effects for principals' academic backgrounds on student achievement gains in middle and high schools, but no effects in elementary schools.

The evidence for the effectiveness of principal training and professional development is also mixed (Clark et al., 2009). In general, the research findings indicate that principal education, training, and professional development have no consistent, direct impact on student achievement gains (Rice, 2010).

Research on Principal Experience

Another initial hypothesis was that principals' years of experience as a principal could make an impact on student achievement. Researchers have found some evidence linking principal effectiveness to measures of experience—Clark, Martorell, and Rockoff (2009) and Branch, Hanushek, and Rivkin (2009) both found that more experienced principals produced higher student achievement gains, especially in math. As with the impact of teachers' years of teaching experience on teacher effectiveness, the influence of principal experience appears to be steep through the initial years and then levels off considerably after about four years (Clark et al., 2009).

Other researchers have investigated whether particular types of prior education experience matter more than others. Several studies have found that school tenure (a principal's experience as a principal at their current school) appears to matter at least as much as principal experience in general (Wheeler, 2006; Branch et al., 2009). However, it is difficult to determine whether these principals are more effective because they stay in their school, or if they stay because they are more successful. In sum, the evidence suggests that principals who remain in their current school tend to be more effective than those who move to other schools (Rice, 2010). Another study revealed that, for new principals, school tenure as an assistant principal (AP) also seems to matter with regard to student achievement (Clark et al., 2009). While teachers' perceptions of principal quality are positively associated with teaching experience (Ballou & Podgursky, 1995), research has revealed that experience as a teacher—or any other school employment aside from that cited above—has little impact on principal effectiveness as measured by student achievement gains (Rice, 2010).

Modeling Principals' Impacts on Student Achievement in Illinois

In order to investigate these findings using Illinois data, we use two-level hierarchical linear growth models to measure the impact of principal characteristics on growth in student proficiency over time. We estimate these statistical models for all Illinois public schools over six academic years (from 2000-01 through 2005-06). A more detailed explanation of the models used in this study is available in Appendix 1 of this report.

Data

The variables included in the statistical models represent three main categories—student, teacher, and principal variables—each aggregated to the school-level. These data derive primarily from state administrative records maintained by the Illinois State Board of Education (ISBE), such as the school report cards and the Teacher Service Record, supplemented with data from other public sources. Numerous measures in each of these categories were included in initial models, though some were eventually rejected due to missing data, colinearity, or because they otherwise failed to contribute significantly to the statistical models. All variables included in the models are time-varying since a school's students, teachers, and principal may each change from year-to-year. The variables included in the final hierarchical linear models (HLMs) are discussed below, and descriptive statistics for these variables are included in Appendix 2 of this report.

Our principal variables measure academic background characteristics, professional experience in Illinois public schools, and principal race.[1] For principal academic characteristics, we link ISBE data on their undergraduate colleges with Barron's competitiveness ratings to create a measure of whether the principal attended a less

[1] Principal gender, degree level, teaching experience, and measures of experience and tenure in other positions were included in earlier models, but omitted from the final HLMs because they did not have any consistent, statistically significant impact on school outcomes. Principal age and overall principal experience were excluded from the final models because they were highly correlated with other included variables that offered more explanatory value. Principal ACT data were not available for a sufficient number of principals to be included in these analyses.

competitive ("noncompetitive" or "less competitive" according to Barron's, 2003), competitive, or more competitive ("very," "highly," or "most" competitive according to Barron's) baccalaureate institution. We also link ISBE data on principals' graduate institutions with Carnegie classifications (Carnegie, 2001)from the Integrated Post-Secondary Education System to create a measure of whether the principal attended a research university for their advanced degree program. Our measures of principals' professional experience are based on Illinois public schools employment data from ISBE's Teacher Service Record. Guided by the previous research on principal effectiveness, we include measures of principals' school tenure as principal and assistant principal in our final models. School tenure as principal is represented as a categorical variable, indicating whether the individual is in their first year as principal at the school, their second through fifth year as principal at the school, or has six or more years of experience as principal at the school. Assistant principal tenure is represented as the total number of years as AP in the principal's current school. We also include a single variable indicating whether the principal's race was classified as white or non-white.

Our teacher variables are school-level measures of experience and teacher academic background. For teacher experience, we include the proportion of teachers at the school with three years of experience or less. We use three years as the signifier for inexperienced teachers because the literature indicates that teacher effectiveness increases rapidly through at least the first three years before leveling off (Rice, 2003; Wayne & Youngs, 2003). Our variable for the academic characteristics of teachers is the Index of Teacher Academic Capital (ITAC), a measure created by the IERC to best represent the collective teacher qualifications and academic resources available at each school (White, Presley, & DeAngelis, 2008). The ITAC is a composite index combining school level measures of teachers' ACT Composite and English scores, teachers' undergraduate college competitiveness rankings, the proportion of emergency or provisionally certified teachers at the school, and the proportion of teachers who failed the Illinois Basic Skills test on their first attempt.

Our student variables were selected based on previous evidence of impact on achievement and consistent availability across the state over the time period of our study. These include school size (enrollment), attendance and mobility rates, the proportion of economically disadvantaged students (those receiving free- or reduced-price school lunch), and the proportions of African American, Hispanic, and Asian students at the school.

Methodology

Our analyses use two-level hierarchical linear growth model in order to account for the dependent variance structure that results from nesting multiple time points within each school (Hox, 2002; Raudenbush & Bryk, 2002; Singer & Willet, 2003). In these models, the first level measures within school change over time and the second level measures differences between schools in initial school achievement.[2] We estimate four separate statistical models for each analysis in this study—one for Chicago elementary and middle schools, one for non-Chicago elementary and middle schools, one for Chicago high schools, and one for non-Chicago high schools. We split the data by school level because elementary and middle school students participate in a different statewide standardized test (the Illinois Standard Achievement Test) than high school students (the Prairie State Achievement Examination), each producing different means and distributions of scores each year, and different changes over time. We split the data by Chicago/Non-Chicago (CPS/non-CPS) because the district is quite different from the rest of the state as a whole (Bryk, Sebring, Allensworth, Luppescu, & Easton, 2010) and sufficiently large to warrant separate analyses. Approximately 2,630 non-CPS and 480 CPS elementary and middle schools, and 570 non-CPS and 85 CPS high schools are included in our analyses each year.

Results: Principal Characteristics and Student Proficiency

For our first set of HLMs, we estimate the effect of

[2] A notable disadvantage of this approach is that it may fail to address sorting of principals across different types of schools (Chaplin, 2003), such as that documented in Brown and White (2010). For this reason, many of the other researchers cited in this report utilized fixed effects models to account for this non-random distribution of principal characteristics. However, since the fixed effects approach only allows investigations of schools where principal changes have occurred, the use of HLM allows us to substantially increase our sample size to include all Illinois schools in our analyses. This approach will also permit added flexibility for potential expansion in future papers, as well as an alternative lens through which to view principal effects by comparing findings across the two methodologies.

principal characteristics on school performance. Our measure of school performance is the percentage of students meeting or exceeding proficiency standards on statewide standardized tests (ISAT for elementary and middle schools, PSAE for high schools)—the same measure that is currently used for school accountability purposes under No Child Left Behind (NCLB).[3] Because the PSAE was not administered until 2002, our high school models encompass five academic years of data (2001-02 through 2005-06), while our analyses of elementary and middle schools cover six academic years (2000-01 through 2005-06).

Table 1 details the results of the two-level HLM for the impact of principal characteristics on student proficiency. For comparison, teacher effects are also displayed in Table 1. Detailed results for the full model are shown in Appendix 3. The model statistics (bottom of Table 1) indicate that the full models using student, teacher, and principal data explain 75-84% of the variance in proficiency between schools. The models for Chicago explain 63-90% of the within school variance, while the non-Chicago models explain very little (0-3%) of the variance in proficiency within schools over time. This finding is mitigated by the intraclass correlation statistic, which shows that the vast majority of the variance in proficiency (from 81% to 92%) occurs between schools. That is, our non-Chicago models may have difficulty explaining differences within schools over time simply because the vast majority of the variation in student proficiency can be attributed to differences between schools, rather than within schools over time.

Table 1 displays standardized coefficients for all variables in the models, which can be interpreted as effect sizes on student proficiency in this context. To aid in interpretation, coefficients in the table are highlighted according to statistical significance level and all variables are grand mean centered (see Appendix 2 for descriptive statistics on all variables included in these models). Controlling for schools' teacher and student characteristics (ITAC, proportion of inexperienced teachers, enrollment, and student race and poverty composition, mobility, and attendance) we see some evidence from non-CPS that high schools with principals who obtained their advanced degrees from research institutions have larger initial proportions of proficient students (by .03 SDs) than schools with principals from masters-level institutions. Principal academics alone—undergraduate competitiveness of Carnegie classification of graduate institution—have no consistent, independent impact on growth in student proficiency, but non-CPS elementary/middle schools with first year principals from more competitive undergraduate institutions tend to increase student proficiency at greater rates (by .01 SD per year) compared to similar schools with first year principals from undergraduate institutions of medium competitiveness.

Elementary and middle schools with principals with six or more years of school tenure have higher initial proportions of proficient students (by .02 SDs) compared to elementary and middle schools with principals who have served the school for two to five years. Schools with principals in their first year at the school or with principals with six or more years at the school both tend to increase in student proficiency more slowly than schools with principals in their second to fifth year at the school (by .01 to .02 SDs per year). Our previous research suggest that principal sorting by tenure is not at play here, as principals' experience at the current school has little relationship to student poverty levels or other school characteristics in Illinois (Brown & White, 2010). Elementary and middle schools with principals who have more years of assistant principal experience at their school increase their student proficiency at faster rates (by .01 to .04 SDs per year for each standard deviation increase in years of AP experience at the school). It is worth noting that these findings hold for both CPS and non-CPS schools, given that CPS principals typically have considerably higher levels of previous AP experience than those elsewhere in the state (Brown & White, 2010). Non-CPS schools with minority principals tend to have lower initial proportions of proficient students (by .06 to .10 SDs) relative to non-CPS schools with white principals, but principal race does not appear to have any consistent impact on within-school proficiency growth over time.

Taken together, these results indicate that principal race, school principal tenure, and graduate program Carnegie

[3] While there are some serious problems with the use of proficiency scores in both statistical models and school accountability systems (Ho, 2008), they are the only consistent measures of student achievement available for this time period. Our findings should hold some relevance due to the important role of proficiency scores under the NCLB school accountability system.

Table 1

Predicted Statewide 6-Year Student Proficiency 2000-2001 through 2005-2006: A Two-Level Hierarchical Linear Growth Model Controlling for Student Demographics

		Elementary/Middle School		High School	
		Non-CPS	CPS	Non-CPS	CPS
Differences in Initial Proficiency					
Teacher	% Inexperienced Teachers	**-.015**	.013	-.021	**-.079**
Teacher	ITAC	**.049**	**.033**	**.088**	**.190**
Principal	More Competitive Undergrad (vs. competitive)	.004	.012	.009	-.002
Principal	Less Competitive Undergrad (vs. competitive)	.007	.019	-.002	-.043
Principal	Grad Degree from Research Institution (vs. masters-level institution)	.005	.007	**.026**	.003
Principal	Minority (vs. white)	**-.060**	-.022	**-.099**	-.024
Principal	First Year at School (vs. 2-5 years at school)	-.001	-.001	.001	-.025
Principal	6+ Years at School (vs. 2-5 years at school)	**.016**	**.021**	.010	-.050
Principal	AP Years at School	.001	-.010	.008	.071
Differences in Proficiency Growth Rates					
Teacher	% Inexperienced	-.001	**.025**	.009	-.009
Teacher	ITAC	-.004	.003	.007	-.011
Principal	Minority (vs. white)	-.007	.001	.000	.008
Principal	First Year at School (vs. 2-5 years at school)	**-.011**	-.007	.012	-.006
Principal	6+ Years at School (vs. 2-5 years at school)	**-.021**	-.011	-.004	.035
Principal	More Competitive Undergrad (vs. competitive)	.000	.010	.001	.023
Principal	Less Competitive Undergrad (vs. competitive)	.001	-.006	-.006	-.003
Principal	Grad Degree from Research Institution (vs. masters-level institution)	-.002	-.010	-.008	.013
Principal	AP Years at School	**.006**	**.037**	.012	-.052
Principal	More Competitive Undergrad * First Year at School	**.007**	-.011	.002	.032
Principal	Less Competitive Undergrad * First Year at School	-.004	-.008	.010	.020
Model Statistics					
Intraclass Correlation		.85	.88	.81	.92
Residual Variance (improvement over unconditional model)		.09 (3%)	.05 (63%)	.10 (-4%)	.01 (90%)
Intercept Variance (improvement over unconditional model)		.14 (75%)	.14 (84%)	.09 (78%)	.26 (83%)

Significant at the .001 level Significant at the .01 level Significant at the .05 level

classification help to explain initial differences in student proficiency in elementary and middle schools statewide, and in non-Chicago high schools. School principal and assistant principal tenure and undergraduate college competitiveness for first year principals also explain some of the differences in school proficiency growth rates for elementary and middle schools, especially those not in Chicago. Proficiency growth rates in high schools appear to be unrelated to principal characteristics, which may be partly explained by the fact that year-to-year changes in high school proficiency during this time period were small and statistically insignificant (see Appendix 3). While most of these findings from this analysis are consistent with prior research in both size and direction of impact, the negative relationship observed between long school principal tenure (six or more years) and proficiency growth is noteworthy, and could suggest diminishing returns to extended principal school tenure spells or to age (about one third of these principals were 55 years or older compared to only 16% of less-tenured principals).

Indirect Principal Effects

As shown in Table 1, ITAC (the IERC's composite index of teacher academic characteristics) helps explain initial student proficiency differences between schools with consistency and statistical significance, but small effect sizes. Since schools with higher ITACs have higher initial proportions of proficient students, we also wanted to investigate the relationship between principal characteristics and teacher qualifications to determine the impact that principals might have on ITAC. In fact, this question is aligned with much of the school leadership research that suggested much of the principal's effect is indirect—that is, that principals influence student achievement through their influence on a school's curriculum, culture, and teachers (Hallinger & Heck, 1998; Leithwood & Riehl, 2003). For example, previous research has found that principals can affect school performance through their choices of instructional and professional development programs (Eberts & Stone, 1988), and by creating a school culture focused on student learning goals (Brewer, 1993; Hallinger & Heck, 1996). Principals also have a measurable impact on parents' perceptions (Rice, 2010) and student absences and suspensions (Clark et al., 2009), which, in turn, may influence student achievement. Some studies (Wheeler, 2006; Clotfelter et al., 2007) have used principal leadership ratings from a teacher working conditions survey to determine that principals with higher leadership ratings tend to produce greater gains in student achievement, though these gains were quite modest and present only in elementary and high schools, not middle schools.

Recently, researchers have started to hone in on principals' abilities to attract, develop, and retain effective teachers as the most prominent mechanism by which they can improve student achievement (Brewer, 1993, Leithwood et al, 2004; Grissom & Loeb, 2009; Rice, 2010). For example, Brewer (1993) found that the primary impact of principals stems from making effective hiring choices, and Jacob and Lefgren (2005) found that principals affect school performance through their abilities to assess teacher quality. Although principals' academic qualifications do not have a direct impact on student achievement outcomes, Baker and Cooper (2005) and Wheeler (2006) both found that principals with stronger academic credentials tend to hire teachers with stronger academic backgrounds, who, in turn, tend to be more effective at improving student learning (Boyd, Grossman, Lankford, Loeb, & Wyckoff, 2009; Rice 2003; Wayne & Youngs, 2003). Other studies have found that more effective principals are able to attract and hire teachers with higher tests scores, more teaching experience, and better track records of improving student achievement (Clotfelter et al., 2007; Beteille, Kalogrides, & Loeb, 2010). Principals also have an impact on teachers' satisfaction, decisions about where to work, motivation, and working conditions (Louis, Leithwood, Wahlstrom, & Anderson, 2010; Rice, 2010), and research shows that highly rated and more tenured principals can reduce teacher turnover and teacher absences (Clotfelter et al., 2007; Clark et al., 2009). Further, Beteille, Kalogrides, and Loeb (2010) found that more effective principals were able to retain higher-quality teachers, remove less-effective teachers, and improve teachers' skills more rapidly, compared to less effective principals. For these reasons, the next step in our study was to model the connections between principal characteristics and teacher qualifications using Illinois data.

Modeling Principals' Impacts on Teacher Academic Qualifications in Illinois

In these models, our outcome variable is each school's ITAC in the subsequent academic year, since any changes principals make to their schools' teaching corps in any given year would not be observed in the data until the following year (Wheeler, 2006). ITAC data were previously calculated for 2000-01 through 2005-06, so subsequent year ITACs are available only through academic year 2004-05. Thus, these models address only five years of data each, with populations roughly similar in size to the models discussed above.

Table 2 details the results of the two-level hierarchical linear model estimating the impact of principal experience and academic background on initial teacher academic qualifications (ITAC). The full model results are available in Appendix 4. In the model statistics section (bottom of Table 2), the intraclass correlation statistic shows that about 43-70% of the variance in ITAC resides between schools rather than within schools over time. The model fit statistics indicate that the full models explain 23-59% of the variance in initial ITAC between schools and about 60-87% of the variance in ITAC within schools over time.

Table 2

Predicted Statewide 5-Year ITAC 2000-2001 through 2004-2005: A Two-Level Hierarchical Linear Growth Model Controlling for Student Demographics

		Elementary/Middle School		High School	
		Non-CPS	CPS	Non-CPS	CPS
Differences in Initial ITAC					
Principal	More Competitive Undergrad (vs. competitive)	*.010*	*-.000*	*.030*	*.007*
	Less Competitive Undergrad (vs. competitive)	*-.004*	*.013*	*-.015*	*.016*
	Grad Degree from Research Institution (vs. masters-level institution)	**.024**	*.033*	*.023*	*.045*
	Minority (vs. white)	**-.074**	**-.076**	*-.008*	*-.019*
	First Year at School (vs. 2-5 years at school)	*.003*	*-.007*	*-.006*	*-.002*
	6+ Years at School (vs. 2-5 years at school)	*.002*	*-.011*	*-.019*	*-.001*
	AP Years at School	*-.008*	*-.016*	*.006*	*.018*
Differences in ITAC Growth Rate					
Principal	Minority (vs. white)	*-.001*	*-.007*	*.021*	*-.004*
	More Competitive Undergrad (vs. competitive)	*.007*	*.020*	*.003*	*.045*
	Less Competitive Undergrad (vs. competitive)	*.009*	*-.005*	*-.002*	*-.049*
	Grad degree from research institution (vs. masters-level)	**.019**	*.036*	*.009*	*.005*
	First year at school (vs. 2-5 years)	*.003*	*.004*	*-.007*	*.015*
	6+ Years at School (vs. 2-5 years at school)	*-.008*	*-.006*	*-.008*	*.029*
	AP Years at School	*.002*	*.028*	*.019*	*-.146*
Model Statistics					
Intraclass Correlation		*.43*	*.64*	*.55*	*.70*
Residual Variance (improvement over unconditional model)		*.08 (60%)*	*.07 (85%)*	*.04 (87%)*	*.15 (77%)*
Intercept Variance (improvement over unconditional model)		*.44 (23%)*	*.52 (37%)*	*.42 (32%)*	*.59 (59%)*

Significant at the .001 level Significant at the .01 level Significant at the .05 level

Overall, these models show that most principal characteristics are not closely associated with either initial ITAC levels or ITAC growth rates. Part of the reason for this may be that student characteristics—especially poverty concentration—explain the bulk of the differences in school ITAC level, and that year-to-year changes in ITAC are quite small (see Appendix 4). However, these analyses do reveal significant relationships between principal graduate program Carnegie class and both initial ITAC and ITAC growth rates for non-CPS elementary and middle schools. These findings are consistent with the prior research cited above showing that principal academics are associated with teacher qualifications.

Table 2 shows that, controlling for school context —proportion of inexperienced teachers, year, school enrollment, and student race and poverty composition, mobility, and attendance—principals' undergraduate college selectivity has no consistent impact on initial ITAC. However, non-CPS elementary and middle schools with principals who received their advanced degrees from research institutions have higher initial ITACs (by .02 SDs) compared to similar schools with principals who received their advanced degrees from masters-level institutions. These same schools (non-CPS elementary and middle schools with principals from research institutions) also increase their ITAC at greater rates (by .02 SDs more per year) compared to non-CPS elementary/middle schools with principals from masters-level institutions. On the other hand, principal school tenure, as AP or otherwise, has little bearing on initial school ITAC or growth in ITAC. Principal race appears to have no bearing on the rate of change in ITAC, but elementary and middle schools with minority principals tend to have lower initial ITACs (by .07 SDs) compared to elementary/middle schools with white principals.

Conclusions

In sum, we find that principal characteristics have a small, but statistically significant, impact on student proficiency and teacher characteristics and, in general, our analyses of Illinois data using an HLM framework support the existing research evidence suggesting that principal experience and academic qualifications play a role in this relationship. In particular, our findings indicate that Illinois principals' effects on student achievement derive partially through experience as principal or assistant principal at their current school, and also that principals who obtained their advanced degrees from research universities (as opposed to masters-level institutions) have a positive association with study proficiency. Furthermore, our evidence also supports the notion that principals play a large indirect role in improving student achievement via their impact on the teaching corps. Our analyses of Illinois data suggest that principals with advanced degrees from research institutions have a positive association with improved teacher qualifications, which in turn, have a strong relationship with student proficiency.

Table 3 summarizes our findings regarding the impact of principal characteristics on student proficiency and teacher academic qualifications. For ease of interpretation, principal characteristics with positive findings from at least one model are color shaded, while those that are negatively associated with proficiency, ITAC, or change in these measures are shaded grey.

Table 3

Summary of Findings: Impact of principal characteristics on student proficiency and teacher academic qualifications

Principal Characteristics		Impact on Student Achievement	Impact on Student Achievement Growth	Impact on ITAC (teacher qualifications)	Impact on Growth of ITAC (teacher qualifications)
Principal Experience	First Year at School (vs. 2nd–5th year at school)	No significant effects	Negative effect in non-CPS elem/mid schools	No significant effects	No significant effects
	6+ Years at School (vs. 2nd–5th year at school)	Positive effects in elem/mid schools	Negative effect in non-CPS elem/mid schools	No significant effects	No significant effects
	Years as Assistant Principal at School	No significant effects	Positive effects in elem/mid schools	No significant effects	No significant effects
Principal Academics	More Competitive Undergrad (vs. competitive)	No significant effects	No significant effects	No significant effects	No significant effects
	Less Competitive Undergrad (vs. competitive)	No significant effects	No significant effects	No significant effects	No significant effects
	Grad Degree from Research Institution (vs. masters-level institution)	Positive effect in non-CPS high schools	No significant effects	Positive effect in non-CPS elem/mid schools	Positive effect in non-CPS elem/mid schools

Principal Experience

Experience as principal in one's current school and experience as assistant principal in one's current school both appear to be associated with differences in initial student proficiency between schools and on differences in growth in student proficiency at the elementary/middle school level. The most tenured principals (those with six or more years of experience as principal at their school) have a positive effect on initial proficiency at the elementary/middle school level for both Chicago and non-Chicago schools. In non-Chicago elementary/middle schools, principals with two to five years of tenure at their schools tend to produce more proficiency growth than both the most tenured (6+ years at school) and least tenured (first year at school) principals. School tenure as assistant principal has a positive impact on school growth in proficiency for both of our elementary/middle school models (Chicago and non-Chicago), however, none of the measures of principal experience used in our models appear to have any effect on initial ITAC levels or growth in ITAC after controlling for other variables.

Principal Academics

Regardless of whether the principal attended a more competitive or less competitive institution (as opposed to one that was simply competitive), principal undergraduate college competitiveness alone appears to have no significant impact on initial levels of student proficiency or ITAC, or within school growth in either of these measures. However, in non-Chicago elementary and middle schools, first year principals who attended more competitive colleges had a positive impact on growth in student proficiency. We also find evidence that principals who obtained their advanced degrees from research universities (as opposed to masters-level institutions) have a positive effect on initial student proficiency and ITAC, and on growth in ITAC. Further, our models show that ITAC has a positive impact on initial student proficiency across all school types (both elementary/middle and high schools, and both Chicago and non-Chicago schools).

Implications

With so much recent research and policy attention on teachers and teacher quality, it may be easy to overlook the fact that principals also play a vital role in the success of our schools. Because principals are so important, it is essential to focus more intently on principal quality and work to ensure that our school leaders are both adequately supported and held accountable for their effectiveness. One promising development already underway in Illinois is recently passed legislation that will encourage frequent and high-quality evaluations for all principals in the state. However, the knowledge base on effective principal evaluation is relatively slim and most districts have little experience with the task. Two recent reviews of instruments for measuring principal performance suggest that few existing assessment systems are sufficiently valid, reliable, and comprehensive (Condon & Clifford, 2010; Davis, Kearney, Sanders, Thomas, & Leon, 2011).

One possible new direction for research lays in our results indicating principals who received their graduate degrees from research institutions (as opposed to masters-levels institutions) have an impact on both student proficiency levels and teacher qualifications. These initial findings suggest that the Carnegie classification of principals' advanced degree-granting institutions could serve as a potential indicator of the quality of principal preparation programs. Further investigation is warranted to determine whether, for example, doctoral-level institutions are more effective than masters-level institutions at imparting strategies that lead to improved school outcomes, or whether research institutions simply attract candidates who are more qualified or tend to seek out more rigorous educational experiences, and that these qualities are associated with principal effectiveness.

Finally, our findings on the importance of the assistance principalship, combined with earlier findings on the increasing utilization of the AP position across Illinois (Brown & White, 2010), suggest that principal quality is improving in the state and bodes well for future success. Although rural and small-town schools may have limited capacity to justify these positions, opportunities for teacher leadership, new principal mentoring, and pre-service residencies and internships are some potential strategies that can improve future principals' chances for success, and policymakers should consider funding such capacity-building efforts to help new principals hit the ground running.

References

Baker, B., & Cooper, B. (2005). Do principals with stronger academic backgrounds hire better teachers? Policy implications for improving high poverty schools. *Educational Administration Quarterly 41*, 449-479.

Ballou, D. & Podgursky, M. (1995). What makes a good principal? How teachers assess the performance of principals. *Economics of Education Review, 14*(3), 243-252.

Barron's. (2003). *Profiles of American colleges*. Woodbury, NY: W's Educational Series, Inc.

Beteille, T., Kalogrides, D., & Loeb, S. (2010). *Effective schools: Managing the recruitment, development, and retention of high-quality teachers*. Paper presented at the annual meeting of the American Educational Research Association, Denver, CO, April 20-May 1, 2010.

Bill & Melinda Gates Foundation (2010). *Learning about teaching: Initial findings from the Measures of Effective Teaching Project*. Retrieved from: http://metproject.org/downloads/Preliminary_Findings-Research_Paper.pdf

Boyd, D. J., Grossman, P. L., Lankdord, H., Loeb, S., & Wyckoff, J. H. (2009). *Who leaves? Teacher attrition and student achievement* (CALDER Working Paper 23). Washington, DC: The Urban Institute.

Branch, G., Hanushek, E., & Rivkin, S. (2009). *Estimating principal effectiveness*. Washington, DC: CALDER.

Brewer, D. J. (1993). Principals and student outcomes: Evidence from U.S. high schools. *Economics of Education Review, 12*(4), 281-292.

Brown, K. S. & White, B. R. (2010). *The state of leadership: Public school principals in Illinois* (IERC 2010-2). Edwardsville, IL: Illinois Education Research Council.

Bryk, A. S., Sebring, P. B., Allensworth, E., Luppescu, S., & Easton, J. Q. (2010). *Organizing schools for improvement*. Chicago: University of Chicago Press.

The Carnegie classification of institutions of higher education, 2000 edition. (2001). Menlo Park, CA: The Carnegie Foundation for the Advancement of Teaching.

Chaplin, D. (2003). *Hierarchical linear models: Strengths and weaknesses.* Association for Public Policy Analysis and Management Annual. Washington, DC: Urban Institute. Retrieved from http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?db=pubmed&cmd=Retrieve&dopt=AbstractPlus&list_uids=9727690524451418154related:KjDcEv6y_4YJ

Clark, D., Martorell, R., & Rockoff, J (2009). *School principals and school performance.* Washington, DC: CALDER.

Clotfelter, C. T., Ladd, H. F., Vigdor, J. L., & Wheeler, J. (2007). *High poverty schools and the distribution of teachers and principals* (CALDER Working Paper No.1). Washington, DC: National Center for Analysis of Longitudinal Data in Education Research.

Condon, C. & Clifford, M. (2010). *Measuring principal performance: How rigorous are commonly used principal performance assessment instruments?* (A Quality School Leadership Issue Brief). Naperville, IL: Learning Point Associates. Retrieved from http://www.learningpt.org/pdfs/QSLBrief2.pdf

Creemers B. P. M. & Reezigt, G. J. (1996). School level conditions affecting the effectiveness of instruction. *School Effectiveness and School Improvement, 7*, 197-228.

Davis, S., Kearney, K., Sanders, N., Thomas, C., & Leon, R. (2011). T*he policies and practices of principal evaluation: A review of the literature*. San Francisco, CA: WestEd.

Eberts, R. W. & Stone, J. A. (1988, June). Student achievement in public schools: Do principals make a difference? *Economics of Education Review, 7*(3), 291-299.

Golhbaber, D., Liddle, S., Theobald, R., & Walch, J. (2010). *Teacher effectiveness and the achievement of Washington's students in mathematics* (CEDR Working Paper 2010-06). University of Washington Bothell, Center for Education Data and Research. Retrieved from http://www.cedr.us/papers/working/CEDR%20WP%202010-6%20Teacher%20Effectiveness%20in%20WA%20%2812-7-10%29.pdf

Grissom, J. & Loeb, S. (2009). *Triangulating principal effectiveness: How perspectives of parents, teachers, and assistant principals identify the central important of managerial skills*. Washington, DC: CALDER.

Hallinger, P. & Heck, R. (1996). Reassessing the principal's role in school effectiveness: A review of emprical research, 1980-1995. *Educational Administration Quarterly, 32*(1), 5-44.

Hallinger, P., & Heck, R. H. (1998). Exploring the principal's contribution to school effectiveness: 1980-1995. *School Effectiveness and School Improvement, 9*, 157-191.

Heck, R., Thomas, S. L., & Tabata, L. (2010). *Multilevel and longitudinal modeling with IBM SPSS*. New York: Routledge.

Ho, A. D. (2008). The problem with "proficiency": Limitations of statistics and policy under No Child Left Behind. *Educational Researcher, 37*, 351-360.

Hox, J. (2002). *Multilevel analysis: Techniques and applications*. Mahwah, NJ: Erlbaum.

Jacob, B. A., & Lefgren, L. (2005). *Principals as agents: Subjective performance measurement in education* (Working Paper 11463). Cambridge, MA: National Bureau of Economic Research.

Leithwood, K. A., & Riehl, C. (2003). *What do we already know about successful school leadership?* Paper prepared for the AERA Division A Task Force on Developing Research in Educational Leadership.

Leithwood, K., Seashore-Louis, K., Anderson, S. & Wahlstrom, K. (2004). *How leadership influences student learning: A review of research for the learning from leadership project*. New York:Wallace Foundation.

Leithwood, K., Day, C., Sammons, P., Harris, A., & Hopkins, D. (2006). *Successful school leadership: What it is and how it influences pupil learning*. London, UK: DfES. Retrieved from http://www.dfes.gov.uk/research/data/uploadfiles/RR800.pdf

Louis, K., Leithwood, K., Wahlstrom, K., & Anderson, S. (2010). *Learning from leadership: Investigating the links to improved student learning*. Final report of research findings. University of Minnesota.

Raudenbush, S. W. & Bryk, A. S. (2002). *Hierarchical linear models: Applications and data analysis methods*. Thousand Oaks, CA: Sage.

Rice, J. K. (2003). *Teacher quality: Understanding the effectiveness of teacher attributes*. Washington, DC: Economic Policy Institute.

Rice, J. (2010). *Principal effectiveness and leadership in an era of accountability: What the research says*. Washington, DC: CALDER.

Rivkin, S. G., Hanushek, E. A., & Kain, J. F. (2005). Teachers, schools, and academic achievement. *Econometrica, 73*(2), 417–58.

Scheerens, J. & Bosker, R. (1997). *The foundations of educational effectiveness*. Oxford, England: Pergamon Press.

Singer, J. D., & Willett, J. B. (2003). *Applied longitudinal data analysis: Modeling change and event occurrence.* New York: Oxford University Press.

Waters, T., Marzano, R. J., & McNulty, B. (2003). *Balanced leadership: What 30 years of research tells us about the effect of leadership on student achievement* (Working Paper). Aurora, CO: Mid-continent Research for Education and Learning.

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

Wheeler, J. (2006). *An analysis of principal turnover, distribution, and effectiveness in the state of North Carolina*. Master's Thesis prepared for Dr. Helen Ladd, Duke University.

White, B. R., Presley, J. B., & DeAngelis, K. J. (2008). *Leveling up: Narrowing the teacher academic capital gap in Illinois* (IERC 2008-1). Edwardsville, IL: Illinois Education Research Council.

Appendices

Appendix 1

Statistical Models

The Level 1 model includes the fixed effects for the intercept, year, and the time-varying covariates for each school. The Level 2 model allows the intercepts and the slope for year to vary randomly, holding all other slopes for the covariates as fixed effects. SPSS (PASW) 18.0.0 was used to estimate the model parameters and residuals (Heck, Thomas, & Tabata, 2010).

Following the nomenclature recommended in the HLM literature (Raudenbush & Bryk, 2002), the general form of the hierarchical linear growth model can be represented by the following equations:

Level 1: Profij = π0 j + π1j YEARij + π2j Xij ...eij

Level 2: π0 j = γ00 + Wj +γ0 j

π1j = γ10+ Wj + γ1j

π2j = γ20

in which

Profij = School proficiency at time i

YEARij = year for each school's data

Xij = time-varying covariates for each school in each year

π 0j = the slope of the intercepts varying randomly across schools; school j's estimated proficiency in 2000-01 (ISAT) or 2001-02 (PSAE)

π 1j = the slope of time varying randomly across schools; the annual rate at which school's proficiency grew between 2000-2001 and 2005-2006

π p2j = the slope of a Level 1 predictor across schools

Wj = level 2 predictor across schools by year

Appendix 2

Descriptive Statistics for Variables Included in Statistical Models

	Elementary/Middle School				High School			
	Non-CPS		CPS		Non-CPS		CPS	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Proficiency	72.4%	*14.5*	46.0%	*19.5*	55.7%	*12.5*	24.8%	*22.6*
Student enrollment	430	*228.4*	669	*325.0*	874	*853.6*	1,176	*798.5*
Student attendance	95.2%	*1.5*	93.7%	*2.1*	93.4%	*2.4*	85.7%	*5.5*
Student mobility	16.0%	*11.3*	25.1%	*14.2*	12.5%	*8.0*	28.3%	*25.6*
Black students	13.6%	*23.5*	56.3%	*43.4*	7.1%	*17.3*	61.1%	*37.2*
Hispanic students	11.1%	*18.1*	31.3%	*36.5*	5.0%	*10.0*	28.0%	*29.8*
Asian students	3.1%	*5.4*	2.7%	*7.6*	1.8%	*3.7*	3.0%	*5.9*
FRL students	31.6%	*25.5*	85.2%	*19.7*	20.5%	*15.9*	82.8%	*16.5*
Teachers inexperienced	16.9%	*0.1*	17.4%	*0.1*	16.5%	*0.1*	22.9%	*0.1*
Teachers ITAC	0.1	*0.7*	-1.1	*0.9*	0.6	*0.7*	-0.3	*0.9*
Minority principal	10.0%	*0.3*	68.2%	*0.5*	5.8%	*23.4*	73.2%	*0.4*
Principal from more competitive undergrad	17.8%	*0.4*	26.4%	*0.4*	18.5%	*0.4*	29.5%	*0.5*
Principal from less competitive undergrad	16.6%	*0.4*	29.4%	*0.5*	12.3%	*0.3*	20.7%	*0.4*
Principal with advanced degree from research institution	53.1%	*0.5*	35.4%	*0.5*	48.3%	*0.5*	40.4%	*0.5*
Principal in first year at school	19.9%	*0.4*	13.1%	*0.3*	20.8%	*0.4*	26.0%	*0.4*
Principal with 6+ years at school	34.3%	*0.5*	53.0%	*0.5*	33.1%	*0.5*	26.4%	*0.4*
Principal years as AP at school	0.3	*1.1*	0.2	*0.9*	0.9	*2.3*	0.6	*1.4*

Appendix 3

Results from Model of Student Proficiency

	Elementary/Middle School				High School			
	Non-CPS		CPS		Non-CPS		CPS	
	B	Sig	B	Sig	B	Sig	B	Sig
Intercept	.059	.000	.188	.001	.006	.699	.897	.003
Year	.265	.000	.146	.000	.016	.138	.113	.472
School Variables								
Enroll[a]	-.047	.000	-.138	.000	.120	.000	-.045	.427
Attendance	.052	.000	.218	.000	.258	.000	.176	.000
Black[a]	-.127	.000	-.207	.000	-.062	.003	-.097	.454
Hispanic[a]	-.060	.000	.008	.615	-.065	.000	-.031	.533
Asian[a]	.083	.000	.143	.000	.086	.000	.164	.001
FRL[b]	-.357	.000	-.713	.000	-.315	.000	-.889	.000
Mobility[b]	-.040	.000	-.074	.000	-.051	.001	-.157	.000
Teacher Variables								
% Inexperienced Teachers	-.015	.000	.013	.118	-.021	.057	-.079	.006
ITAC	.049	.000	.033	.002	.088	.000	.190	.000
Principal Variables								
More Competitive Undergrad	.004	.357	.012	.278	.009	.414	-.002	.959
Less Competitive Undergrad	.007	.107	.019	.082	-.002	.887	-.043	.084
Grad Degree from Research University	.005	.321	.007	.553	.026	.025	.003	.926
Minority	-.060	.000	-.022	.072	-.099	.000	-.024	.546
First Year as Principal at School	-.001	.623	-.001	.896	.001	.859	-.025	.114
6+ Years as Principal at School	.016	.000	.021	.019	.010	.318	-.050	.052
AP Years at School	.001	.861	-.010	.416	.008	.448	.071	.079
Within-School Variables								
Enroll[a] * Year	.009	.036	-.032	.003	.001	.948	-.012	.753
Black[a] * Year	-.014	.003	-.035	.022	-.000	.999	-.005	.946
Hispanic[a] * Year	.041	.000	.016	.108	-.013	.369	-.018	.480
Asian[a] * Year	.007	.130	-.013	.194	-.017	.259	.037	.189
FRL[b] * Year	.114	.000	.148	.000	-.014	.456	-.017	.786
Mobility[b] * Year	-.022	.000	.015	.146	.006	.732	-.006	.810
Attend * Year	.063	.000	.087	.000	.007	.733	.008	.745
tInexp * Year	-.001	.659	.025	.003	.009	.402	-.009	.699
ITAC * Year	-.004	.313	.003	.704	.007	.629	-.011	.673
Minority Principal * Year	-.007	.127	.001	.914	.000	.982	.008	.705
Principal's First Year as Principal at School * Year	-.011	.000	-.007	.435	.012	.224	-.006	.737
Principal with 6+ Years as Principal at School * Year	-.021	.000	-.011	.176	-.004	.739	.035	.115
Principal from More Competitive Undergrad * Year	.000	.905	.010	.195	.001	.945	.023	.273
Principal from Less Competitive Undergrad * Year	.001	.710	-.006	.400	-.006	.595	-.003	.880
Principal Grad Degree from Research University * Year	-.002	.468	-.010	.229	-.008	.413	.013	.547
Principal's AP Years at School * Year	.006	.041	.037	.001	.012	.231	-.052	.132
Principal from More Competitive Undergrad * Principal's First Year as Principal at School * Year	.007	.010	-.011	.100	.002	.799	.032	.059
Principal from Less Competitive Undergrad * Principal's First Year as Principal at School * Year	-.004	.123	-.008	.274	.010	.306	.020	.188

[a] Variable was transformed by the natural log function to correct for skewness in the data
[b] Variable was transformed by the square root function to correct for skewness in the data

Appendix 4

Results from Model of Teacher Academic Qualifications

	Elementary/Middle School				High School			
	Non-CPS		CPS		Non-CPS		CPS	
	B	Sig	B	Sig	B	Sig	B	Sig
Intercept	.139	.000	-.422	.000	.069	.022	-.590	.212
Year	-.001	.940	.050	.464	.051	.004	-.246	.539
School Variables								
Enroll[a]	-.000	.992	-.119	.003	.189	.000	.091	.399
Attendance	-.031	.004	.013	.799	-.053	.057	-.085	.699
Black[a]	-.011	.339	.044	.174	.059	.022	.197	.008
Hispanic[a]	.046	.000	.159	.000	.052	.017	.252	.000
Asian[a]	-.183	.000	-.320	.000	-.229	.000	-.201	.215
FRL[b]	-.022	.002	-.044	.072	-.042	.015	-.057	.175
Mobility[b]	.004	.506	.020	.479	.036	.257	.066	.143
Attendance	.004	.504	-.019	.270	.006	.642	.172	.000
% Inexperienced Teachers	.049	.000	.033	.002	.088	.000	.190	.000
Principal Variables								
More Competitive Undergrad	.010	.130	-.000	.987	.030	.051	.007	.876
Less Competitive Undergrad	-.004	.544	.013	.549	-.015	.314	.016	.702
Grad Degree from Research University	.024	.001	.033	.195	.023	.165	.045	.320
Minority	-.074	.000	-.076	.003	-.008	.747	-.019	.733
First Year as Principal at School	.003	.445	-.007	.630	-.006	.520	-.002	.929
6+ Years as Principal at School	.002	.726	-.011	.558	-.019	.171	-.001	.970
AP Years at School	-.008	.158	-.016	.508	.006	.674	.018	.759
Within-School Variables								
Enroll[a] * Year	.003	.698	.040	.118	-.064	.014	.008	.925
Black[a] * Year	-.027	.001	.003	.928	.078	.001	.226	.191
Hispanic[a] * Year	.015	.054	-.011	.649	-.040	.055	-.036	.578
Asian[a] * Year	.016	.038	-.018	.435	.012	.527	.094	.137
FRL[b] * Year	.027	.009	.065	.228	-.001	.973	.113	.463
Mobility[b] * Year	-.006	.405	-.024	.289	-.054	.003	.025	.596
Attendance * Year	-.011	.174	-.052	.015	-.066	.018	-.003	.945
% Inexperienced Teachers * Year	.001	.822	-.008	.655	.009	.502	-.062	.158
Minority Principal * Year	-.001	.939	-.007	.702	.021	.352	-.004	.930
Principal from More Competitive Undergrad * Year	.007	.214	.020	.273	.003	.808	.045	.321
Principal from Less Competitive Undergrad * Year	.009	.128	-.005	.745	-.002	.909	-.049	.250
Principal Grad Degree from Research University * Year	.019	.001	.036	.064	.009	.506	.005	.918
Principal's First Year as Principal at School * Year	.003	.425	.004	.816	-.007	.486	.015	.602
Principal 6+ Years as Principal at School * Year	-.008	.175	-.006	.743	-.008	.506	.029	.461
Principals' AP Years at School * Year	.002	.661	.028	.223	.019	.121	-.146	.060

[a] Variable was transformed by the natural log function to correct for skewness in the data
[b] Variable was transformed by the square root function to correct for skewness in the data

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The Illinois Education Research Council, housed at Southern Illinois University Edwardsville, was established in 2000 to provide Illinois with education research to support P-20 education policy making and program development. The IERC undertakes independent research and policy analysis, often in collaboration with other researchers, that informs and strengthens Illinois' commitment to providing a seamless system of educational opportunities for its citizens. Through publications, presentations, participation on committees, and a research symposium, the IERC brings objective and reliable evidence to the work of state policy makers and practitioners.